(12)

Description

This invention relates to a tape guide according to the preamble of claim 1 and to a combination of such a guide with a tape cassette according to the preamble of claim 7.

Such a guide and combination is known from the teaching of US—A—3 934 842 which is discussed in detail below.

A tape cassette is usually made by joining substantially planar top and bottom halves together to house two tape reels and tape which runs therebetween. A tape cassette also includes a tape guide structure which is either formed integrally of the two halves along an open front wall region thereof or is molded independently and is positioned at the front wall region during assembly. In operation, a magnetic head of an external tape player/recorder apparatus is inserted into the open front wall region to contact the tape running across the tape guide.

To ensure optimum sound reproduction, it is critical that the tape crossing the magnetic head be oriented exactly "perpendicular" to the planes of the cassette halves to ensure proper contact between running tape and the magnetic head. Deviation from exact "perpendicularity" usually is the result of misalignement of the tape at the tape guide.

In order to avoid misalignment of the tape, the tape guide must be designed and manufactured according to strict structural parameters to ensure guiding of the tape in as "perpendicular" an orientation as possible. Of course, such careful design and manufacturing is expensive. On the other hand, because of the vast quantities of compact cassettes made and sold, economy of construction is also important and must be balanced against the strict structural parameters required for an effective tape guide.

Up until now, this balance has been attempted by molding the tape guide entirely of plastic, whether the tape guide is formed integrally of the top and bottom halves of the tape cassette or molded independently thereof.

For example, U.S. Patent No. 3,934,842, issued to *Posso*, teaches a tape cassette comprising top and bottom halves of a tape cassette and an independent one-piece tape guide molded entirely of plastic. More particularly, the independent tape guide is made up of an elongated molded body, integral at its back with two longitudinal ribs having a notch therebetween for receiving a pin extending from the bottom half of the cassette which holds the tape guide in the longitudinal direction. There is also formed on the front a plurality of transverse tabs, a left pair of which cooperates with lugs located on the bottom half of the cassette to hold the tape guide in the transverse direction. There is also an aperture formed in the lower half of the cassette which combines with a member extending from the external tape player/recorder to position the tape cassette relative to the tape player/recorder.

Each of the plurality of tabs is designed to require a central notch whose edge is rounded. This series of round-edged notches in the plastic molded tabs is co-planar and defines the tape sliding surface along the open front wall region of the tape cassette.

Finally, the tape guide of the '842 patent comprises a pressing member having a rigid support plate positioned centrally thereof for urging the tape against the magnetic head during operation. To this end, the most centrally located pair of tabs have projections formed integrally thereon in the shape of inclined ramps and adjacent bosses are formed integrally of the body of the tape guide. The rigid support plate of the pressing member is pressed against the ramps such that the plate deforms with its ends being housed between the projections and bosses.

The US 3984 842 patent states that the above-discussed tape guide design provides an absolutely perpendicular sliding surface for the tape to travel along. This design, however, actually has several inherent drawbacks which frustrate the realization of the "balance" between optimum 'perpendicularity" and cost efficiency.

Firstly, the "perpendicularity" of the tape sliding surface is only as good as the molding process used to form the tape guide, most particularly, the tabs and the notches in the tabs. As suggested in the US 3934 842 patent, molding plastics to exacting structural specifications can be very difficult and expensive, and the more exacting the specifications of the molded product, the greater the chance for mold imperfections, especially where cost of manufacturing is a preoccupation.

Secondly, since the independent tape guide is designed to be positioned stationary relative to the cassette, if the area of the tape player/recorder intended for receiving the cassette is not perfectly co-planar relative to the top and bottom of the tape guide, or vice versa, the tabs and notches formed on the tape guide will not be properly oriented relative to the magnetic head. Thus, "perpendicularity" of the tape at the magnetic head would be negatively effected.

More particularly, as discussed in the latter U.S. Patent No. 4,166,593, issued to *Milants* (which generally teaches away from the use of an independent tape guide), in a conventional two-part cassette housing having the tape guide molded integrally of each half of the tape cassette, guides project from the bottom cassette half and the top cassette half. When molding either such housing half, it is necessary to provide a taper of "draft" in those parts which extend substantially in the direction in which the mold is opened, so that the housing can be removed easily from the mold. Because of this draft the tape guide molded thereby does not possess true cylindrical surfaces about axes perpendicular to the planes of the cassette halves, but have more of a conical shape. A deterioration of tape playing/recording quality is inevitable with this construction.

In contrast to the conventional construction described above, the tape guide of the

US 3934 842 patent teaches that the independent tape guide is molded with the mold interface perpendicular to the bottom cassette half wall so that the tape sliding surface can be "theoretically" perpendicular to the support planes. This independent tape guide unit is then fixedly mounted in a corresponding box-shaped recess in the cassette.

However, as emphasized in the US 4166 593 patent, the overall accuracy of the tabs and notches comprising the tape sliding surface depends greatly on the cumulative dimensional tolerances of the box-shaped recess and the tape guide in its entirety, and also on the tolerances observed during assembly. Moreover, the top and the bottom of the independent tape guide, like the conventional two-piece cassette described above, each are tapered to provide "draft", so that these surfaces by which the independent tape guide is mounted in the tape cassette may again provide an unwanted oblique relationship between the tape guide and the bottom of the box-shaped recess.

Thirdly, due to the relative rigidity of the pressing member used with the independent tape guide of the US 3934 842 patent, it is possible that the pressing member could exert an uneven or non-"perpendicular" pressure upon the tape. In addition, the interference fit between the pressing member and the projections and bosses formed on the tape guide may result in a distortion of the front radius of the tape guide. These factors again could frustrate "perpendicular".

