

Description

The invention relates to a magnetic tape cassette.

Magnetic tape cassettes including two magnetic tape reels and a magnetic tape casing are well known.

Conventionally, in such magnetic tape cassettes, the tape reel assembly comprises a cylindrical drum section having integral upper and lower reel flanges on upper and lower faces thereof, and the casing comprises upper and lower housings. The lower flange has a cylindrical hub section projecting from the outer surface thereof and comprises a substantially cylindrical recess for receiving a reel shaft of a recording and/or reproducing apparatus. The tape reel is rotatably received within a circular opening formed in the lower housing through the cylindrical hub section. A clearance between the outer peripheral surface of the cylindrical hub section and the inner peripheral surface of the circular opening is standard among tape cassette manufacturers. Since the alignment of the reel shaft may vary slightly between cassette players, the clearance is necessary in order to ensure smooth rotation of the tape reel assembly without friction between the hub section and the circular opening formed in the cassette case for receiving it. The clearance is referred to as a "G spec."

However, in such a magnetic tape cassette, the bosses of the tape reels are often caused, due to vibration or shocks, to come out of the respective openings of the lower housing and, as a result, dust is produced by friction between the edges of the upper and lower flanges and inner walls of the housing.

Thus, in conventional tape cassettes, the degree of play of the tape reel perpendicular to the centre axis thereof is either defined by the clearance between the edges of the upper and lower flanges of tape reel and the inner surfaces of side walls of the housing, or defined by the clearance between the inner periphery of the circular opening and the corresponding hub section of the reel assembly.

Recently, magnetic tape cassettes with provision for preventing the bosses of the tape reels from coming out of the respective openings of the lower housing have been proposed.

A magnetic tape cassette belonging to the prior art includes an inwardly extending annular projection at the periphery of the circular opening of its lower housing, for preventing the bosses of the tape reel assemblies from coming out of the respective openings in the lower housing, and for preventing fracturing of the upper flange. In such magnetic tape cassettes, there is a problem in that since the reels are supported and guided near the

central axes thereof, they can easily become inclined, with the result that the bosses come out of the hole in the lower half of the casing and the reel becomes free to slide around the inside of the cassette casing. Another result of the inclination is that the flanges impinge at their outer edges upon the upper and/or lower inner surfaces of the casing, with the result that they may become cracked near the hubs.

Patent Specification EP-A-150 987 discloses upper and lower ring-shaped projecting parts of a reel hub engaged into a ring-shaped groove of a top plate and a ring-shaped groove of a base plate. The upper and lower ring-shaped projecting parts are not provided on the upper and lower flange sections of the tape reels, but rather are provided on the hub sections of the reel hubs. A cassette case includes a sliding body and a lid so as to prevent dust from outside the tape cassette from entering into the tape cassette.

According to the invention there is provided a magnetic tape cassette including:

a tape reel rotatable about its axis to receive a tape, formed with at least a cylindrical drum and a flange extending radially from one end surface of the drum;

a housing defining a space for enclosing the tape reel, the housing having a first inner surface opposing the surface of the flange which faces away from the drum and a second inner surface perpendicular to the first inner surface; and

means for limiting radial displacement of the tape reel within said space to maintain a required distance between the outer circumference of the flange and the respective opposing second inner surface of the housing;

characterised in that said displacement limiting means includes a first contact portion which projects from the surface of the flange facing away from the drum and has a generally cylindrical outer peripheral surface coaxially arranged about said axis substantially midway between the perimeter of the flange and the central portion of the flange, and a second contact portion which is disposed on said first inner surface of the housing and has a generally cylindrical inner peripheral surface to abut the outer peripheral surface of the first contact portion so as to limit the radial displacement of the tape reel, thereby to prevent contact between the outer circumference of the flange and the respective opposing second inner surface of the housing.

In such a magnetic tape cassette movement of the reels within a cassette casing can be regulated in both axial and radial directions.

