

Description

Background of the invention

The present invention relates to a tape guide arrangement for a helical scan magnetic recording and playback apparatus as set forth in the preamble of claim 1. Such arrangement is known from JP—A—45654/1983.

In a recording and playback apparatus of the kind described, a magnetic tape is generally transported helically wrapping around a guide drum over a predetermined angular range. To implement such a manner of tape transport, a stationary lower drum of a guide drum assembly is usually provided with a tape transport guide adapted to guide a magnetic tape helically along a predetermined path.

In such a prior art tape guide arrangement, the tape transport guide is formed in part of the outer periphery of the lower drum and made up of a shoulder to be engaged by the lower edge of a running magnetic tape and a tape sliding surface to be engaged by one surface of the tape. The problem encountered with this kind of tape transport guide is that the area over which the tape surface contacts the tape sliding surface of the lower drum and, therefore, friction developing therebetween is relatively large, liable to develop unstable transport of the tape and make the tape and guide drum assembly easy to be worn out or damaged. An attempt heretofore made to solve such a problem consists in joining the shoulder and the tape sliding surface to each other by an intermediary curved surface to reduce the friction due to contact, as disclosed in above-mentioned JP—A—45654/1983. This approach, however, brings about another problem that upon contact of the lower edge of a magnetic tape in transport with the curved surface the level, or height, of the tape is apt to fluctuate in height and fail to be maintained at a predetermined position.

Summary of the invention

It is therefore an object of the present invention to provide an improved tape guide arrangement for a magnetic recording and playback apparatus of the aforementioned kind which allows a magnetic tape to be transported stably in a flat profile and at a constant height and is capable of reducing a frictional load in the transport of a magnetic tape.

This object is attained by the characterizing features of claim 1. Preferred embodiments of the invention are subject matter of the dependent claims.

The objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

Brief description of the drawings

Figure 1 is a side elevation of a prior art tape guide arrangement for a magnetic recording and playback apparatus;

Figure 2 is an enlarged vertical section of a tape

transport guide portion of the arrangement shown in Figure 1;

Figures 3 and 4 are fragmentary vertical sections each showing the arrangement of Figure 1 in a tape guiding condition;

Figure 5 is an enlarged vertical section of the prior art tape guide arrangement for a magnetic recording and playback apparatus as set forth in aforementioned JP—A—45654/1983.

Figure 6 is a fragmentary vertical section of a tape guide arrangement for a magnetic recording and playback apparatus embodying the present invention which is shown in a tape guiding condition;

Figure 7 is fragmentary enlarged view of the arrangement shown in Figure 6; and

Figure 8 is an enlarged vertical section showing a modification to a tape transport guide portion of the tape guide arrangement in accordance with the present invention.

Description of the preferred embodiments

Before entering into detailed description of the present invention, a brief reference will be made to some examples of prior art tape guide arrangements shown in Figures 1—5.

Referring to Figures 1—5, a rotatable upper drum 10 is positioned coaxially with a stationary lower drum 12 and provided with, for example, two magnetic heads 14 and 16. Driven by a motor (not shown), the upper drum 10 rotates at a high speed (e.g. 1800 rpm) in a position above and coaxial with the lower drum 12. The lower drum 12 includes a stepped tape transport guide 20 positioned in its outer periphery for guiding a magnetic tape 18 a profile of which is shown in the figures. The tape 18 is transported in contact with the lower drum 12 over a predetermined angular range. Due to such fast rotation of the upper drum 10, an air film 22 develops between the drum 10 and the tape 18 to keep them spaced apart from each other. The tape 18 in transport is wound around the upper and lower drums 10 and 12 over a predetermined angle and regulated in level, or height, due to the abutment of its lower edge against a shoulder 24 of the guide 20, while the magnetic heads 14 and 16 rotating with the upper drum 10 record or reproduce signals into or out of the tape 18. As shown in an enlarged scale in Figure 2, the lower drum 12 is provided with a tape sliding surface 26 having a cylindrical configuration which is substantially equal in diameter to the upper drum 10. The surface 26 extends perpendicular to the shoulder 24.