A fourth and final drawback of the tape guide of the US 3934 842 patent is that it requires molding parts on the bottom half of the casswette which are different than parts molded on the top half of the cassette and thus, this design prevents use of identical top and bottom halves which of course, increases manufacturing costs.

From the foregoing, it can be seen that an improved tape guide for a tape cassette is desired which can be accurately formed, but which is relatively simple in structure such that it may be made easily through automation, and which effectuates optimum orientation of the tape in the tape cassette crossing the magnetic head of a tape player/recorder.

It is also known from the teaching of US—A—4,191,345 (SATO) that plastic powder is formed by the wearing phenomenon which deposits on the magnetic layer of the tape whereby a drop-out is induced. In order to prevent these troubles, a pin mounted on a plastic case is formed and a metal pipe is fixed on the pin in a conventional video tape cassette.

Thus, SATO's guide posts are intended to replace the conventional corner rollers and are bound in a cassette via pin or frame molded integrally of the cassette bottom. Apart from being made by a costly and time-consuming method such a metallic guide post is characterized by several critical drawbacks if used anywhere in a tape cassette, for example it is susceptible to scratching during handling, which can damage the travelling tape.

Accordingly the present invention seeks to provide an economical, high quality tape cassette which is still molded substantially of relatively inexpensive plastic.

Furthermore, a tape cassette should be provided which can be formed and assembled efficiently by automation.

The present invention also aims to provide a tape guide for a tape cassette which accurately guides tape across the magnetic head of a tape player/recorder.

It is an object of the invention to provide a tape guide for a tape cassette which can be manufactured at a relatively low cost and yet provides superior orientation of the tape relative to the tape player/recorder in comparison to the prior art, having a tape guide sliding surface whose structural accuracy is not restricted by the current state of the molding art.

The guide according to the invention is set out in claim 1.

The tape guide for a tape cassette according to the invention replaces the traditional molded tabs located closest to the magnetic head with a separate pair of pins inserted into the independent tape guide having locating holes formed therein for receiving a member of an external tape player/recorder to properly orient the tape guide relative to the external tape player/recorder.

The tape guide for a tape cassette according to the invention whose most critical tape sliding surface, i.e., the area closest to the magnetic head, is defined by pins, preferably out of stainless steel whose design parameters can be carefully fabricated thus allowing for less exacting and less expensive design parameters at other areas of the tape guide, and most importantly, at the tape sliding surface.

The present invention also provides a tape guide for a tape cassette which is an independent subassembly having a tape sliding surface defined by a pair of pins and a plurality of projections formed on the tape guide, each pin and projecting being positioned perpendicular relative to the planes of the top and bottom of the tape guide.

A preferred embodiment of the present invention provides a tape cassette having top and bottom halves and washers or liners made of clear plastic, while the tape guide, tape reels and tape rollers are made of dark plastic, thus imparting an attractive appearance to the tape cassette and allowing a view of the tape's operation.

A further advantage of the present invention is a tape guide for a tape cassette having a flexible tape contacting member for urging an even "perpendicular" pressure against the tape crossing the magnetic head of the tape player/recorder.

Additional advantages of the invention will be set forth in part in the description which follows, and, in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

A combination of a guide with a tape cassette,

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according to a second aspect of the invention, is set out in claim 7 EP—A—224035 concerns a divisional application excised from the present application.

Brief description of the Drawings

FIG. 1 is a top plan view of the preferred embodiment of the tape cassette of the present invention, illustrating particularly the lower half of the tape cassette with the separate tape guide positioned therein;

FIG. 2 is an exploded isometric view of the preferred embodiment of the tape cassette of the present invention, illustrating particularly assembly of the separate tape guide within the tape cassette;

FIG. 3 is a top plan view of the preferred embodiment of the tape guide of the present invention;

FIG. 4 is a front view of the preferred embodiment of the tape guide of the present invention; and

FIG. 5 is a top cross-sectional view of the preferred embodiment of the tape guide of the present invention.

Description of the preferred embodiments

For convenience of reference to the tape cassette shown in the accompanying drawings, "front" indicates the area of the tape cassette exposed to the magentic head of the player/recorder, "back" is the area opposite the front, "top" is the planar surface of the cassette facing up when the front of the cassette is inserted into the player/recorder, "bottom" is the opposite planar surface parallel the top, and "sides" are the areas extending perpendicularly between and connecting the edges of the top and bottom.

Figs. 1 and 2 illustrate the tape cassette according to the present invention indicated generally by reference numeral 10. The tape cassette 10 includes a bottom half 12 and a top half 14 which are preferably made of a clear, hard plastic such as styrene. When assembled, the tape cassette 10 (and accordingly each cassette half 12 and 14) has a front 16, a back 18, a left side 20 (viewing from the tape player/recorder . . . not shown), and a right side 22. Positioned within the tape cassette 10 are a first tape reel 24 and a second tape reel 26 used to assist in moving tape 28 throughout the tape cassette 10. Each tape reel 24 and 26 is made of a dark-colored plastic such as acetal.

Located on the bottom half 12 of the tape cassette 10 are corner tape guiding shafts 30 and 32. There are also provided tape rollers 34 and 36, which are preferably made of a dark- or black-colored, hard plastic such as acetal, and which are rotatably received by columns 38 and 40.

Elevated areas 42 and 46 are formed in the bottom half 12 and the top half 16 of the tape cassette 10, respectively, for receiving the tape guide sub-assembly 44 which will be described hereafter.

Both the top half 14 and the bottom half 12 have pairs of holes 48 and 50, respectively, for receiving part of the self-contained separate tape guide 44, which will also be described hereafter.

