

PATENT SPECIFICATION

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(54) TAPE CASSETTES

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to magnetic tape cassettes for use in presently available tape recorders. More particularly, this invention relates to improved means for guiding tape on to a spool and for providing a constant tension on the tape in such cassettes.

In the field of magnetic tape recording, there are several types of tape cassette and recorder systems employing two single-spool cassettes or a single cassette containing two spools. An example of such a two spool cassette and recorded system is disclosed in U.S. Patent 3,111,281. The cassette disclosed in that patent includes two spools of tape wound on rotatably mounted cores adapted to be driven by drive spindles on tape recorders adapted to receive such cassettes. The cassette housing has various openings to enable cooperation of recorder apparatus with tape in the cassette cartridge, for example tape heads for record, play-back, and erase and tape drive mechanisms. The disclosed cassette includes roller posts and various other guide members defining the path of tape from one spool to pass the various openings in the cassette housing to the other spool.

Since magnetic tape is limp, it tends not to follow the defined path from spool to spool if slack is permitted between the spools. Slight slackness in the tape results in uneven recording and playback, [Price 33p]

and any accumulation of slack tape will collect in the cassette and can jam the spool. Accordingly, such cassettes usually include brake means to maintain a constant tension on the tape between the spools.

Also, two-spool cassettes usually include guide means for directing tape on to the spools in alignment with tape on the spools to avoid having the spool convolutions becoming misaligned and jamming against the cartridge housing.

The cassette disclosed in U.S. Patent 3,111,281 includes a typical braking guiding means in the form of pivot arms biased into engagement with the tape spools to provide a frictional drag on the spool to stop the spools when the tape is not being advanced. Such pivotal brake arms typically include a guide channel for maintaining alignment of the tape with the convolutions on the spool.

Various designs of brake arms and guiding means have been attempted to provide a uniform tension on the spool by means of a simple mechanism that is inexpensive to manufacture and easy to assemble. Most brake arms of the described type are biased by a separate spring resiliently urging the arm into engagement with the outer convolution of the spool. Such brake arms have been mounted in many different positions, for example in the corner of the cassette opposite the roller post directing tape on to the spool. Such an arrangement is generally satisfactory, but the tension provided by such a spring increases as the diameter of the spool increases resulting in an increasing frictional drag as the spools diameter increases. Also, mounting the arm with its pivot axis in the corner causes the brake arm to contact the spool at a point that varies as the diameter of the spool varies. Thus, when the spool diameter is

relatively small in such a cassette, the brake contacts the tape after it is on the spool and the guide means on the brake arm is rendered less effective in guiding tape on to the outer convolution of spooled tape. When the spool diameter is relatively large, the brake surface engages the tape before it is wound on to the spool and the tape tends to pull the brake off the spool, which alters the frictional tension applied to the tape.

In accordance with the present invention there is provided a tape cassette including a rotatably mounted core having a cylindrical surface for supporting tape wound thereon, a guide member defining the path of tape to the outer convolution of tape on the core, and tape guiding and tensioning means comprising a brake arm having one end pivotally mounted adjacent the guide member and having on the opposite end means defining a brake surface adapted to engage the outer convolution of tape on the core at substantially the same tangent point at which tape is directed on to said outer convolution from the guide member; means for resiliently biasing the brake surface into engagement with tape wound on the core, said bias means including means defining a bearing surface and a resilient arm attached to the brake arm and extending into sliding engagement with the bearing surface, the resilient arm being attached to the brake arm nearer to the brake surface end than to the pivot axis end and extending from the brake arm at an acute angle generally toward said pivot axis; and guide means on the brake arm defining a pair of guide surfaces for guiding the tape edges to maintain alignment of the tape with the convolutions of tape wound on the core.

It should be understood that a tape guiding and tensioning means according to this invention can be incorporated in a tape cassette of the type including a single core or of the type including a pair of cores.

In the accompanying drawings:—

Fig. 1 is a plan of the interior structure of a tape cartridge constructed according to one embodiment of the invention; and

Fig. 2 is a plan, to an enlarged scale, of a braking and guiding means according to another embodiment of the present invention.

