

Description

The invention relates to type recording and/or reproducing apparatus, particularly but not exclusively a compact 8-mm VTR with a built-in camera, wherein a tape drawn from a tape cassette is wound around a rotary head drum to perform a recording thereon or reproducing therefrom.

In previously proposed cassette type VTRs, a tape cassette is mounted on a chassis in such a way that a pair of tape reels are engaged with a pair of reel discs, respectively and then a tape is drawn from the tape cassette by tape loading means to wind the tape around a rotary head drum and, thereafter, a recording or reproducing takes place by the rotary head drum while the tape moves at constant speed along its running path. That is, the tape cassette must be located on the chassis at some distance from the rotary head drum so that the tape cassette or the tape in the tape cassette does not unexpectedly come into contact with a rotary drum located at the top of the rotary head drum.

However, to place the tape cassette at a sufficient distance from the rotary head drum, prevents the VTR from being made compact. In order to make the VTR compact, it is therefore, important to diminish the distance between the tape cassette and the rotary head drum.

In order to overcome such a problem, it has been proposed to move the rotary head drum so as to bring it near the tape cassette after the tape cassette is installed on the chassis. Thus Patent Specification WO-A-8403720 discloses a cassette tape recorder wherein a cassette mounting part is relatively movable with respect to a part mounting a rotary head drum so that during recording or reproducing the drum is advanced into an opening in the tape cassette to reduce the overall size of the recorder. However the rotary head drum is such an important component of the VTR as to be made with considerable accuracy of the order of a few microns. Therefore, if such a constitution is adopted in a practical VTR, unstable factors in tape running are enhanced, and recording and/or reproducing precisions are degraded. Hence, the idea mentioned above has not been widely applied to practical VTRs.

According to the invention there is provided a tape loading device for cassette type tape recording and/or reproducing apparatus comprising:

a main chassis on which a rotary head drum is mounted;

a sub-chassis slidably mounted on the main chassis to accommodate a tape cassette;

a chassis drive mechanism arranged between the main chassis and the sub-chassis so as to move the sub-chassis from a first position in which the

cassette can be exchanged to a second position in which the cassette can be recorded/reproduced and vice versa; tape loading means to draw out a tape from within the cassette and guide the tape to the periphery of the rotary head drum; and guide rail means to guide movement of the tape loading means therealong; characterised in that the guide rail means consist of first guide rail means on the sub-chassis and

second guide rail means on the main chassis to be aligned with the first guide rail means in the second position of the sub-chassis whereby the tape loading means can be transferred between the sub-chassis and the main chassis to position the tape loading means adjacent the rotary drum head.

Such a construction makes it possible to diminish the distance between the rotary head drum and the tape cassette mounted on the chassis, while maintaining stable tape running and high recording or reproducing precision, in a compact VTR.

Thus the tape loading device comprises a fixed chassis on which the rotary head drum is mounted, and a slidable chassis on which the pair of reel discs are mounted, the slidable chassis being slidably mounted on the fixed chassis so that the pair of reel discs can be moved to approach or separate from the rotary head drum; after a tape cassette is installed on the movable chassis and the pair of tape reels therein are engaged with the pair of reel discs, the tape cassette being moved by means of the slidable chassis toward the rotary head drum; and a tape in the tape cassette being wound around the rotary head drum by a tape loading means.

The tape cassette can thus be placed at a sufficient distance at first from a rotary head drum, so that the tape cassette or the tape therein does not come in contact with the rotary head drum and they are not damaged by each other.

Thus the rotary head drum is immovable and, instead, the pair of reel discs and the tape cassette mounted thereon are moved toward the rotary head drum by the slidable chassis. The distance between the tape cassette and rotary head drum can be greatly decreased during normal operation, despite maintaining high tape-running stability and high recording and reproducing precision. Therefore, the total size of the cassette type recording and/or reproducing apparatus can be reduced as much as or more than that of conventional apparatus.

In addition, since tape loading means, which are provided on a slidable chassis and are moved integrally therewith, are guided by the guide rails while the tape cassette is moved by the slidable chassis, positioning of the tape loading means with respect to the moving tape cassette can be accurately defined, and a length of the guide rail can

be greatly decreased. Therefore, when the tape cassette is mounted on the slidable chassis, the tape in the tape cassette will no longer be damaged due to interference of the tape loading means or due to a unnecessary withdrawal force of the tape loading means.