Now, magnetic tapes extensively used today may generally be classified into two types, i.e., a magnetic layer coated type and a deposition type. As generally known, the coated type magnetic tape is little susceptible to curling, while the deposition tape is susceptible thereto very much. The deposition type tape of which a metal magnetic material is deposited on a support in a vacuum deposition or sputtering process, compared to the coated type, has a hard surface and has rigidity in itself so that a portion thereof

engaged with the tape guide arrangement is apt to wear; a wider friction area results in a larger load in the tape transport and, thereby, more critical, tape guiding and transport. Where the tape 18 comprises a coated type tape, a lower portion of the tape 18 is engaged with the tape guide 20 over substantially the whole surface 26 of the latter, as shown in Figure 3. Even in case of a curly deposition type tape loaded in place of the tape 18 of Figure 3, the contact area between the tape 18 and the surface 26 of the tape guide 20 is still large although somewhat smaller than the case with the coated type tape.

The tape guide arrangement disclosed in JP-A-45654/1983 as previously mentioned is shown in Figure 5. In Figure 5, the shoulder 24 and the tape sliding surface 26 joins each other through an intermediary curved portion 30. In this construction, an air gap developed by the air film 22 between the upper drum 10 and the tape 18 due to the fast rotation of the drum 10 is also communicated to a gap between the lower drum 12 and the tape 18 for the purpose of allowing the tape 18 to run at a spacing from the surface 26 and, thereby, reducing frictional resistance exerted by the surface 26.

In the prior art arrangement shown in Figures 1-4, the contact area between the tape 18 and the surface 26 is relatively large and, in turn, entails substantial friction which is detrimental to the stability of tape transport. Especially, where use is made of a deposition type tape, the rigidity and surface hardness particular thereto promotes wear of those portions of the lower drum 12 which make contact with the tape, while causing damage to the tape itself. Meanwhile, the prior art arrangement shown in Figure 5 is not fully acceptable because the height of the tape 18 fluctuates as its lower edge is brought into contact with the curved portion 30 between the shoulder 24 and the surface 26.

Reference will be made to Figures 6-8 for describing the present invention in detail. In Figures 6-8, the same or similar structural elements as those of Figures 1-5 are designated by like reference numerals and detailed description thereof will be omitted for simplicity.

In Figures 3, 4 and 5, although the tape 18 is shown in an exaggerated profile which is bulged as being momentarily pressed by the head 14 (16), such bulge develops only at a moment of the head contact so that the profile of the tape 18 is subject generally to the upper and lower drum surfaces in the predetermined angular range.

A lower drum 32 is provided with a tape transport guide 34 which plays an essential role in the tape guide arrangement of the present invention. As shown in an enlarged scale in Figure 7, the tape transport guide 34 comprises a stepped portion having an abutment surface formed by a shoulder 36, a tape guide portion 38 and an inclined portion 40, and a tape transport surface portion 42. The shoulder, 36 guides a magnetic tape 18 in transport while being engaged by the lower edge of the tape 18 to restrict the height of

the latter. Having a cylindrical configuration, the tape guide portion 38 guides the tape 18 while being engaged by only limited part of one of opposite surfaces of the tape 18 which is adjacent to the lower edge. The tape guide portion 38 rises from the shoulder 36 to a height such as 0.2-0.3 millimeter for a 12.7 millimeter wide tape which suffices for tape transport guide and, yet, allows a minimum of friction to develop between the tape 18 and the surface portion 38. The shoulder 36 and the tape guide portion 38 extend perpendicular to each other. The tape transport surface portion 42 has a cylindrical configuration whose outside diameter is substantially the same as or slightly smaller than that of an upper drum 10. The outside diameter of the tape guide portion 38 is slightly larger than that of the upper drum 10, the difference being complementary to the thickness of an air film 22 which is, for example 0-20 microns depending on the angular position in the predetermined angular range.