Referring now in detail to the drawings, Fig. 1 shows the interior of a tape cartridge 1 according to the present invention, including an outer housing 2 usually in the form of two shells or trays which are sealed together to form a generally flat rectangular compartment enclosing a supply core 3 and a take-up core 4 mounted in a side-by-side relation for rotation in the same plane

about parallel axes. Although not shown in the drawing, the cores are each adapted to receive, and to be driven by, drive spindles of commercially available tape recording apparatus. The opposite ends of the tape T are attached to the two cores and the end portions are wound in rolls 5 and 6 on the cores 3 and 4, respectively, such that the tape can be advanced from one roll to the other along a predetermined path. The path of the tape between the cores is defined by guide rollers 7 and 8 and other guide members not shown. As the tape passes between the guide rollers 7 and 8 it passes along the front wall 10 of the cartridge having a plurality of access openings 11 which permit various recorder apparatus to engage the tape, for example drive rollers 12 and 14 and tape heads 16, 18 and 20 for recording, play-back and erase, respectively.

In order to prevent tape from becoming slack between the two rolls, brake means are provided according to the invention to engage the rolls with a substantially constant frictional drag. The brake means includes brake arms 22 and 23 pivotally mounted at one end on spindles 24 and 25 adjacent the roller posts 8 and 7, respectively. Since the braking and guiding means for each roll shown in Fig. 1 are substantially the same, the remaining description refers only to such means operating with the roll 6. The other end of the brake arm 22 includes means defining a brake surface 26 and a pair of guide members 28 that define with the brake surface 26 a U-shaped channel for guiding the edges of the tape to maintain the tape in alignment with the roll 6. The brake arm 22 is urged into frictional engagement with the outer convolution on the roll 6 by means of a resilient arm 32 attached at one end to the brake arm 22, nearer the brake surface than to the pivot end of the arm, and extending at an acute angle toward the pivot spindle 24 with its other end in sliding engagement with an interior surface 30 of a sidewall 33 of the cassette housing 2. In the embodiment shown in Fig. 1 the resilient arm 32 is integrally moulded with the brake arm 22 and it has a curved end portion 34 that slidably engages the wall surface 33. Thus, rotation of the brake arm 22 causes the curved end portion 34 of the resilient arm 32 to slide along the wall surface 30 and maintain a generally constant resilient pressure on the brake arm 22 regardless of the radial position of the brake arm 22. Moreover, the position of the spindle 24 adjacent the roller post 8 enables the brake surface 26 on the opposite end of the brake arm 22 to contact the roll substantially at the tangent point at which tape is fed on to or

from the roll 6, regardless of the amount of tape on the roll.

Although the embodiment shown in Fig. 1 discloses a brake and guide means according to the invention in a two core type of cassette, it should be understood that the invention can be incorporated in a single core type of cassette.

An alternative embodiment of the invention is illustratively shown in Fig. 2 in which a portion of the structure shown in Fig. 1 is in a modified form. In Fig. 2 a portion of the roll 6 is shown with the brake arm 22, the brake surface 26 and the guide members 28. Attached to the brake arm is a resilient arm 32 slidably engaged with a bearing surface 36 which is curved according to a predetermined profile and is formed on a part 38 of the cassette. This bearing surface is located in the vicinity of spindle 24, and its profile determines the variation of flexion of the resilient arm 32 in the various positions of the brake arm 22. Thus the variations of tension applied by the brake surface 26 on the roll 6 are varied in a predetermined manner as defined by the profile of the bearing surface 36. The bearing surface can be circular with the same centre as the spindle 24 to maintain an absolutely constant flexion of the resilient arm 22. However, alternative bearing surfaces can be provided which constantly vary the tension on the roll according to a predetermined function. As illustratively shown, the bearing surface 36 is adapted to provide a constantly increasing tension on the roll as the roll diameter increases.

WHAT WE CLAIM IS:—

1. A tape cassette including a rotatably mounted core having a cylindrical surface for supporting tape wound thereon, a guide member defining the path of tape to the outer convolution of tape on the core, and tape guiding and tensioning means comprising a brake arm having one end pivotally mounted adjacent the guide member and having on the opposite end means defining a brake surface adapted to engage the outer convolution of tape on the core at substantially the same tangent point at which tape is directed on to said outer convolution from the guide member; means for resiliently biasing the brake surface into engagement with tape wound on the core, said bias means including means defining a bearing surface and a resilient arm attached to the brake arm and extending into sliding engagement with the bearing surface, the resilient arm being attached to the brake arm nearer to the brake surface end than to the pivot axis end and extending from the brake arm at an acute angle generally toward said pivot axis; and guide means on the brake arm defining a pair of guide surfaces for guiding the tape edges to maintain alignment of the tape with the convolutions of tape wound on the core.

2. A tape cassette according to Claim 1 having tape guiding and tensioning means substantially as hereinbefore described with reference to, and as shown in, the accompanying drawing.

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