

Description

Technical Field

The present invention relates in general to magnetic recording tape cassettes and more specifically to a rotatable tape roller guide for such cassettes.

Background Art

Typical tape cassettes include a case with spaced-apart sidewalls, at least one tape supporting reel rotatably disposed between the case sidewalls, and a pair of tape guiding members which are typically pin mounted in the case. Rotatable tape roller guides in tape cassettes are advantageous because they produce minimal drag on the tape and thereby reduce the torque required to advance the tape. However, in the past it has been a problem to efficiently and economically produce cassettes including rotatable guides having proper bearing end clearances. If too small a bearing end clearance is provided, the guides will bind in the case; if too large a bearing end clearance is provided, the guides will oscillate on their pin shafts and when driven at high speeds produce an irritating noise. A lowering of the quality of reproduction of the recorded format due to improper tape positioning as a result of such oscillation can also occur.

Attempts to provide the required case to roller guide clearance while limiting oscillation have been disclosed in U.S. Patent No. 3,891,159, issued June 24, 1975 to Nelson, and U.S. Patent No. 3,829,040 issued August 13, 1974 to Nelson, both assigned to the assignee of the present invention, which show shim layers positioned within the cassette body which straddle the roller guides to prevent oscillation and a spindle press fitted into the roller guide bore and adjusted by contact with the case as the cassette base is assembled, respectively.

Another means for preventing guide oscillation was shown in U.S. Patent No. 3,735,940 issued May 29, 1973 to Schwartz in which a roller is shown biased into contact with the cassette case by a coil spring. Yet another means for preventing guide oscillation is disclosed in DE-A-2062458 in which a separate biasing element is positioned between the spool and its closure and in one form of the disclosure of this reference the biasing element is made of foam. However such a foam biasing element is not usually employed because of undue frictional drag on its associated spool.

Although these methods of preventing roller guide oscillation have proven to be operationally satisfactory, they result in undesirable manufacturing expense and assembly costs.

Disclosure of the Invention

According to this invention there is provided a tape cassette including a pair of generally parallel sidewalls having spaced inner surfaces between which is mounted a roller guide characterized by said roller guide having an axis disposed generally normal to said inner surfaces, axially

spaced bearing surfaces adjacent said inner surfaces, a main portion comprising a generally cylindrical outer surface about said axis, and at least one axially extending projection integrally formed with said main portion and defined by a partial radially extending cut between said projection and said main portion, said projection defining one of said bearing surfaces and being resiliently deflected toward said main portion by the spacing between the inner surfaces of said sidewalls to locate said roller guide with respect to said inner surfaces; and by means mounting the roller guide between said sidewalls for rotation relative thereto around said axis.

The projection defining one of the bearing surfaces produces a biasing force which locates the guide with respect to the sidewalls of the cassette and greatly restricts roller guide oscillation. Since separate elements known from the prior art to perform this function are avoided manufacturing and assembly costs are greatly reduced.

Brief Description of the Drawing

The present invention will be further described by way of example with reference to the accompanying drawing wherein the numbers refer to like parts in the several views, and wherein:

Fig. 1 is a plan view of a typical tape cassette including a pair of roller guides according to the present invention and having a part broken away to show details;

Fig. 2 is an enlarged fragmentary view in cross-section taken approximately through the plane 2-2 of Fig. 1, indicating the disposition of one of the roller guides of Fig. 1 in the cassette; and

Fig. 3 is an enlarged fragmentary sectional view of the roller guide shown in Figure 2.

Detailed Description

Referring now to the drawings and specifically to Fig. 1, there is shown a magnetic tape cassette including a case 10 which has a pair of shells or sidewalls 12 and 14 which mate with each other in a conventional manner to provide an interior space for receiving and rotatably mounting a pair of tape reels 16 and 18 on which end portions of a flexible magnetic tape 20 can be wound to form tape packs 24 and 26.

Located within the case 10 between the sidewalls 12 and 14 are roller guide assemblies 28 which serve to direct tape 20 coming off respective tape packs 24 or 26 so that the tape 20 extends along and is movable relative to an adjacent side margin 29 of the cassette case 10. The case margin 29 between the roller guide assemblies 28 is apertured to present several spaced openings by means of which portions of the magnetic tape 20 are exposed.

One of the two identical roller guide assemblies 28 is shown in Fig. 2, and is comprised of any suitable material, which may be metal but is preferably plastic, and has a rim 30 providing a cylindrical surface 31 and including a pair of axially spaced side flanges 32 and 34 projecting

above the surface 31. The cylindrical surface 31 and the flanges 32 and 34 cooperate to keep the tape 20 centered between the flanges 32 and 34 as the tape 20 passes partially around the roller guide assembly 28 and as the roller guide itself rotates around its central axis in a manner to be described.

The rim 30 is connected by radially extending webs 35 to a central hub 36 which has an axial bore 38 journaled on a pin 40 which extends into and is captured by recesses 42 and 44 formed in the sidewalls 12 and 14. Clearance is provided between the hub 36 and the pin 40 to permit the roller guide assembly 28 to rotate freely about the pin 40.