As seen in Fig. 2, to assemble the tape cassette 10, the tape guide subassembly 44 is positioned within areas 42 and 46 as the bottom half 12 and the top half 14 are joined. The tape reels 24 and 26 with tape 28 extending therebetween are positioned between flat washers or liners 52 and 54, which are preferably flat or creased and made of a clear, flexible plastic such as in anti-static-treated polyester film. Each of the washers 52 and 54 are substantially thin and rectangular and have holes 55 formed therein for receiving the hubs of tape reels 24 and 26. The combination of reels 24 and 26 and washers 52 and 54 are located by pairs of raised annular rings, 21 and 23 formed in the top half 14 and bottom half 12, respectively, and positioned between the relatively central planar areas of the top and bottom halves, 12 and 14, respectively, of the tape cassette 10. The tape, of course, is placed across the front of the tape guide 44, and around tape guiding shafts 30 and 32 and rollers 34 and 36.

More particularly, as seen in Figs. 2—5, the tape guide sub-assembly 44 comprises an elongated bridge 56 having a top 58, a bottom 60, a front 62, a back 64, a left end 66 and a right end 68. The elongated bridge 56 is preferably made of a single-piece of dark- or black-colored, hard molded plastic such as "ABS" (acrylonitrile butadiene styrene).

At the front 62 of the tape guide 44, there is located near the center thereof two pairs of colinear corner posts, 70, 72, and 74, 76. More particularly, there is an upper left corner post 70, a lower left corner post 72, an upper right corner post 74 and a lower right corner post 76. Each pair of posts 70, 72 and 74, 76 has a hole 78 extending therethrough for receiving the ends of a left pin 80 and a right pin 82, both of which are preferably cylindrical, of even length and made of non-magnetic stainless steel. The pins 80 and 82 are positioned within the holes 78 such that the pins 80 and 82 are perpendicular to the planes of the top 58 and bottom 60 of the tape guide 44 (and accordingly, parallel to each other).

In contrast to the tabs formed in the tape guide described in U.S. Pat. No. 3,934,842, the pins 80 and 82 may be formed more exactly and may be more easily oriented perpendicular to the planes of the top 58 and 68 of the tape guide 44. Thus, the desired "perpendicularity" is no longer made dependent on the current state of the molding art to create the mold for forming the tape guide. In addition, the problems regarding "draft" in molding, as discussed in regard to the prior art, are eliminated by the use of these pins 80 and 82. In addition the dimensions or other quality characteristics of the stainless steel pins 80 and 82 may be more carefully controlled than the molded projections of the prior art. For example, a stainless steel pin may have a particular low friction or low wear surface finish or plating applied thereto which is superior in tape contacting characteristics to a molded plastic surface.

In addition, since the area near the magnetic head is the most critical for "perpendicularity" and thus overall performance, greater engineering and manufacturing effort and expense may be put into producing the pins, 80 and 82, while less engineering and manufacturing effort and expense may be put into producing the rest of the tape guide, and particularly the tape sliding surface of the tape guide.

Thus, the first drawback of the US 3934 842 patent is overcome by the present invention,. i.e., the accuracy of the most critical area of the tape sliding surface is not dependent upon the present state of the molding art. Instead, metal pins are used to create exact "perpendicularity".

At the front 62 of the tape guide 44, there is formed from left to right projections or ribs denominated by the letters A, B, C and D. Each of the projections A—D are molded perpendicular to the planes of the top 58 and bottom 60 of the tape guide 44. The projections A—D, along with the stainless steel pins 80 and 82, define the tape sliding surface of the present invention.

The tooling used to produce the particular "perpendicularity" of the projections A—D in the present invention is different from that used with the US 3934 842 patent for producing "perpendicularity" of the tabs and notches therein. The tooling used herein is more similar to that described in U.S. Pat. No. 4,166,593. That is, the parting line (mold opening plane) of the mold used to produce the present invention is similar to the mold described in relation to Fig. 3 of the US 4166 593 patent. The mold used for the present invention has a parting line parallel to the tape traveling direction in the tape cassette 10 and the side action member in the mold forms the projectons A—D perpendicular to this tape traveling direction. The "B" motion described in the US 4166 593 patent is similar to the movement of the side action member used to form the present invention to allow molding of a planar top 58 and bottom 60 and also the plurality of projections A—D perpendicular to the planes of the bridge top 58 and bottom 60 of the bridge 56.

Thus, the second drawback of the US 3934 842 patent is overcome by eliminating "draft" during the molding process.

The tape guide sub-assembly 44 also comprises a spring means 84 comprising a leaf spring 86 and a relatively soft, low friction tape contacting member 88. The ends of the leaf spring 86 are positioned on a left ridge 90 and a right ridge 92 formed between each pair of posts 70, 72 and 74, 76, respectively. Each of the ridges 90 and 92 are relatively flat and are also formed perpendicular to the planes of the top 58 and bottom 60 of the tape guide 44. By resting against these perpendicular ridges 90 and 92, the spring means 84 is capable of deflecting and exerting an even and perpendicular force uniformly against the tape 28 crossing the magnetic head during operation.

Thus, the third drawback of the US 3934 842 patent is overcome since when the spring means 84 is inserted in the present invention it is not irregularly distorted, nor is the tape guide 44 itself irreguarly distorted. Thus, the spring means 84 retains its flexible nature and constantly provides an even "perpendicular" pressure against the tape during operation.

A relatively rigid shield 94 having a rectangular shape is also used with the tape guide 44 of the present invention. This shield 94 is a conventional means of keeping magnetic signals which are produced near the recording head away from the tape 28 on the reels 24 and 26. The shield 94 fits into areas 96 formed between the posts 70, 72, 74 and 76 and a wall 98. The wall 98 has one or more rounded projections 100 extending therefrom for abutting the shield 94. Finally, the shield 94 rests on a ledge 102 extending perpendicularly from the bottom of the wall 98.

