

"ENDLESS TAPE CASSETTE FOR VIDEO TAPE RECORDER"

The present invention relates to an endless tape cassette for a video tape recorder (to be referred to as a VTR hereinafter).

Two types of tape cassettes are currently used for VTRs throughout the world: tape cassettes of the Betamax system and of the VHS system.

In a tape cassette of the VHS system, as shown in Figure 1, a video tape 4 is wound around a supply reel 2 and a take-up reel 3 arranged inside a cassette 1. When the cassette 1 is loaded (to be referred to as automatically loaded hereinafter), the front cover of the cassette 1 automatically opens as shown in Figure 2. Through this opening, the video tape 4 is drawn outside the cassette 1 by means of a movement guide post 5 for guiding the video tape 4, conical guides 6 and 7, a movement guide post 8, and a capstan 9. The part of the video tape 4 drawn out of the cassette 1 (to be referred to as a slack part) is threaded past a full-width erase head 10, a roller 11, a video head 12, a roller 13, an audio head 14, and a pinch roller 15. Then, the video tape 4 is driven at normal speed by the pinching action between the capstan and the pinch roller. In Figure 2, reference numerals 16 and 17 denote tension posts; 18 and 19, guide poles; 20, a spring plate; and 21, a pad plate.

When the eject button is depressed, the video tape 4 is taken up completely by the supply reel 2 in the direction indicated by

a dotted arrow while the movement guide post 5, the conical guides 6 and 7, the movement guide post 8, and the capstan 9 return to the positions shown in Figure 1. When the slack part is completely wound on the supply reel 2, the front cover of the cassette 1 automatically closes. Then, the cassette 1 is disengaged from a reel spindle and can be ejected.

In a cassette of the Betamax system, as shown in Figure 3, a video tape 24 is wound around a supply reel 22 and a take-up reel 23 arranged inside a cassette 35. When the video tape 24 is automatically loaded, the front cover of the cassette 35 automatically opens as shown in Figure 4. Then, the video tape 24 is drawn out of the cassette 35 by means of movement guide posts 25 and 26 for guiding the video tape 24, capstan 27, and a guide post 28. Thus, the slack part of the video tape 24 is formed. The video tape 24 is brought into contact with a full-width erase head 29, a video head 30 and an audio head 31 to start travelling at normal speed. When the eject button is depressed, the video tape 24 is taken up by the take-up reel 23 while the movement guide posts 25 and 26, the capstan 27 and the guide post 28 return to their original positions shown in Figure 3. When the slack part of the video tape 24 is completely taken up, the front cover automatically closes. Thereafter, the cassette 15 can be disengaged from a reel spindle and can be ejected outside the VTR. Referring to Figure 4, reference numeral 32 denotes a loading ring which serves as a mount for the guide post 26, the capstan 27, and the guide post 28, and reference numerals 33 and 34 denote tape guide posts also mounted on the loading ring 32.

As may be seen from a comparison of the figures, the length of the slack part of the video tape which is drawn outside the cassette and which is originally kept taut between the two reels in the cassette significantly differs from the Betamax type to the VHS type.

In a cassette of the Betamax system, the slack part takes an omega shape and the length of it exceeds about 40 cm. However, in a cassette of the VHS type, the slack part takes an M-shape and the length of it is about 25 cm. The basic structures and the tape suspending mechanisms are significantly different in cassettes of the Betamax system and the VHS system.

In order to house an endless tape of 1/2 inch width in a cassette of the type wherein the slack part must be automatically eliminated before ejection of the cassette, a totally new mechanism must be adopted which is different from that widely adopted for cassettes of endless tapes of 1/4 inch width or less.

In an endless tape cassette of 1/4 inch width or less of known type, the portion of the tape at the inner periphery of the tape coil is drawn out to pass it past the recording and reproducing parts, and is then wound around the outer periphery of the tape coil. This inevitably results in a structure wherein the drawing part of the tape and each turn of the tape coil cross each other in a stepped form. Due to this structure, it has been impossible to draw the video tape outside the cassette and to automatically take up the slack part thus formed by pivotal movement of the take-up reel.

The invention provides an endless tape cassette for a video tape recorder comprising first and second reels having hubs, and an endless tape having a length substantially greater than the shortest endless path around the hubs of the reels in order to provide slack
5 for automatic loading of the tape in a video tape recorder, one of the reels being provided with a tape hook pin for taking up the slack in the tape, and the tape extending around the hubs of the two reels and through a gap between the tape hook pin and the hub of said one reel.

10 Preferred and/or optional features of the invention are set forth in claims 2-6.

It is thus possible to provide an endless tape cassette for a video tape recorder wherein the drawing part of a video tape and each turn of the wound tape coil do not cross each other in a stepped
15 form, the tape drive resistance and wow and flutter may be reduced to the minimum, damage to the video tape may be reduced to the minimum, the service life of the video tape may be prolonged, and the tape cassette may be conveniently used for a VTR.