The hub 36 extends axially beyond the flange 34 and includes an integral biasing projection 46 which angles from an end surface 48 of the hub 36. The projection 46 may be molded in conjunction with the hub 36 or may be attached to the hub 36 as by adhesive bonding or welding, but is preferably formed by partially slicing or "skiving" the hub 36 in a radial direction so that the hub has a radially extending cut.

Prior to slicing the hub to form the projection 46, the bore 38 is chamfered 52 or counterbored slightly to provide a clearance which ensures that the inner surface of the projection 46 will not interfere with the pin 40 as the projection 46 moves away from the hub 36.

The length of the hub 36 is such that the projection 46 is slightly deflected by the sidewall 12 toward the hub 36 when the sidewalls 12 and 14 are assembled to form the cassette case 10. The natural resiliency of the material comprising the projection 46 produces a biasing force which axially urges the hub 36 into contact with a bearing surface 50 formed in the sidewall 14. This biasing force results in a damping action which restricts axial movement of the roller guide assembly 28. Thus the tape 20 is maintained in desired alignment and noise caused by roller guide oscillation is greatly restricted.

A surprising and beneficial result of using a plastic material to form the roller guide assembly 28 and biasing projection 46 is that the biasing force is reduced to a relatively low value with the passage of time due to a phenomenon known as "creep" or "cold flow". Cold flow is a relaxation of stresses within the material due to molecular rearrangement of the plastic.

The result of this reduction in the biasing force is that the frictional force generated between the roller guide assembly 28 and the cassette case 10 is likewise reduced, and that less torque is required to rotate the roller guide assemblies 28 than would be the case if, for example, a metal helical spring were used as the biasing element.

It will be recognized that the biasing force produced by the projection 46 will be determined and may be varied within limits by selection of the material comprising the hub 36 and also by adjusting the thickness of the projection 46 produced during the slicing operation.

Many changes can be made in the shapes and

features of the roller guide assembly 28. For example, the rim 30 and the hub 36 may be formed as a solid piece instead of being connected by the radial webs 35. Furthermore, the axially angled projection 46 need not be located adjacent the pin 40 nor need it be produced on only one end of the hub 36. Biasing projections could be produced by cutting the flanges 32 or 34 at diametrically opposed locations, or could be produced on both ends of the central hub 36.

Claims

1. A tape cassette (10) including a pair of generally parallel sidewalls (12, 14) having spaced inner surfaces between which is mounted a roller guide (28) characterized by said roller guide (28) having an axis disposed generally normal to said inner surfaces, axially spaced bearing surfaces (28) adjacent said inner surfaces, a main portion (30) comprising a generally cylindrical outer surface (31) about said axis, and at least one axially extending projection (46) integrally formed with said main portion (30) and defined by a partial radially extending cut between said projection and said main portion, said projection defining one of said bearing surfaces (48) and being resiliently deflected toward said main portion (30) by the spacing between the inner surfaces of said sidewalls (12, 14) to locate said roller guide (28) with respect to said inner surfaces; and by means mounting (40) the roller guide (28) between said sidewalls (12, 14) for rotation relative thereto around said axis.

2. A tape cassette (10) according to claim 1 wherein said roller guide (28) is further characterized by a hub (36) coaxial with said cylindrical outer surface (31), said hub (36) including said partial radially extending cut between said projection (46) and said main portion (30).

3. A tape cassette (10) according to claim 1 wherein said means mounting (40) the roller guide is characterized by a pin (40) having ends each coupled to a different one of said sidewalls (12, 14) and the main portion (30) of said roller guide (28) further includes a tubular hub (36) journaled on said pin (40).

4. A tape cassette (10) according to claim 4 wherein said roller guide (28) is further characterized by said partial radial cut being oriented substantially perpendicular to said axis separating said projection (46) from said hub (36) so that said projection (46) projects angularly away from said hub (36) and partially arcuately surrounds said pin (40).

5. A tape cassette (10) according to claim 5 further characterized by a bore in said hub (36) chamfered (52) adjacent said projection (46) to provide clearance between the inner surface of said projection (46) and said pin (40).

Revendications

1. Cassette pour bande (10) comprenant deux parois latérales sensiblement parallèles (12, 14)

(12)

above the surface 31. The cylindrical surface 31 and the flanges 32 and 34 cooperate to keep the tape 20 centered between the flanges 32 and 34 as the tape 20 passes partially around the roller guide assembly 28 and as the roller guide itself rotates around its central axis in a manner to be described.