Thus the first and second contact portions can cooperatively serve so as to limit the movement of the tape reel within the cassette casing in both axial and radial directions. Moreover, the second

contact portion formed on the inside lower half thereof supports a relatively large area of the flange of the tape reel means. Mating surfaces of the first contact portion formed on the flange of the tape spool and the second contact portion formed on the lower half of the cassette casing cooperate to form a barrier against dust created due to friction, so as to prevent it from entering the interior of the cassette casing and becoming attached to the tape disposed therein.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a perspective view illustrating the upper side of the magnetic tape cassette according to the invention;

Figure 2 is a perspective view illustrating the lower side of the magnetic tape cassette of Figure 1;

Figure 3 is a partial cross sectional view showing internal details of the magnetic tape cassette of Figures 1 and 2 in one relative position;

Figure 3A is an enlarged cross-sectional view of the portion enclosed by the chain dotted line in Figure 3; and

Figure 4 is another partial sectional view of internal details of the magnetic tape cassette of Figure 3 in another relative position.

Referring to the drawings, Figures 1 and 2 show a tape cassette 11 having a pair of tape reels 12, 13 and a substantially rectangular cassette housing 14. The illustrated tape cassette 11 contains 8-mm video tape for a video tape recorder (VTR).

The respective tape reels 12, 13 comprise upper and lower flanges 17, 18 and a cylindrical drum section 16, and are rotatably retained side by side in the rectangular cassette housing 14. Tape T is wound on the tape reels. The cassette housing 14 is formed with upper and lower housing portions 20 and 21. The tape cassette 11 includes a lid assembly 15 which is pivotably mounted on the housing 14 so as to be operable between open and closed mode positions. When the lid assembly 15 is open, a segment of the tape between the tape reels 12 and 13 is exposed for withdrawal from the cassette housing 14. On the other hand, when the lid is in the closed position, it encloses the tape T. While the tape cassette 11 is not inserted into the drive device of a video tape recorder, a lock-pin P remains in a lock mode. As the tape cassette 11 is inserted into the drive device, the lock-pin P is positioned in an unlock mode, with the result that the lid assembly 15 can be opened.

On each reel 12, 13, a cylindrical hub section 19 is formed at the centre of the lower flange 18 and protrudes from the bottom face of the flange 18. The inner peripheral wall of the cylindrical hub

section 19 define a cylindrical recess 19a in which a reel shaft (not shown) of a recording and/or reproducing apparatus can engage. The lower housing portion 21 includes a pair of circular openings 22 and 23 through which the reel shafts can be inserted into the cylindrical hub sections 19.

Figures 3 and 4 are sectional views illustrating the relationship of the lower flange 18 to the lower housing portion 21.

Figure 3 shows an annular projection 25 formed on the bottom face of the lower flange 18 around the cylindrical hub portion 19. The centre axis of the annular projection 25 coincides with that of the tape reel. The lower housing portion 21 includes an annular projection 26 and an annular groove 27, which limit motion of the tape reel assembly within the cassette housing 14. The inner diameter of the annular projection 26 is slightly larger than the outer diameter of the annular projection 25. The clearance A_1 between the annular projection 25 and the annular projection 26 is smaller than the clearance G between the outer peripheral surface of the cylindrical hub section 19 and the inner peripheral surface of the circular opening 22. The clearance G defines the so-called "G spec."

In Figure 3A, an upper face 26a of the annular projection 26 supports the bottom face of the lower flange 18 before insertion of the tape cassette 11 into recording and/or reproducing apparatus. An inner peripheral surface 26b of the annular projection 26 limits motion of the tape reel in radial directions, with the result that the upper and lower flanges 17 and 18 are prevented from colliding with the side walls 28 and 29 of the upper and lower housing portion 20 and 21, respectively. In addition, the annular projection 25 is fitted into the annular groove 27 so as not to come out thereof. In this way, a contact portion 24 formed by the annular projection 26 and the annular groove 27 cooperates with the annular projection 25 of the flange 18 to limit play of the tape reel within the cassette housing 14 in any direction.