The tape 18 in transport remains in abutment against the shoulder 36 at its lower edge and contacts the tape guide portion 38 over limited part of its surface which is adjacent to the lower edge. Because the outside diameter of the tape transport surface portion 42 is smaller than that of the tape guide portion 38, an air gap 44 is defined between the tape 18 and the tape transport surface portion 42 to allow the tape 18 to run without contacting the surface portion 42 or under a light load. Friction of the tape 18, therefore, develops but is limited to portions only between the lower edge of the tape 18 and the shoulder 36 and between the limited area of the tape 18 adjacent to the tape lower edge and the guide portion 38. The result is only a small magnitude of friction and, therefore, a light load in tape transport which insures smooth movement of the tape, thus minimizing a load to the tape transport system as well as wear of the drum even with the deposition tape, which has substantial rigidity as previously stated.

An alternative configuration of the tape transport guide 34 is shown in Figure 8. A tape transport guide 34a of Figure 8 includes a tape transport surface portion 42a which is inclined.

In summary, it will be seen that the present invention provides a tape guide arrangement for a magnetic recording and playback apparatus which reduces the contact area between a tape guide portion and a magnetic tape to minimum one which suffices for holding a tape in position for transport, thereby reducing the friction between the interengaged surfaces and, thereby, the load in tape transport. Such is also effective to lessen the chance of damage to the tape and lower drum. Because the tape runs in a relatively flat profile, it is held in contact with magnetic heads in a desirable manner. Further, because the outside diameter of the tape guide portion may be slightly larger than that of the upper drum, a portion of the tape adjacent to the lower end and guided by the tape guide portion is kept aligned with an upper portion of the tape which is spaced

from the upper drum by an air film developed by the rotation of the upper drum. This further enhances the transport of the tape in a flat profile and, thereby, the desirable contact of the tape with the heads.

Claims

1. A tape guide arrangement installed in a magnetic recording and playback apparatus for guiding a magnetic tape being transported, comprising a rotatable drum member (10) provided with tape transport regulating means (34, 34a) for guiding the tape (18) such that the tape (18) runs helically wrapping around the rotatable drum member (10) and a stationary drum member (32) over a predetermined angular range, said tape transport regulating means (34, 34a) having tape positioning means for guiding the tape (18) with one edge of the tape (18) abutted against an abutment surface (36) and positioning the tape (18) with respect to height thereof, said tape positioning means being provided on said stationary drum member and comprising a stepped portion including said abutment surface (36) which extends parallel to the tape transport direction and contacts one edge of the tape (18) and tape guide means comprising a tape non-contact surface portion (42, 42a) which faces one of opposite surfaces of the tape (18), a tape contact surface portion (38) which is engaged by a part of said one surface of the tape (18) to guide the tape (18) along a predetermined tape transport path and holds the tape (18) in a flat profile, and an air gap portion (44) defined between said one surface of the tape (18) and the tape non-contact surface portion (42, 42a), wherein the tape contact surface portion (38) is smaller in area than the tape non-contact surface portion (42, 42a) characterized in that the tape contact surface portion (38) is cylindrical and is perpendicular to the abutment surface (36) of the stepped portion and is of greater diameter than the tape non-contact surface portion (42, 42a).

2. A tape guide arrangement as claimed in claim 1, wherein the tape non-contact surface portion (42a) is inclined relative to the tape contact surface portion (38).

3. A tape guide arrangement as claimed in claim 1, wherein the tape guide means further comprises an inclined surface portion (40) which joins the tape contact surface portion (38) and the tape non-contact surface portion (42) to each other.

4. A tape guide arrangement as claimed in any one of claims 1 to 3, wherein the tape non-contact surface portion (42, 42a) of the stationary drum member (32) is substantially equal in diameter to the rotatable drum member (10).

5. A tape guide arrangement as claimed in any one of claims 1 to 3, wherein the tape non-contact surface portion (42, 42a) of the stationary drum member (32) is smaller in diameter than the rotatable drum member (10).

6. A tape guide arrangement as claimed in any

one of claims 1 to 3, wherein the tape contact surface portion (38) of the stationary drum member (32) is larger in diameter than the rotatable drum member (10).