As shown in FIG. 4, the tape guide 44 also contains a pair of bottom-to-top diagonally opposed primary locating holes 104 and a pair of top-to-bottom diagonally opposed secondary locating holes 106. The primary and secondary locating holes are rectangular in shape, with the secondary locating holes being slightly larger than the primary locating holes, e.g., preferably .156 inch (3,96 mm) side-to-side as opposed to .143 inch (3,63 mm) (the dimensions from front to back are preferably the same, i.e., .147 inch). This difference in dimensions is required to compensate or provide "slack" for the manufacturing tolerances of the external tape player/recorder or of the cassette itself.

The primary and secondary locating holes are molded into the tape guide 44 and are important because they define the relative positions of the projections A B C and D, as well as the steel pins 80 and 82, which are the tape sliding surface.

Positioned around each of the holes 104 and 106 on the left side of the bridge, are left collars 108 and positioned around each of the holes 104 and 106 on the right side of the bridge are right collars 110. When the tape cassette 10 is being assembled, left collars 108 are positioned within one set of holes 48 and 50 located in the top half 14 and the bottom half 12, respectively, of the tape cassette 10, and the right collars 110 are similarly positioned within the other set of holes 48 and 50 located in the top half 14 and bottom half 12 of the tape cassette 10.

Both the bottom half of the cassette 12 and the top half of the cassette 14 also have a pair of colinear clearance holes 112 and 114, respectively. These clearance holes 112 and 114 function to receive the drive pin (not shown) of the external player/recorder when the tape cassette 10 is inverted during operation to play/record both sides of the tape 28.

Thus, the collars 108, 110 orient the tape guide 44 relative to the tape cassette 10, while the primary and secondary locating holes 104, 106, respectively, combine with the pair of locating guide pins (not shown) of the external tape player/recorder (not shown) for properly orienting the tape guide 44 relative to the tape player/recorder.

Immobilizing the tape guide 44 of the present invention within the tape cassette 10 during assembly thereof is not as crucial as is taught by the US 3934 842 patent. Instead, it is more important that the tape guide 44 is aligned relative to the external tape player/recorder than to the tape cassette 10. As a matter of fact, the US 3934 842 patent does not even have any separate holes in the independent tape guide for receiving the external tape player/recorder.

Thus, a major difference between the present invention and the '842 patent is that the present invention emphasizes the orientation of the tape guide relative to the magnetic head, whereas the US 3934 842 patent emphasizes the orientation of the tape guide relative to the cassette. The inherent drawback of this type of design was already discussed, *supra*.

The tape guide 44 also has a substantially cylindrical hole 116 near the central back 64 of the bridge 56 which, when the tape guide 44 is inserted into the tape cassette 10, surrounds a shaft 118 formed on the bottom half 12 of the tape cassette 10. The shaft 118 eventually is received by a hole 109 formed in the top half 14 of the tape cassette 10 during final assembly.

As is common in the art, Figs. 1 and 2 illustrate that there is formed in the front 16 of both the bottom half 12 and the top half 14 of the tape cassette 10 a left aperture 120 and a right aperture 122 for receiving the player/recorder roller (not shown) to be used together with the drive pin, and a central aperture 124 for receiving the magnetic head of the tape player/recorder.

As seen in Figs. 1 and 2, the structures of the top half 14 and bottom half 12 are substantially the same except for minor modifications, e.g., shaft 118 and hole 109, so a basic mold could be used to make either half and then the minor modifications could be made. By having substantially similar halves, overall production costs are minimized.

Thus, the present invention overcomes the fourth drawback of the US 3934 842 patent, i.e., requiring separately designed top and bottom halves which, of course, increases production cost.

As seen from the embodiments described above, this invention provides a relatively simple design wherein the tape sliding surface is more accurately formed than in the prior art, primary and secondary locating holes aid in orienting the tape guide relative to the tape player/recorder, exactly machined stainless steel pins are used to partially define the tape sliding surface instead of using only imprecisely molded tabs, and perpendicular ridges are used to resiliently support a spring which also urges an even "perpendicular" pressure upon the tape crossing the magnetic head. These above features of the present invention provide an efficiently manufactured tape cassette for producing improved orientation of the tape in relation to the magnetic head and thus, improved sound reproduction.

In addition, the tape cassette of the present invention may be fabricated from different colored plastics, i.e., the top and bottom halves of the cassette may be made of clear, styrene plastic, the washers of liners may be made of clear, anti-static-treated polyester film, the bridge may be made of "ABS" (acrylonitrile butadiene styrene) and the tape reels and rollers may be made of acetal. This contrasting color combination provides an aesthetically pleasing cassette from a marketing standpoint, while also allowing the manufacturer or user to view the interior of the cassette, and more particularly, the operation of the cassette, which, of course, is a functional advantage.

The above-described tape cassette has been shown to be of the type intended for use in analog and digital audio tape players and recorders. However, the invention can be similarly applied to tape cassettes for use in video or other playing and/or recording apparatus.