It is also possible to provide an endless tape cassette for
20 a video tape recorder wherein, during endless recording with a cassette in a VTR, the recorded information may be reproduced within 20 to 30 seconds after depression of a playback button and the recorded information may be repeatedly reproduced as needed. For example, a VTR with a tape cassette of the present invention loaded may be
25 installed at a cross section or the like where the traffic is heavy.

The VTR is maintained in a condition of constant recording. When a traffic accident or the like occurs, the VTR may be immediately switched to the playback mode so that the scene from 20 to 30 seconds before the traffic accident may be reproduced. Then, the conditions of the accident may be easily determined.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, wherein:-

Figure 1 is a schematic plan view showing the interior of the tape cassette of the VHS system loaded on a VTR;

10 Figure 2 is a schematic plan view showing the driving state of the video tape of Figure 1;

Figure 3 is a schematic plan view showing the interior of the tape cassette of the Betamax system loaded on a VTR;

15 Figure 4 is a schematic plan view showing the driving state of the video tape of Figure 3;

Figure 5 is a schematic plan view showing the interior of one embodiment of an endless tape cassette according to the present invention as loaded on a VTR;

20 Figure 6 is a schematic plan view showing the driving state of the video tape of Figure 5;

Figure 7 is a schematic plan view showing the interior of another embodiment of an endless tape cassette according to the present invention as loaded on a VTR; and

Figure 8 is a schematic plan view showing the driving state of the video tape of Figure 7.

Referring to Figure 5, reference numeral 101 denotes a lower part (to be referred to as a lower half) of a cassette housing accommodating the video tape. A supply reel 103 and a take-up reel 104 are arranged inside the lower half 101.

10 A tape hook pin 107 is mounted on the supply reel 103 of the two reels. An endless video tape 105 passes between the tape hook pin 107 and a reel hub 108 and is wrapped on the reel hub 108 of the supply reel 103 and on a reel hub 109 of the take-up reel 104.

The video tape 105 passes from start point a and between the 15 inside of the tape hook pin 107 and the outside of the reel hub 108 of the supply reel 103. Through points b, c, d, e, f and g the video tape 105 then returns to point a where the start point and the endless video tape is defined and is completely accommodated within the cassette housing, that is, the upper and lower halves.

20 The endless video tape 105 has a length which is the sum of the length of the outer rim of the section including the take-up reel 104 and the supply reel 103 and at least the length of the slack part during automatic loading.

Figure 6 shows the state of automatic loading as in the case of Figure 2, wherein the endless video tape 105 is drawn out of the cassette by means of the movement guide post 5, the conical guides 6 and 7, the movement guide post 8 and the capstan 9. An overlapping part of the tape through points a, b, and c is loaded outside the cassette and is driven by the capstan 9 and the pinch roller 15. During driving, a significant back tension acts on the tape due to the weight of the supply reel 103 and the frictional force caused by the spring plate 20 or the pad plate 21 for adjusting inertia.

10 By this back tension, the video tape 105 may be brought into good contact with the full width erase head 10, the roller 11 and the audio head 14.

The mode of operation of the endless tape cassette for VTR will now be described.

15 The endless tape cassette is inserted in a VTR in a similar manner to that of conventional tapes. The playback button is depressed to perform automatic loading first. Then, the slack part of the video tape 105 is formed by the movement guide post 5, the conical guides 6 and 7, the movement guide post 8 and the capstan 9. Then,

20 the supply reel 103 and the take-up reel 104 placed under free conditions pivot as indicated by dotted arrows in Figures 5 and 6. The video tape 105 is then brought into contact with the full-width erase head 10, the roller 11 and the audio head 14. Simultaneously, the tape 105 is driven by the pinching action of the pinch roller 15 and the

25 capstan 9. Since the supply reel 103 is free in this condition,

the tape 105 is driven by slipping, in the direction of a solid arrow, around the pin 107 even if it is brought into contact with the pin 107 inside the supply reel 103, as shown in Figure 6. Thus, the video tape 105 can be smoothly driven while being pulled by the pinching force of the pinch roller 15 and the capstan 9. During such operation, the spring plate 20 or the pad plate 21 urges the outer surface of the collar portion of the supply reel 103 to ensure sufficient contact between the video tape 105 and the full-width erase head 10, the roller 11 and the audio head 14.

In order to eject the cassette from the VTR, the eject button (not shown) of the VTR is depressed. Then the supply reel 103 rotates in the opposite (counterclockwise) direction by a gear mechanism (not shown) to eliminate the slack part. In a cassette of the VHS system, the tape 105 is wound in the direction indicated by the solid arrow while it is hooked on the pin 107, as shown in Figure 5. Since the supply reel 103 is rotated in the direction indicated by the solid arrow by the gear and motor mechanisms, the slack part of the tape can be satisfactorily eliminated. Then, the front cover of the cassette is automatically closed, and the cassette is automatically ejected by means (not shown), as in a known VTR.

Referring to Figure 7, reference numeral 201 denotes a lower part (to be referred to as a lower half) of the cassette housing accommodating the tape. A supply reel 203 and a take-up reel 204 are arranged inside the lower half 201.