Preferably, the first guide rails on the slidable chassis are formed of a synthetic resin and the tape loading means can be moved smoothly along the first guide rails with a small torque, thus rendering a motor for driving the tape loading means compact in size.

The invention is diagrammatically illustrated by way of example with reference to the accompanying drawings in which:-

Figures 1 and 2 are plan views of a main part of one embodiment of a tape loading device according to the invention;

Figures 3 and 4 are side views of a main part thereof of the device of Figures 1 and 2;

Figure 5 is a plan view of a fixed chassis of the device of Figures 1 to 4;

Figure 6 is a perspective view of a slidable chassis of the device of Figures 1 to 5;

Figure 7 is a partially enlarged plan view of the slidable chassis;

Figure 8 is a sectional view taken on line VIII - VIII in Figure 7; and

Figure 9 is a sectional view taken on line IX - IX of Figure 8.

An 8-mm VTR includes, as illustrated in Figure 6, a slidable chassis 1 formed of a metal plate, such as stainless steel plate, and reinforced by a plurality of ribs 2 formed by bent over peripheries of the metal plate, thereby to obtain a plate which has highly precise flat-surfaces. A pair of reel discs, particularly a supply reel disc 3a and a take-up reel disc 3b, are rotatably mounted on the upper rear end portion of the slidable chassis 1. An opening 4, in which a mechanism for driving the reel discs (to be described later) is arranged, is formed between the reel discs 3a and 3b. Guide slots 5 extending in the front to rear direction are formed in the four corner portions of the slidable chassis 1 in parallel with one another. A pair of cassette positioning pins 6 and a pair of cassette mounting bases 7 are provided on the upper surface of the slidable chassis 1.

Referring to Figures 6 to 9, a pair of first guide rails 9a and 9b for guiding tape loading means 27a and 27b (to be described later) are mounted on the front end portion of the slidable chassis 1. The first guide rails 9a and 9b are outsert-moulded on the slidable chassis 1 of the metal plate using a synthetic resin, such as polyacetal resin. Curved guide grooves 10 are formed at respective central portions of the first guide rails 9a and 9b, and distal ends (front ends) 10a of the guide grooves 10 are

open at front end portions 11 of the first guide rails 9a and 9b. The base portions 13 of the first guide rails 9a and 9b are outsert-moulded along inner surfaces of grooves 12 formed in the slidable chassis 1, and the guide grooves 10 are positioned at levels somewhat higher than the level of the base portions 13. The base portions 13 are secured to the slidable chassis 1 with upper and lower flanges 13a, between which the slidable chassis 1 is sandwiched, and a plurality of connecting pins 13b, which vertically extend through the slidable chassis 1, are spaced apart from one another. By outsert-moulding the first guide rails 9a and 9b on the slidable chassis 1, the number of assembling steps can be reduced and the guide rails are prevented from becoming loose or disengaged from the chassis.

A pair of upper and lower pawls 14a and 14b are formed integrally with the respective first guide rails 9a and 9b at their end portions 11 and at each side of the distal ends 10a of the guide grooves 10. Further, inclined planes 15a and 15b are formed in the respective opposing surfaces of the distal ends of the pawls 14a and 14b.

Referring to Figures 1 to 5, a drive mechanism 80 for driving the slidable chassis and the tape loading means has a fixed chassis 17 formed of metal, such as aluminum. Mounted on the upper front end portion of the fixed chassis 17 by way of a drum base 19 is a rotary head drum 18, upper and the lower drums 18a, 18b of which are a rotary drum and a fixed drum, respectively. The fixed drum 18b is fixed to the drum base 19. As shown in Figure 1, the rotary head drum 18 forms a predetermined angle θ in the direction of arrow a with a reference line P which is parallel to the front surface of a tape cassette (to be described later). Four guide pins 20 extend from the upper portion of and near the respective corner positions of the fixed chassis 17, and the guide slots 5 of the slidable chassis 1 are engaged with the respective upper ends of the guide pins 20, whereby the slidable chassis 1 is held parallel to and above the fixed chassis 17. The slidable chassis 1 is horizontally movable in the direction of arrow b (Figures 1 and 3) or c (Figures 2 and 4) toward or away from the rotary head drum 18 under the guidance of the four sets of the guide pins 20 and guide slots 5.