Claims

1. A tape guide (44) for a tape cassette which is formed independently of the top and bottom of the tape cassette and has a tape sliding surface for guiding tape through a tape cassette (10) and along an external tape player/recorder apparatus, comprising:
an elongated bridge (56) having a relatively planar top surface (58), a relatively planar bottom surface (60), a front (62), a back (64) a left end (66) and a right end (68), wherein the planes of the top (58) and bottom surfaces (60) are substantially parallel to each other, and a plurality of projections (A—D) formed perpendicular relative to the planes of the top (58) and bottom surfaces (60) of the bridge (56) on the left and right of the pin receiving means (78);
characterized by
a first columnar pin (80) and a second columnar pin (82) fixedly received by pin receiving means (78) formed approximately at the center of the front (62) of the bridge (56), perpendicular relative to the planes of the top (58) and bottom surfaces (60) of the bridge (56), wherein the plurality of projections (A—D) and the first and second pins (80, 82) define the tape sliding surface for the tape (28) being guided through the tape cassette (10), wherein the bridge (56) further comprises a pair of primary locating holes (104) and a pair of secondary locating holes (106) capable of receiving a member of the external tape player/recorder apparatus to orient the tape guide relative to the tape player/recorder apparatus.

2. The tape guide as recited in claim 1, wherein the pin receiving means (78) comprises a first colinear pair of posts (70, 72) and a second colinear pair of posts (74, 76), each post having a hole (78) formed therein, wherein the first pin (80) is received by the holes (78) in the first pair of posts (70, 72) and the second pin (82) is received by the holes (78) in the second pair of posts (74, 76).

3. The tape guide as recited in claim 2, wherein

Immobilizing the tape guide 44 of the present invention within the tape cassette 10 during assembly thereof is not as crucial as is taught by the US 3934 842 patent. Instead, it is more important that the tape guide 44 is aligned relative to the external tape player/recorder than to the tape cassette 10. As a matter of fact, the US 3934 842 patent does not even have any separate holes in the independent tape guide for receiving the external tape player/recorder.

Thus, a major difference between the present invention and the '842 patent is that the present invention emphasizes the orientation of the tape guide relative to the magnetic head, whereas the US 3934 842 patent emphasizes the orientation of the tape guide relative to the cassette. The inherent drawback of this type of design was already discussed, *supra*.

The tape guide 44 also has a substantially cylindrical hole 116 near the central back 64 of the bridge 56 which, when the tape guide 44 is inserted into the tape cassette 10, surrounds a shaft 118 formed on the bottom half 12 of the tape cassette 10. The shaft 118 eventually is received by a hole 109 formed in the top half 14 of the tape cassette 10 during final assembly.

As is common in the art, Figs. 1 and 2 illustrate that there is formed in the front 16 of both the bottom half 12 and the top half 14 of the tape cassette 10 a left aperture 120 and a right aperture 122 for receiving the player/recorder roller (not shown) to be used together with the drive pin, and a central aperture 124 for receiving the magnetic head of the tape player/recorder.

As seen in Figs. 1 and 2, the structures of the top half 14 and bottom half 12 are substantially the same except for minor modifications, e.g., shaft 118 and hole 109, so a basic mold could be used to make either half and then the minor modifications could be made. By having substantially similar halves, overall production costs are minimized.

Thus, the present invention overcomes the fourth drawback of the US 3934 842 patent, i.e., requiring separately designed top and bottom halves which, of course, increases production cost.

As seen from the embodiments described above, this invention provides a relatively simple design wherein the tape sliding surface is more accurately formed than in the prior art, primary and secondary locating holes aid in orienting the tape guide relative to the tape player/recorder, exactly machined stainless steel pins are used to partially define the tape sliding surface instead of using only imprecisely molded tabs, and perpendicular ridges are used to resiliently support a spring which also urges an even "perpendicular" pressure upon the tape crossing the magnetic head. These above features of the present invention provide an efficiently manufactured tape cassette for producing improved orientation of the tape in relation to the magnetic head and thus, improved sound reproduction.

In addition, the tape cassette of the present invention may be fabricated from different colored plastics, i.e., the top and bottom halves of the cassette may be made of clear, styrene plastic, the washers of liners may be made of clear, anti-static-treated polyester film, the bridge may be made of "ABS" (acrylonitrile butadiene styrene) and the tape reels and rollers may be made of acetal. This contrasting color combination provides an aesthetically pleasing cassette from a marketing standpoint, while also allowing the manufacturer or user to view the interior of the cassette, and more particularly, the operation of the cassette, which, of course, is a functional advantage.

The above-described tape cassette has been shown to be of the type intended for use in analog and digital audio tape players and recorders. However, the invention can be similarly applied to tape cassettes for use in video or other playing and/or recording apparatus.

Claims

1. A tape guide (44) for a tape cassette which is formed independently of the top and bottom of the tape cassette and has a tape sliding surface for guiding tape through a tape cassette (10) and along an external tape player/recorder apparatus, comprising:
an elongated bridge (56) having a relatively planar top surface (58), a relatively planar bottom surface (60), a front (62), a back (64) a left end (66) and a right end (68), wherein the planes of the top (58) and bottom surfaces (60) are substantially parallel to each other, and a plurality of projections (A—D) formed perpendicular relative to the planes of the top (58) and bottom surfaces (60) of the bridge (56) on the left and right of the pin receiving means (78);
characterized by
a first columnar pin (80) and a second columnar pin (82) fixedly received by pin receiving means (78) formed approximately at the center of the front (62) of the bridge (56), perpendicular relative to the planes of the top (58) and bottom surfaces (60) of the bridge (56), wherein the plurality of projections (A—D) and the first and second pins (80, 82) define the tape sliding surface for the tape (28) being guided through the tape cassette (10), wherein the bridge (56) further comprises a pair of primary locating holes (104) and a pair of secondary locating holes (106) capable of receiving a member of the external tape player/recorder apparatus to orient the tape guide relative to the tape player/recorder apparatus.

2. The tape guide as recited in claim 1, wherein the pin receiving means (78) comprises a first colinear pair of posts (70, 72) and a second colinear pair of posts (74, 76), each post having a hole (78) formed therein, wherein the first pin (80) is received by the holes (78) in the first pair of posts (70, 72) and the second pin (82) is received by the holes (78) in the second pair of posts (74, 76).