Patentansprüche

1. Bandführungseinrichtung, die in einem magnetischen Aufzeichnungs- und Wiedergabegerät installiert ist, zum Führen eines transportierten Magnetbandes, enthaltend eine drehbare Trommel (10), die mit einer Bandtransporteinrichtung (34, 34a) zum Führen des Bandes (18) versehen ist derart, daß das Band (18) schraubenlinienförmig um die drehbare Trommel (10) und eine stationäre Trommel (32) über einen vorbestimmten Winkelbereich läuft, wobei die Bandtransporteinrichtung (34, 34a) eine Bandpositioniereinrichtung aufweist, um das Band (18) so zu führen, daß ein Rand des Bandes (18) gegen eine Anstoßfläche (36) anstößt, und um das Band (18) in bezug auf seine Höhe zu positionieren, wobei die Bandpositioniereinrichtung an der stationären Trommel angeordnet ist und einen abgestuften Abschnitt enthält, der die genannte Anstoßfläche (36) aufweist, der sich parallel zu der Bandtransportrichtung erstreckt und einen Rand des Bandes (18) berührt, und die Bandführungseinrichtung einen nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42, 42a), der einer der entgegengesetzten Flächen des Bandes (18) gegenübersteht, einen Bandberührungsoberflächenabschnitt (38), der von einem Teil der genannten einen Oberfläche des Bandes (18) berührt wird, um das Band (18) längs eines vorbestimmten Bandtransportweges zu führen und das Band (18) in einem flachen Profil hält, und einen Luftspaltabschnitt (44) enthält, der zwischen der genannten einen Oberfläche des Bandes (18) und dem nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42, 42a) definiert ist, wobei der Bandberührungsoberflächenabschnitt (38) der Fläche nach kleiner ist, als der nicht mit dem Band in Berührung befindliche Oberflächenabschnitt (42, 42a), dadurch gekennzeichnet, daß der Bandberührungsoberflächenabschnitt (38) zylindrisch und senkrecht zu der Anstoßfläche (36) des abgestuften Abschnitts ist und einen größeren Durchmesser hat, als der mit dem Band nicht in Berührung befindliche Oberflächenabschnitt (42, 42a).

2. Bandführungseinrichtung nach Anspruch 1, bei der der mit dem Band nicht in Berührung befindliche Oberflächenabschnitt (42a) gegenüber dem Bandberührungsoberflächenabschnitt (38) geneigt ist.

3. Bandführungseinrichtung nach Anspruch 1, bei der die Bandführungseinrichtung weiterhin einen geneigten Oberflächenabschnitt (40) aufweist, der den Bandberührungsoberflächenabschnitt (38) und den nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42) miteinander verbindet.

4. Bandführungseinrichtung nach einem der Ansprüche 1 bis 3, bei der der mit dem Band nicht



from the upper drum by an air film developed by the rotation of the upper drum. This further enhances the transport of the tape in a flat profile and, thereby, the desirable contact of the tape with the heads.

Claims

1. A tape guide arrangement installed in a magnetic recording and playback apparatus for guiding a magnetic tape being transported, comprising a rotatable drum member (10) provided with tape transport regulating means (34, 34a) for guiding the tape (18) such that the tape (18) runs helically wrapping around the rotatable drum member (10) and a stationary drum member (32) over a predetermined angular range, said tape transport regulating means (34, 34a) having tape positioning means for guiding the tape (18) with one edge of the tape (18) abutted against an abutment surface (36) and positioning the tape (18) with respect to height thereof, said tape positioning means being provided on said stationary drum member and comprising a stepped portion including said abutment surface (36) which extends parallel to the tape transport direction and contacts one edge of the tape (18) and tape guide means comprising a tape non-contact surface portion (42, 42a) which faces one of opposite surfaces of the tape (18), a tape contact surface portion (38) which is engaged by a part of said one surface of the tape (18) to guide the tape (18) along a predetermined tape transport path and holds the tape (18) in a flat profile, and an air gap portion (44) defined between said one surface of the tape (18) and the tape non-contact surface portion (42, 42a), wherein the tape contact surface portion (38) is smaller in area than the tape non-contact surface portion (42, 42a) characterized in that the tape contact surface portion (38) is cylindrical and is perpendicular to the abutment surface (36) of the stepped portion and is of greater diameter than the tape non-contact surface portion (42, 42a).