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Revendications

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comportant des surfaces intérieures espacées entre lesquelles est monté un galet de guidage (28), caractérisé en ce que ledit galet de guidage a un axe sensiblement perpendiculaire auxdites surfaces intérieures, des surfaces d'appui (48) axialement espacées et adjacentes auxdites surfaces intérieures, une portion principale (30) comprenant une surface extérieure sensiblement cylindrique (31) autour dudit axe, et au moins un ergot (46) s'étendant axialement et formé d'un seul tenant avec ladite portion principale (30) et défini par une découpe partielle s'étendant radialement entre l'ergot et la portion principale, ledit ergot définissant l'une desdites surfaces d'appui (48) et étant élastiquement sollicité en direction de la portion principale (30) par l'espace entre les surfaces intérieures desdites parois latérales (12, 14) afin de positionner ledit galet de guidage (28) par rapport auxdites surfaces intérieures; et en ce que des moyens de montage (40) du galet de guidage (28) disposés entre les parois latérales (12, 14) permettent la rotation relative dudit galet par rapport auxdites parois autour dudit axe.

2. Cassette (10) suivant la revendication 1, dans laquelle le galet de guidage (28) est caractérisé en outre par un moyeu (36) coaxial à ladite surface extérieure cylindrique (31), ledit moyeu (36) présentant ladite découpe partielle qui s'étend radialement entre l'ergot (46) et la portion principale (30).

3. Cassette (10) suivant la revendication 1, dans laquelle les moyens de montage précités (40) du galet de guidage sont caractérisés par une broche (40) ayant ses extrémités couplées à l'une différente des deux parois latérales (12, 14), et en ce que la portion principale (30) du galet de guidage (28) comprend en outre un moyeu tubulaire (36) qui tourillonne sur ladite broche (40).

4. Cassette (10) suivant la revendication 2, dans laquelle le galet de guidage (28) est caractérisé en outre en ce que la découpe radiale partielle est orientée sensiblement perpendiculairement audit axe séparant ledit ergot (46) dudit moyeu (36) de façon que ledit ergot (46) s'écarte angulairement dudit moyeu (36) et se recourbe partiellement autour de ladite broche (40).

5. Cassette (10) suivant la revendication 4, caractérisée en outre par un alésage dans ledit moyeu (36), chanfreiné (52) de façon adjacente audit ergot (46) pour établir un jeu entre la surface intérieure dudit ergot (46) et ladite broche (40).

Patentansprüche

1. Bandkassette (10) mit einem Paar von allgemein parallelen Seitenwänden (12, 14), die im Abstand voneinander angeordnete Innenflächen besitzen, zwischen denen eine Führungsrolle (28) montiert ist, dadurch gekennzeichnet, daß die Führungsrolle (28) eine zu den genannten Innenflächen allgemein normale Achse besitzt, ferner den genannten Innenflächen benachbarte, im Axialabstand voneinander angeordnete Lagerflächen (48), einen Hauptteil (30) mit einer die genannte Achse umgebenden, allgemein zylindrischen Außenfläche (31) und mindestens einen axialen Vorsprung (46), der mit dem Hauptteil (30) einstückig und von einem Einschnitt begrenzt ist, der sich teilweise radial zwischen dem Vorsprung und dem Hauptteil erstreckt, wobei der genannte Vorsprung eine der Lagerflächen (48) bildet und infolge des Abstandes zwischen den Innenflächen der Seitenwände (12, 14) derart zu dem Hauptteil (30) elastisch ausgelenkt ist, daß die Führungsrolle (28) gegenüber den genannten Innenflächen festgelegt ist, und daß Mittel (40) zur um die genannte Achse drehbaren Lagerung der Führungsrolle (28) zwischen den Seitenwänden (12, 14) vorgesehen sind.

2. Bandkassette (10) nach Anspruch 1, dadurch gekennzeichnet, daß die Führungsrolle (28) eine mit der zylindrischen Außenfläche (31) koaxiale Nabe (36) besitzt, die mit dem Einschnitt versehen ist, der sich teilweise radial zwischen dem Vorsprung (46) und dem Hauptteil (30) erstreckt.

3. Bandkassette (10) nach Anspruch 1, dadurch gekennzeichnet, daß die Mittel (40) zur Lagerung der Führungsrolle einen Zapfen (40) besitzen, dessen Enden mit je einer der Seitenwände (12, 14) gekuppelt sind, und daß der Hauptteil (30) der Führungsrolle (28) eine auf dem Zapfen (40) drehbar gelagerte, rohrförmige Nabe (36) besitzt.

4. Bandkassette (10) nach Anspruch 4, dadurch gekennzeichnet, daß der teilweise radiale Einschnitt in der Führungsrolle (28) im wesentlichen rechtwinklig zu der genannten Achse ist und den Vorsprung (46) von der Nabe (36) trennt, so daß der Vorsprung (46) von der Nabe (36) im Winkel absteht und den Zapfen (40) im Bogen teilweise umgibt.

5. Bandkassette (10) nach Anspruch 5, dadurch gekennzeichnet, daß in der Nabe (36) eine Bohrung ausgebildet ist, die im Bereich des Vorsprungs (46) eine Fase (52) besitzt, so daß zwischen der Innenfläche des Vorsprungs (46) und dem Zapfen (40) ein Abstand vorhanden ist.