3. The tape guide as recited in claim 2, wherein

* C L M S *

each imaginary line passing through each first and second colinear pair of posts (70, 72 and 74, 76) respectively, is perpendicular to the planes of the top and bottom surfaces (58, 60) and the bridge (56).

4. The tape guide recited in claim 1, wherein each of the primary locating holes (104) is diagonally opposed and each of the secondary locating holes (106) is diagonally opposed, relative to the front (62) of the bridge (56).

5. The tape guide recited in claim 4, wherein the bridge further comprises:

(a) a first relatively flat ridge (90) formed between the first pair of posts (70, 72) in perpendicular relation to the planes of the top and bottom surfaces (58, 60) of the brigde (56);

(b) a second relatively flat ridge (92) formed between the second pair of posts (74, 76) in perpendicular relation to the planes of the top and bottom surfaces (58, 60) of the bridge (56); and

(c) spring means (84) extending between and abutting the first and second ridges (90, 92) for urging the tape (28) being guided along the tape sliding surface against the external tape player/recorder apparatus.

6. The tape guide as recited in claim 5, wherein the spring means (84) comprises a leaf spring (86) having bent ends to extend over each first and second ridge (90, 92) and a relatively low friction tape contacting member located centrally thereof.

7. Combination of a tape guide according to one or more of the proceeding claims 1 and 4—6 with a tape cassette (10) for running tape (28) between tape reels (24, 26) along a tape sliding surface and past an external tape player/recorder apparatus, comprising:

(a) a cassette housing having

(i) a top half (14), and

(ii) a bottom half (12) joined to the top half (14); and

(b) said tape guide (44) positioned between the top half (14) and the bottom half (12) of the cassette housing.

8. Combination according to claim 7, wherein the elongated bridge (56) is molded of plastic independently of the top half (58) and the bottom half (60) of the cassette housing.

9. Combination according to claim 7, wherein the bridge (56) further comprises a collar (108, 110) surrounding each primary and secondary locating hole (106), the top and bottom half (58, 60) of the tape cassette (10) each comprises holes for receiving the collars individually, and wherein when the tape guide is assembled between the top and bottom of the cassette, the collars are received by the holes in the cassette halves to orient the tape guide relative to the tape cassette.

10. Combination according to claim 7, wherein the top and half and bottom half (58, 60) of the cassette (10) are substantially identical in structure.

11. Combination according to claim 7, wherein the bridge (56) is a single, plastic molded piece.

12. Combination according to claim 7, further comprising:

(a) a first washer positioned between the tape reels (24, 26) and the top half (14) of the cassette (10);

(b) a second washer positioned between the tape reels (24, 26) and the bottom half (12) of the cassette (10);

(c) a first tape roller rotatably positioned on the bottom half (12) of the tape cassette, adjacent the left end of the bridge (56); and

(d) a second tape roller rotatably positioned on the bottom half (12) of the cassette adjacent the right end of the bridge (56).

13. Combination according to claim 7, wherein the top and bottom half (14, 12) of the cassette (10) and the first and second washers are formed of a clear substantially flat material, and the bridge (56), the tape reels (24, 26) and the first and second tape rollers as formed of a relatively darker material.

Patentansprüche

1. Bandführung (44) für eine Bandcassette, die unabhängig vom Deckel und Boden der Bandcassette geformt ist und eine Bandgleitfläche zum Führen des Bandes durch die Bandcassette (10) hindurch und entlang eines externen Bandabspiel/Aufnahmeapparates, enthaltend:
eine längliche Brücke (56) mit einer relativ ebenen Oberseite (58), einem relativ ebenen Boden (60), einer Vorderseite (62) einer Rückseite (64), einem linken Ende (66) und einem rechten Ende (68), wobei die Flächen der Oberseite (58) und des Bodens (60) im wesentlichen parallel zueinander verlaufen, und wobei eine Vielzahl von Vorsprüngen (A—D) senkrecht zu den Flächen der Oberseite (58) und des Bodens (60) der Brücke (56) auf der linken und rechten Seite des Bolzenaufnahmemittels (78) ausgebildet sind, gekennzeichnet durch:
einen ersen säulenartigen Bolzen (80) und einen zweiten säulenartigen Bolzen (82) die, fest vom Bolzenaufnahmemittel (78) aufgenommen werden, das etwa in der Mitte der Vorderseite (62) der Brücke (56) senkrecht zu den Flächen der Oberseite (58) und des Bodens (60) der Brücke (56) ausgebildet ist, und wobei die Vielzahl der Vorsprünge (A—D) und des ersten und zweiten Bolzens (80, 82) die Bandgleitfläche für das Band (28) bilden, das durch die Bandcassette (10) hindurchgeführt wird, wobei die Brücke (56) ferner ein paar erster Halternungs-bzw. Ausrichtungslöcher (104) und ein paar zweiter Halterungs-bzw. Ausrichtungslöcher (106) umfaßt, die ein Glied eines externen Bandabspiel/Aufnahmeapparates aufnehmen können, um die Bandführung relativ zum Bandabvspiel/Aufnahmeapparat auszurichten.

2. Bandführung nach Anspruch 1, bei der das Bolzenaufnahmemittel (78) ein erstes kolineares Pfostenpaar (70, 72) und eine zweites kolineares Pfostenpaar (74, 76) umfaßt, wobei jeder Pfosten ein in ihm ausgebildetes Loch (78) umfaßt, und wobei der erste Bolzen (80) durch die Löcher (78) im ersten Pfostenpaar (70, 72) und der zweite

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Bolzen (82) durch die Löcher (78) im zweiten Pfostenpaar (74, 76) aufgenommen wird.