2. A tape guide arrangement as claimed in claim 1, wherein the tape non-contact surface portion (42a) is inclined relative to the tape contact surface portion (38).

3. A tape guide arrangement as claimed in claim 1, wherein the tape guide means further comprises an inclined surface portion (40) which joins the tape contact surface portion (38) and the tape non-contact surface portion (42) to each other.

4. A tape guide arrangement as claimed in any one of claims 1 to 3, wherein the tape non-contact surface portion (42, 42a) of the stationary drum member (32) is substantially equal in diameter to the rotatable drum member (10).

5. A tape guide arrangement as claimed in any one of claims 1 to 3, wherein the tape non-contact surface portion (42, 42a) of the stationary drum member (32) is smaller in diameter than the rotatable drum member (10).

6. A tape guide arrangement as claimed in any

one of claims 1 to 3, wherein the tape contact surface portion (38) of the stationary drum member (32) is larger in diameter than the rotatable drum member (10).

Patentansprüche

1. Bandführungseinrichtung, die in einem magnetischen Aufzeichnungs- und Wiedergabegerät installiert ist, zum Führen eines transportierten Magnetbandes, enthaltend eine drehbare Trommel (10), die mit einer Bandtransportregleinrichtung (34, 34a) zum Führen des Bandes (18) versehen ist derart, daß das Band (18) schraubenlinienförmig um die drehbare Trommel (10) und eine stationäre Trommel (32) über einen vorbestimmten Winkelbereich läuft, wobei die Bandtransportregleinrichtung (34, 34a) eine Bandpositioniereinrichtung aufweist, um das Band (18) so zu führen, daß ein Rand des Bandes (18) gegen eine Anstoßfläche (36) anstößt, und um das Band (18) in bezug auf seine Höhe zu positionieren, wobei die Bandpositioniereinrichtung an der stationären Trommel angeordnet ist und einen abgestuften Abschnitt enthält, der die genannte Anstoßfläche (36) aufweist, der sich parallel zu der Bandtransportrichtung erstreckt und einen Rand des Bandes (18) berührt, und die Bandführungseinrichtung einen nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42, 42a), der einer der entgegengesetzten Flächen des Bandes (18) gegenübersteht, einen Bandberührungsoberflächenabschnitt (38), der von einem Teil der genannten einen Oberfläche des Bandes (18) berührt wird, um das Band (18) längs eines vorbestimmten Bandtransportweges zu führen und das Band (18) in einem flachen Profil hält, und einen Luftspaltabschnitt (44) enthält, der zwischen der genannten einen Oberfläche des Bandes (18) und dem nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42, 42a) definiert ist, wobei der Bandberührungsoberflächenabschnitt (38) der Fläche nach kleiner ist, als der nicht mit dem Band in Berührung befindliche Oberflächenabschnitt (42, 42a), dadurch gekennzeichnet, daß der Bandberührungsoberflächenabschnitt (38) zylindrisch und senkrecht zu der Anstoßfläche (36) des abgestuften Abschnitts ist und einen größeren Durchmesser hat, als der mit dem Band nicht in Berührung befindliche Oberflächenabschnitt (42, 42a).

2. Bandführungseinrichtung nach Anspruch 1, bei der der mit dem Band nicht in Berührung befindliche Oberflächenabschnitt (42a) gegenüber dem Bandberührungsoberflächenabschnitt (38) geneigt ist.

3. Bandführungseinrichtung nach Anspruch 1, bei der die Bandführungseinrichtung weiterhin einen geneigten Oberflächenabschnitt (40) aufweist, der den Bandberührungsoberflächenabschnitt (38) und den nicht mit dem Band in Berührung befindlichen Oberflächenabschnitt (42) miteinander verbindet.