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A tape hook pin 207 is mounted on the take-up reel 204 of the two reels. An endless video tape 205 passes between the tape hook pin 207 and a reel hub 209 and is wrapped on the reel hub 209 of the take-up reel 204 and on the reel hub 208 of the supply reel 203.

- 5 The video tape 205 passes from start point a and between the inside of the tape hook pin 207 and the outside of the reel hub 209 of the take-up reel 204. Through points b, c, d, e, f and g, the video tape 205 then returns to point a where the start point and the terminal point of the tape merge. In this manner, the endless
- 10 video tape is defined and is completely accommodated within the cassette, that is, the upper and lower halves. The endless video tape 205 has a length which is the sum of the length of the outer rim of the section including the take-up reel 204 and the supply reel 203 and at least the length of the slack part during loading.
- 15 Figure 8 shows the state of automatic loading as in the case of Figure 2, wherein the endless video tape 205 is drawn out of the cassette by means of the movement guide posts 25 and 26, the capstan 27 and the guide post 28. An overlapping part of the tape through points a, b, and c is loaded outside the cassette and is driven by
- 20 the capstan 9 and the pinch roller 15.

The mode of operation of the endless tape cassette for VTR will now be described.

The endless tape cassette is inserted in a VTR in a similar manner to that of conventional tapes. The playback

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button is depressed to perform automatic loading. Then, the slack part of the video tape 205 is formed by the movement guide posts 25 and 26, the capstan 27 and the guide post 28. Then, the supply reel 203 and the take-up reel 204 placed under free conditions pivot as indicated by dotted arrows in Figures 7 and 8. The video tape 205 is then brought into contact with the heads 29, 30 and 31. The take-up reel 204 is rotated in the clockwise direction by a drive means (not shown) through a friction joint (not shown), and the pin 207 is brought into contact with the video tape 205. However, since the tape 205 is taut, the tape 205 is not caught by the pin 207 even if the take-up reel 204 is rotated in the direction indicated by the solid arrow. Instead, the take-up reel 204 is placed in a slip condition relative to the drive means, that is, an idler mechanism. Thus, the video tape 205 can be smoothly driven while being pulled by the pinching force of the pinch roller 15 and the capstan 9 while slipping between the pin 207 and the reel hub 209.

In order to eject the cassette from the VTR, the eject button (not shown) of the VTR is depressed. Then the supply reel 203 rotates in the opposite (counterclockwise) direction by a gear mechanism (not shown) to eliminate the slack part. In a cassette of the Betamax system, the tape 205 is wound in the direction indicated by the solid arrow while it is hooked on the pin 207, as shown in Figure 7. Since the take-up reel 204 is pivoted in the direction indicated by the solid arrow by the gear and motor mechanisms, the slack part of the tape can be satisfactorily eliminated. Then, the front cover of the cassette is automatically closed, and the cassette is automatically

ejected by a means (not shown), as in a known VTR.

It is possible to incorporate a section for applying a cleaning agent at a position in the cassette housing so that the tape might come in contact therewith. Thus a tape of material having a cleaning function may be formed in an endless manner and may be housed in the cassette housing in a manner as described above. Then, an endless tape cassette may be used as a cleaning cassette. In a conventional cleaning tape cassette having a cleaning function, ends of the cleaning tape are fixed to both reels. Therefore, once the cleaning tape is driven in the forward direction, it must be manually rewound for performing another cleaning operation. That is, the conventional cleaning tape cassette of this type can perform cleaning only during forward travel. However, in the endless tape cassette described above, cleaning may be performed at any time by simply inserting the cassette and driving the tape constantly in the forward direction.



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CLAIMS

1. An endless tape cassette for a video tape recorder comprising first and second reels having hubs, and an endless tape having a length substantially greater than the shortest endless path around the hubs of the reels in order to provide slack for automatic loading of the tape in a video tape recorder, one of the reels being provided with a tape hook pin for taking up the slack in the tape, and the tape extending around the hubs of the two reels and through a gap between the tape hook pin and the hub of said one reel.
2. An endless tape cassette according to claim 1, wherein said first reel is a supply reel and said second reel is a take-up reel, and said tape hook pin is provided on said supply reel.
3. An endless tape cassette according to claim 1, wherein said first reel is a supply reel and said second reel is a take-up reel, and said tape hook pin is provided on said take-up reel.
4. An endless tape cassette according to any one of claims 1 - 3, wherein a resilient member is in contact with said reels for adjusting frictional drag on the reels.
5. An endless tape cassette according to any one of claims 1-4, wherein a pad is in contact with said reels for adjusting frictional drag on the reels.
6. An endless tape cassette according to any one of the preceding claims, wherein the tape consists of a material having a cleaning



function, and a cleaning agent applying section is provided at a position of the cassette such that the tape may come in contact therewith.

7. An endless tape cassette for a video tape recorder, substantially
5 as hereinbefore described with reference to and as shown in Figures
5 and 6 or Figures 7 and 8 of the accompanying drawings.