In Figure 3, the centre axis of the tape reel assembly 12 is aligned with that of the circular opening 22 of the lower housing portion 21.

In other words, the reel 12 is centred in the circular opening 22.

In Figure 4, the reel 12 is shown displaced in the direction of the side walls 28 and 29 so that the centre axis of the tape reel is displaced from that of the circular opening 22 in the lower housing portion 21 by the maximum displacement (dG). In Figures 3, 3A and 4, a distance l_1 between the outer peripheral surface of the annular projection 25 and the edge of the lower flange 18 is set to be smaller than a distance l_2 between the inner peripheral surface 26b of the annular portion 26 and

the side walls 28 and 29 of the cassette housing 14. As will be seen clearly in Figure 4, a predetermined difference A_2 between the distances l_1 and l_2 is provided. Thus, the outer peripheral surface of the annular projection 25 abuts the inner peripheral 26b of the annular portion 26 so that the tape reel assembly 12 cannot come into contact with the side wall 28, 29 of the cassette housing 14.

In prior art magnetic tape cassettes, the edges of the reel upper and lower flanges may often come into contact with a side wall of the cassette housing, with the result that dust or debris is generated due to friction between the edges of the flanges and the side wall of the cassette housing during shipping and handling. The dust and debris tend to adhere to the surface of the tape, and the surface of the tape is, obviously, quite susceptible to damage therefrom. As a result, the magnetic distance on the surface of the magnetic tape is subject to shear fracture. Such damage to the magnetic tape may result in a so-called dropout error due to failure in the magnetic substance, that is to say, the tapes are not dependable for use as a high quality recording medium.

In the construction of the tape cassette of the described embodiment of the invention, the play of the tape reel in the radial direction is regulated by an annular projection on the lower flange and an annular recess portion of the lower housing portion. Therefore, the outer peripheral surface of the annular projection can contact the inner peripheral surface of the annular portion so that the edges of the upper and lower flanges cannot collide or mate with the side wall of the cassette housing. Dust may be created by friction between the annular projection and the annular recess portion, however, it is separated from the cylindrical drum section in which magnetic tape is wound, and is nearer to the circular opening of the cylindrical hub section. As a result, the dust or debris tends to come out through the circular opening. In this way, since dust and debris cannot be caused by friction or collision between the edges of flanges of the tape reels and the inside of the cassette tape housing, and any dust that is caused by friction between the annular projection of the lower flange and the annular portion of the lower housing portion, cannot easily reach the tape wound around the cylindrical drum section, the tape of the cassette has a greatly reduced tendency to become damaged due to dust.

Among the materials most suitable for the annular projection 25 and the annular projection 26 are synthetic resins having good wear and abrasion resistance, such as an acrylonitrile-butadiene-styrene (ABS). In this case, synthetic resins having abrasion resistance may be used in constructing

the annular projection 25 and/or the annular portion 26, or the entire lower flange 18 and/or the entire lower housing portion 21.

Although the present invention has been disclosed in terms of VTR tape cassettes, it is not intended to limit the scope of the invention to such magnetic tape cassettes and the invention may be embodied in other specific forms.

Claims

1. A magnetic tape cassette including:

a tape reel (12, 13) rotatable about its axis to receive a tape (T), formed with at least a cylindrical drum (16) and a flange (17, 18) extending radially from one end surface of the drum (16);

a housing (14) defining a space for enclosing the tape reel (12, 13), the housing having a first inner surface opposing the surface of the flange (17, 18) which faces away from the drum (16) and a second inner surface perpendicular to the first inner surface; and

means (25, 26, 27) for limiting radial displacement of the tape reel (12, 13) within said space to maintain a required distance between the outer circumference of the flange and the respective opposing second inner surface of the housing;

characterised in that said displacement limiting means includes a first contact portion (25) which projects from the surface of the flange facing away from the drum and has a generally cylindrical outer peripheral surface coaxially arranged about said axis substantially midway between the perimeter of the flange and the central portion of the flange, and a second contact portion (26, 27) which is disposed on said first inner surface of the housing (14) and has a generally cylindrical inner peripheral surface to abut the outer peripheral surface of the first contact portion so as to limit the radial displacement of the tape reel, thereby to prevent contact between the outer circumference of the flange (17, 18) and the respective opposing second inner surface of the housing.