3. Bandführung nach Anspruch 2, bei jeweils eine imaginäre Linie durch jeweils ds erste und zweite kolineare Pfostenpaar (70, 72 bzw. 74, 76) verläuft, die senkrecht zu den Flächen der Oberseite und des Bodens (58, 60) der Brücke (56) ist.

4. Bandführung nach Anspruch 1, bei der die ersten Halterungs- bzw. Ausrichtungslöcher (104) diagonal einander gegenüberliegen und jedes der zweiten Halterungs- bzw. Ausrichtungslöcher (106) diagonal einander gegenüberliegen, in Bezug zur Vorderseite (62) der Brücke (56).

5. Bandführung nach Anspruch 4, bei der die Brücke ferner umfaßt:

(a) eine erste relativ ebene Rippe (90), die zwischen dem ersten Pfostenpaar (70, 72) in senkrechter Beziehung zur Fläche der Oberseite und des Bodens (58, 60) der Brücke (56) ausgebildet ist;

(b) ein zweite relativ ebene Rippe (92), die zwischen dem zweiten Pfostenpaar (74, 76) in senkrechter Beziehung zu den Flächen der Oberseite und des Bodens (58, 60) der Brücke (56) aufgebildet ist; und

(c) Federmittel (84), die sich zwischen der ersten und zweiten Rippe (90, 92) erstrecken und an sie angrenzen, um as Band (28) zur Führung entlang der Bandgleitfläche gegen den extrenen Bandabspiel/Aufnahmeapparat zu drücken.

6. Bandführung nach Anspruch 5, bei der das Federamittel (84) eine Blattfeder (68) umfaßt, die abgebogene Enden besitzt, die sich jeweils um die erste und zweite Rippe (90, 92) und ein Bandkontaktglied mit relativ niedriger Reilbung erstrecken, das zentral davon angeordnet ist.

7. Kombiunation einer Bandführung nach einem oder mehreren der vorstehenden Ansprüche 1 und 4 bis 6 mit einer Bandcassette (10) zum Abspulen eines Bandes (28) zwischen den Bandspulen (24, 26) entlang einer Bandgleitfläche und an einem externen Bandabspiel/Aufnahmeapparat vorbei, umfassend:

(a) ein Cassettengehäuse mit

(i)einer oberen Hälfte (14) und

(ii) einer unteren Hälfte bzw. Boden (12), der mit der oberen Hälfte (14) verbunden ist; und

(b) die genannte Bandführung (44), die zwischen der oberen Hälfte (14) und der unteren Hälfte (12) des Cassettengehäuses angeordnet ist.

8. Kombination nach Anspruch 7, bei der die längliche Brücke (56) aus Kunststoff unabhängig von der oberen Hälfte (58) und der unteren Hälfte (60) des Cassettengehäuses geformt ist.

9. Kombination nach Anspruch 7, bei der die Brücke (56) ferner eine Säule (108, 110) umfaßt, die jeweils das erste und zweite Halterungs- bzw. Ausrichtungsloch (106) umgibt, wobei die obere und die untere Hälfte (58, 60) der Bandcassette (10) jeweils Löcher umfaßt, um die Säulen einzeln aufzunehmen und wobei die Säulen, wenn die Bandführung zwischen der oberen und unteren Hälfte der Cassette eingebaut wird, durch die Löcher in den Cassettenhälften aufgenommen werden um die Bandführung relativ zur Bandcassette auszurichten.

10. Kombination nach Anspruch 7, bei der die obere und die untere Hälfte (58, 60) der Cassette (10) im wesentlichen in ihrem Aufbau identisch sind.

11. Kombination nach Anspruch 7, bei der die Brücke (56) ein einziges, kunststoffgeformtes Stück darstellt.

12. Kombination nach Anspurch 7, ferner umfassend:

(a) einer erste Paßscheibe, die zwischen den Bandspulen (24 26) und der oberen Hälfte (14) der Cassette (10) angeordnet ist;

(b) eine zweite Paßscheibe, die zwischen den Bandspulen (24, 26) und der unteren Hälfte (12) der Cassette (10) angeordnet ist;

(c) eine erste Bandrolle, die drehbar auf der unteren Hälfte (12) der Bandcassette, angrenzend an das linke Ende der Brücke (56) angeordnet ist; und

(d) eine zweite Bandrolle, die drehbar auf der unteren Hälfte (12) der Cassette, angrenzend an das rechte Ende der Brücke (56) angeordnet ist.

13. Kombination nach Anspruch 7, bei der die obere und die untere Hälfte (14, 12) der Cassette (10) und die erste und zweite Paßscheibe aus einem durchsichtigen, im wesentlichen ebenen Material gebildet sind, und wobei die Brücke (56), die Bandspulen (24, 26) und die erste und zweite Bandrolle aus einem relativ drunkleren Material gebildet sind.