4. Bandführungseinrichtung nach einem der Ansprüche 1 bis 3, bei der der mit dem Band nicht



in Berührung befindliche Oberflächenabschnitt (42, 42a) der stationären Trommel (32) im wesentlichen den gleichen Durchmesser wie die drehbare Trommel (10) aufweist.

5. Bandführungseinrichtung nach einem der Ansprüche 1 bis 3, bei der der mit dem Band nicht in Berührung befindliche Oberflächenabschnitt (42, 42a) der stationären Trommel (32) einen kleineren Durchmesser hat, als die drehbare Trommel (10).

6. Bandführungseinrichtung nach einem der Ansprüche 1 bis 3, bei der der Bandberührungsoberflächenabschnitt (38) der stationären Trommel (32) einen größeren Durchmesser als die drehbare Trommel (10) hat.

Revendications

1. Un dispositif de guidage de bande monté dans un appareil d'enregistrement et de lecture magnétique pour guider une bande magnétique qui est transportée, comprenant un élément de tambour rotatif (10) équipé d'un dispositif de régulation (34, 34a) du déplacement de la bande pour guider la bande (18) de telle façon que la bande (18) se déplace en s'enroulant de façon hélicoïdale autour de l'élément de tambour rotatif et un élément de tambour stationnaire (32) sur une plage angulaire déterminée au préalable, ledit dispositif de régulation (34, 34a) du déplacement de la bande ayant un dispositif de positionnement de la bande pour guider la bande (18) de telle sorte qu'un bord de la bande (18) vienne en butée contre une surface d'aboutement (36) et positionnant la bande (18) concernant sa hauteur, ledit dispositif de positionnement de la bande étant prévu sur ledit élément de tambour stationnaire et comprenant une partie comportant ledit surface d'aboutement (36) qui s'étend parallèlement à la direction de déplacement de la bande et est en contact avec un bord de la bande (18) et un dispositif de guidage de la bande comprenant une partie de surface qui n'est pas en contact avec la bande (42, 42a) qui est en regard de l'une des faces opposées de la bande (18), une partie de surface de contact de la bande (38) qui est

engagée par une partie de ladite surface de la bande (18) pour guider la bande (18) le long d'un chemin de déplacement de la bande déterminée au préalable et retient la bande (18) suivant un profil plat, et une partie d'entrefer (44) formée entre ladite surface de la bande (18) et la partie de surface non en contact avec la bande (42, 42a), dans lequel la partie de surface (38) en contact avec la bande est plus petite en surface que la partie de surface non en contact avec la bande (42, 42a), caractérisé en ce que la partie de surface en contact avec la bande (38) est cylindrique et perpendiculaire à la surface d'aboutement (36) de la partie épaulée et a un diamètre supérieur à la partie de surface non en contact avec la bande (42, 42a).

2. Un dispositif de guidage de la bande selon la revendication 1, dans lequel la partie de surface non en contact avec la bande (42a) est inclinée par rapport à la partie de surface en contact avec la bande (38).

3. Un dispositif de guidage de bande selon la revendication 1, caractérisé en ce que le dispositif de guidage de la bande comprend en outre une partie de surface (40) inclinée qui relie la partie de surface de contact de la bande (38) et la partie de surface non en contact avec la bande (42) ensemble.

4. Un dispositif de guidage de bande selon l'une quelconque des revendications 1 à 3, dans lequel la partie de surface non en contact avec la bande (42, 42a) de l'élément de tambour stationnaire (32) est pratiquement égale en diamètre à l'élément de tambour rotatif (10).

5. Un dispositif de guidage de bande selon l'une quelconque des revendications 1 à 3, dans lequel la partie de surface non en contact avec la bande (42, 42a) de l'élément de tambour stationnaire (32) est plus petite en diamètre que l'élément de tambour rotatif (10).

6. Un dispositif de guidage de bande selon l'une quelconque des revendications 1 à 3, dans lequel la partie de surface en contact avec la bande (38) de l'élément de tambour stationnaire (32) est plus grande en diamètre que l'élément de tambour rotatif (10).

50

55

60

65