2. A magnetic tape cassette according to claim 1, wherein the first contact portion (25) includes an axially extending outer peripheral surface to mate with an axially extending inner peripheral surface (26b) of the second contact portion.

the side walls 28 and 29 of the cassette housing 14. As will be seen clearly in Figure 4, a predetermined difference A_2 between the distances l_1 and l_2 is provided. Thus, the outer peripheral surface of the annular projection 25 abuts the inner peripheral 26b of the annular portion 26 so that the tape reel assembly 12 cannot come into contact with the side wall 28, 29 of the cassette housing 14.

In prior art magnetic tape cassettes, the edges of the reel upper and lower flanges may often come into contact with a side wall of the cassette housing, with the result that dust or debris is generated due to friction between the edges of the flanges and the side wall of the cassette housing during shipping and handling. The dust and debris tend to adhere to the surface of the tape, and the surface of the tape is, obviously, quite susceptible to damage therefrom. As a result, the magnetic substance on the surface of the magnetic tape is subject to shear fracture. Such damage to the magnetic tape may result in a so-called dropout error due to failure in the magnetic substance, that is to say, the tapes are not dependable for use as a high quality recording medium.

In the construction of the tape cassette of the described embodiment of the invention, the play of the tape reel in the radial direction is regulated by an annular projection on the lower flange and an annular recess portion of the lower housing portion. Therefore, the outer peripheral surface of the annular projection can contact the inner peripheral surface of the annular portion so that the edges of the upper and lower flanges cannot collide or mate with the side wall of the cassette housing. Dust may be created by friction between the annular projection and the annular recess portion, however, it is separated from the cylindrical drum section in which magnetic tape is wound, and is nearer to the circular opening of the cylindrical hub section. As a result, the dust or debris tends to come out through the circular opening. In this way, since dust and debris cannot be caused by friction or collision between the edges of flanges of the tape reels and the inside of the cassette tape housing, and any dust that is caused by friction between the annular projection of the lower flange and the annular portion of the lower housing portion, cannot easily reach the tape wound around the cylindrical drum section, the tape of the cassette has a greatly reduced tendency to become damaged due to dust.

Among the materials most suitable for the annular projection 25 and the annular projection 26 are synthetic resins having good wear and abrasion resistance, such as an acrylonitrile-butadiene-styrene (ABS). In this case, synthetic resins having abrasion resistance may be used in constructing

the annular projection 25 and/or the annular portion 26, or the entire lower flange 18 and/or the entire lower housing portion 21.

Although the present invention has been disclosed in terms of VTR tape cassettes, it is not intended to limit the scope of the invention to such magnetic tape cassettes and the invention may be embodied in other specific forms.

Claims

1. A magnetic tape cassette including:
 - a tape reel (12, 13) rotatable about its axis to receive a tape (T), formed with at least a cylindrical drum (16) and a flange (17, 18) extending radially from one end surface of the drum (16);
 - a housing (14) defining a space for enclosing the tape reel (12, 13), the housing having a first inner surface opposing the surface of the flange (17, 18) which faces away from the drum (16) and a second inner surface perpendicular to the first inner surface; and
 - means (25, 26, 27) for limiting radial displacement of the tape reel (12, 13) within said space to maintain a required distance between the outer circumference of the flange and the respective opposing second inner surface of the housing;
 - characterised in that said displacement limiting means includes a first contact portion (25) which projects from the surface of the flange facing away from the drum and has a generally cylindrical outer peripheral surface coaxially arranged about said axis substantially midway between the perimeter of the flange and the central portion of the flange, and a second contact portion (26, 27) which is disposed on said first inner surface of the housing (14) and has a generally cylindrical inner peripheral surface to abut the outer peripheral surface of the first contact portion so as to limit the radial displacement of the tape reel, thereby to prevent contact between the outer circumference of the flange (17, 18) and the respective opposing second inner surface of the housing.
2. A magnetic tape cassette according to claim 1, wherein the first contact portion (25) includes an axially extending outer peripheral surface to mate with an axially extending inner peripheral surface (26b) of the second contact portion.