Revendications

1. Guide de bande magnétique pour cassette de bande magnétique, qui est formé indépendamment de al face supérieure et de la face inférieure de la cassette de bande magnétique et qui a une surface de glissement pour bande magnétique pour guider la bande magnétique dans une cassette de bande magnétique (10) et le long d'un magnétophone externe, comprenant:

un pont allongé (56) ayant une surface supérieure relativement plane (58), une surface inférieure relativement plane (60), une face (62), un dos (64), une extrémité gauche (66) et une extrémité droite (68), les plans des surfaces supérieure (58) et inférieure (60) étant, pour l'essentiel, parallèles l'un à l'autre, et une pluralité de prolongements (A à D) formés perpendiculairement par rapport aux plans des surfaces supérieure (58) et inférieure (60) du pont (56) sur la gauche et sur la droite de l'élément recevant la broche (78),

caractérisé par

une première broche en forme de colonne (80) et une deuxième broche en forme de colonne (82) qui sont reçues et fixées par l'élément revevant la broche (78) formé approximativement au centre de la face (62) du pont (56) et perpendiculaire par rapport aux plans de la surface supérieure (58) et de la surface inférieure (60) du pont (56), la pluralité de prolongements (A à D) et la pre-

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mière et la deuxième broche (80, 82) y définissant la surface de glissement de la bande magnétique (28) qui et guidée à travers la cassette de bande magnétique (10), le pont (56) comportant de plus une paire de trous d'ajustage primaires (104) et une paire de trous d'ajustage secondaires (106) capables de recevoir un organe d'un magnétophone externe pour orienter le guide de bande magnétique par rapport au magnétophone.

2. Guide de bande magnétique conformément à la revendication 1, dans lequel l'élément recevant la broche (78) comprend une première paire d'éléments colinéaires (70, 72) et une secondaire pair d'éléments colinéaires (74, 76) chaque élément étant traversé par un trou (78), la première broche (80) étant reçue par les trous (78) de la première paire d'éléments (70, 72) et la seconde broche (82) étant reçue par les trous (78) de la seconde paire d'éléments (74, 76).

3. Guide de bande magnétique conformément à la revendication 2, dans lequel chaque ligne imaginaire traversant chaque première paire et chaque deuxième paire d'éléments colinéaires (respectivement 70, 72 et 74, 76) est perpendiculaire aux plans des surfaces supérieure et inférieure (58, 60) du pont (56).

4. Guide de bande magnétique conformément à la revendication 1, dans lequel chaque trou d'ajustage primaire (104) est diagonalement opposé et chaque trou d'ajustage secondaire (106) est diagonalement opposé, ceci par rapport à la face (62) du pont (56).

5. Guide de bande magnétique conformément à la revendication 4, dans lequel le pont comprend en plus:

(a) une première nervure relativement plate (90) formée entre la première paire d'éléments (70, 72) prependiculairement aux plans des surfaces supérieure et inférieure (58, 60) du pont (56);

(bv) une seconde nervure relativement plate (92) formée entre la seconde paire d'éléments (74, 76) perpendiculairement aux plans des surfaces supérieure et inférieure (58, 60) du pont (56) et

(c) un élément-ressort (84) qui s'étend entre la première et la seconde nervure (90, 92) et qui les touche pour presser la bande magnétique (28) guidée le long de la surface de glissement de la bande magnétique contre le magnétophone externe.

6. Guide de bande magnétique conformément à la revendication 5, dans lequel l'élément-ressort (84) comprend un ressort à lames (86) ayant des extrémités recourbées pours' adapter sur chaque première et seconde nervure (90, 92) et un élément de contact de bande magnétique à peu de frottement situé en son centre.

7. Combinaison d'un guide de bande magnétique conformément à l'une ou plusieurs des revendications précédentes 1 et 4—6 à une cassette de bande magnétique (10) pour dérouler la bande magnétique (28) entre des bobines de bande (24, 26) le long d'une surface de glissement de la bande magnétique et près d'un magnétophone externe, comprenant,

(a) un bâti de cassette ayant

(i) une moitié supérieure (14) et

(ii) une moitié inférieure (12) reliée à la moitié supérieure (14) et

(b) le guide de bande magnétique sus-cité (44) placé entre la moitié supérieure (14) et la moitié inférieure (12) du bâti de cassette.

8. Combinaison conformément à la revendication 7, dans laquelle le pont allongé (56) est moulé en plastique indépendamment de la moitié supérieure (58) et de la moitié inférieure (60) du bâti de cassette.

9. Combinaison conformément à la revendication 7, dans laquelle le pont (56) comprend en plus un collier (108, 110) entourant chaque trou d'ajustage primaire et secondaire (106), la moitié supérieure et la moitié inférieure (58, 60) de la cassette de la bande magnétique (10) comprenant chacune des trous pour recevoir les colliers individuellement et dans laquelle, lorsque le guide de bande magnétique est monté entre la face supérieure et la face inférieure de la cassette, les colliers sont reçus par les trous des moitiés de cassette pour orienter le guide de bande magnétique par rapport à la cassette de bande magnétique.

10. Combinaison conformément à la revendication 7, dans laquelle la moitié supérieure et la moitie inférieure (58, 60) de la cassette (10) sont de construction essentiellement identique.

11. Combinaison conformément à la revendication 7, dans laquelle le pont (56) est une pièce séparée, moulée en plastique.

12. Combinaison conformément à la revendication 7, comprenant de plus:

(a) un premier plateau placé entre les bobines de bande (24, 26) et la moitié supérieure (14) de lacassette (10);

(b) un second plateau placé entre les bibines de bande (24, 26) et la moitié inférieure (12) de la cassette (19);

(c) une première poulie pour bande magnétique placée de manière à être rotative sur la moitié inférieure (12) de la cassette de bande mangétique et adjacente à l'extrémité gauche du pont (56) et

(d) une seconde poulie pour bande magnétique placée de manière à être rotative sur la moitié inférieure (12) de la cassette de bande magnétique et adjacente à l'extrémité droite du pont (56).

13. Combinaison conformément à la revendication 7, dans laquelle la moitié supérieure et la moitié inférieure (14, 12) de la cassette (10) et le premier et le second plateau sont formés en un matériau essentiellement plat de couleur claire et dans laquelle le point (56), les bobines de bande (24, 26) et la première et la seconde poulie de bande sont formés en un matériau relativement plus foncé.