3. A magnetic tape cassette according to claim 2, wherein the second contact portion includes a radially extending surface (26a) to receive the surface of the flange facing away from the drum. 5
4. A magnetic tape cassette according to claim 2, wherein the first contact portion (25) and/or the second contact portion (26, 27) are annular in shape and the first and second contact portions are coaxially arranged with the axis. 10
5. A magnetic tape cassette according to claim 4, wherein the first contact portion (25) is square in cross section. 15
6. A magnetic tape cassette according to claim 4, wherein the second contact portion comprises an annular projection (26) and/or an annular groove (27) which abuts the inner peripheral surface of the annular projection and receives the first contact portion therein. 20
7. A magnetic tape cassette according to claim 6, wherein the annular projection (26) is square in cross section. 25
8. A magnetic tape cassette according to claim 6, wherein the annular groove (27) is square in cross section. 30

Revendications

1. Cassette à bande magnétique comprenant : 35
 - une bobine de bande (12, 13) pouvant tourner autour de son axe afin de recevoir une bande (T), constituée d'au moins un tambour cylindrique (16) et d'un flasque (17, 18) s'étendant radialement depuis une surface d'extrémité du tambour (16);
 - un boîtier (14) définissant un espace destiné à enfermer la bobine de bande (12, 13), le boîtier ayant une première surface intérieure opposée à la surface du flasque (17, 18) qui est dirigée à l'écart du tambour (16) et une deuxième surface intérieure perpendiculaire à la première surface intérieure; et 40
 - des moyens (25, 26, 27) destinés à limiter le déplacement radial de la bobine de bande (12, 13) à l'intérieur dudit espace de façon à maintenir une distance requise entre la circonférence extérieure du flasque et la deuxième surface intérieure opposée respective du boîtier; 45
 - caractérisée en ce que lesdits moyens de limitation de déplacement comportent une première partie de contact (25) qui se projette depuis la surface du flasque dirigée à l'écart 50

du tambour et possède une surface périphérique extérieure généralement cylindrique disposée coaxialement autour dudit axe sensiblement à mi-chemin entre le périmètre du flasque et la partie centrale du flasque, et une deuxième partie de contact (26, 27) qui est disposée sur ladite première surface intérieure du boîtier (14) et possède une surface périphérique intérieure généralement cylindrique destinée à buter contre la surface périphérique extérieure de la première partie de contact afin de limiter le déplacement radial de la bobine de bande, de façon à empêcher ainsi le contact entre la circonférence extérieure du flasque (17, 18) et la deuxième surface intérieure opposée respective du boîtier.

2. Cassette à bande magnétique selon la revendication 1, dans laquelle la première partie de contact (25) comporte une surface périphérique extérieure s'étendant axialement destinée à correspondre à une surface périphérique intérieure s'étendant axialement (26b) de la deuxième partie de contact.
3. Cassette à bande magnétique selon la revendication 2, dans laquelle la deuxième partie de contact comporte une surface s'étendant radialement (26a) destinée à recevoir la surface du flasque dirigée à l'écart du tambour.
4. Cassette à bande magnétique selon la revendication 2, dans laquelle la première partie de contact (25) et/ou la deuxième partie de contact (26, 27) sont de forme annulaire et les première et deuxième parties de contact sont disposées coaxialement à l'axe.
5. Cassette à bande magnétique selon la revendication 4, dans laquelle la première partie de contact (25) est de section carrée.
6. Cassette à bande magnétique selon la revendication 4, dans laquelle la deuxième partie de contact comporte une saillie annulaire (26) et/ou une rainure annulaire (27) qui bute contre la surface périphérique intérieure de la saillie annulaire et y reçoit la première partie de contact.
7. Cassette à bande magnétique selon la revendication 6, dans laquelle la saillie annulaire (26) est de section carrée.
8. Cassette à bande magnétique selon la revendication 6, dans laquelle la rainure annulaire (27) est de section carrée.



Patentansprüche

1. Magnetbandkassette mit:
einer zur Aufnahme eines Bandes (T) um ihre Achse drehbaren Bandspule (12, 13) mit wenigstens einer zylindrischen Trommel (16) und einem von einer Endfläche der Trommel (16) radial sich erstreckenden Flansch (17, 18) einem einen Raum zum Umgeben der Bandspule (12, 13) definierenden Gehäuse (14) mit einer ersten Innenfläche, die einer von der Trommel (16) abgekehrten Fläche des Flansches (17, 18) gegenüberliegt, und einer zur ersten Innenfläche senkrechten zweiten Innenfläche, und
einer Einrichtung (25, 26, 27) zum Begrenzen einer radialen Verschiebung der Bandspule (12, 13) in dem Raum, um einen erforderlichen Abstand zwischen dem äußeren Umfang des Flansches und der diesem gegenüberliegenden zweiten Innenfläche des Gehäuses aufrechtzuerhalten,
dadurch gekennzeichnet,
daß die Einrichtung zur Begrenzung der Verschiebung einen ersten Kontaktabschnitt (25), der von der von der Trommel abgekehrten Fläche des Flansches vorsteht und eine im wesentlichen auf halbem Wege zwischen der Peripherie des Flansches und dem zentralen Abschnitt des Flansches coaxial zur Achse angeordnete, generell zylindrische äußere Umfangsfläche aufweist, und einen zweiten Kontaktabschnitt (26, 27) aufweist, der auf der ersten Innenfläche des Gehäuses (14) angeordnet ist und eine generell zylindrische innere Umfangsfläche aufweist, die an die äußere Umfangsfläche des ersten Kontaktabschnitts stößt, um die radiale Verschiebung der Bandspule zu begrenzen und dabei einen Kontakt zwischen der äußeren Umfangsfläche des Flansches (17, 18) und der diesem gegenüberliegenden zweiten Innenfläche des Gehäuses zu verhindern.
2. Magnetbandkassette nach Anspruch 1, wobei der erste Kontaktabschnitt (25) eine axial sich erstreckende äußere Umfangsfläche aufweist, die an die axial sich erstreckende innere Umfangsfläche (26b) des zweiten Kontaktabschnittes angepaßt ist.
3. Magnetbandkassette nach Anspruch 2, wobei der zweite Kontaktabschnitt eine radial sich erstreckende Fläche (26a) zur Aufnahme der von der Trommel abgekehrten Fläche des Flansches aufweist.
4. Magnetbandkassette nach Anspruch 2, wobei der erste Kontaktabschnitt (25) und/oder der zweite Kontaktabschnitt (26, 27) ringförmig und der erste und zweite Kontaktabschnitt coaxial zur Achse angeordnet sind.
5. Magnetbandkassette nach Anspruch 4, wobei der erste Kontaktabschnitt (25) im Querschnitt viereckig ist.
6. Magnetbandkassette nach Anspruch 4, wobei der zweite Kontaktabschnitt einen ringförmigen Vorsprung (26) und/oder eine ringförmige Nut (27) aufweist, welcher und/oder welche an die innere Umfangsfläche des ringförmigen Vorsprungs anstößt und in welchem und/oder welcher der erste Kontaktabschnitt aufgenommen ist.
7. Magnetbandkassette nach Anspruch 6, wobei der ringförmige Vorsprung (26) im Querschnitt viereckig ist.
8. Magnetbandkassette nach Anspruch 6, wobei die ringförmige Nut (27) im Querschnitt viereckig ist.