A partially toothed gear 21 is rotatably supported on the upper portion of the fixed chassis 17, and a pin 22 is eccentrically secured on the gear 21 as shown in Figure 5. A guide plate 24 with a guide slot 23, into which the drive pin 22 is inserted from below, is fixed to the lower surface of the slidable chassis 1 with a plurality of screws 25. The guide slot 23 comprises a linear part 23a perpendicular to the moving direction of the slidable chassis 1 indicated by arrows b and c and a

curved part 23b, the centre of which coincides with the axis 26 of the drive gear 21.

A drive mechanism 81 for moving the tape loading means 27a and 27b has the following arrangement. Each of the tape loading means 27a and 27b has a vertical roller guide 29, which comprises a roller, and an inclined guide 30, which comprises a fixed pin, and they are mounted on a movable block 28. As shown in Figures 7 to 9, a pair of guide pins 31a and 31b are disposed on the lower surface of the movable block 28. As the movable blocks 28 of the tape loading means 27a and 27b are placed on the respective guide rails 9a and 9b, the loading means 27a and 27b are moved under the guidance of the combination of the guide pins 31a, 31b and guide grooves 10 in the direction of arrow d in Figure 1 or arrow e in Figure 2 so as to move toward or away from the rotary head drum 18.

A pair of drive plates 32a and 32b vertically overlap each other and are symmetrically arranged on the upper portion of the fixed chassis 17 and near the outer periphery of the rotary head drum 18 as shown in Figure 5. The drive plates 32a and 32b have peripheral teeth 33a and 33b and arcuate guide slots 34a and 34b, respectively. A pair of guide pins 35 fixed to the fixed chassis 17 are inserted in the guide slots 34a and 34b. Thus, the drive plates 32a and 32b are movable in the direction of arrow f or g.

Rotatably supported on the upper portion of the fixed chassis 17 are a pair of gears 37a and 37b which are in mesh with the respective peripheral teeth 33a and 33b. There exists a gear train 38 for transmitting torque between the gear 21 and the peripheral teeth 33a of the drive plate 32a. A drive motor 39 is mounted on the upper portion of the fixed chassis 17, and a gear train 40 for transmitting torque is interposed between the motor 39 and gear 37a.

As shown in Figures 7 to 9, one of the guide pins 31a of the tape loading means 27a, 27b is connected to the drive plate 32a, 32b through a spring 42, a slider 43 and a link 44. When the drive plates 32a and 32b are driven in the direction of arrow f or g in Figure 5, the tape loading means 27a and 27b are moved in the respective directions of arrows d in Figure 1 and arrow e in Figure 2 through the springs 42, under the guidance of the guide rails 9a and 9b.

As shown in Figures 1, 2 and 5, or Figures 7 to 9, second guide rail means in the form of a pair of positioning stands 46a and 46b for positioning the tape loading means 27a and 27b are arranged at the right and left sides of the base 19 of the rotary head drum 18. A pair of guide grooves 47 are formed in the respective positioning stands 46a and 46b and open distal ends (rear ends) 47a of

the guide grooves 47 are connected to the respective distal ends 10a of the guide grooves 10. That is, the front end portions 11 of the first guide rails 9a and 9b are connected to respective distal end portions 48 of the positioning plates 46a and 46b as shown in Figures 7 and 9. Inclined planes 49a and 49b are formed on the upper and lower edges of the distal end portions 48 opposite to the inclined planes 15a and 15b of the pawls 14a and 14b.

As shown in Figure 6, a tension detecting pin 51 is pivotally mounted on the front end portion of one side of the slidable chassis 1 through an arm 52 and a pivot 53. A tape drawing pin 54 and a pinch roller 55 are pivotally mounted on the front end portion of the other side of the slidable chassis 1 through respective arms 57 and 56 and respective pivots 59 and 58. The tension detecting pin 51 is connected to a hand brake 60 which is mounted on the slidable chassis 1 to adjust a brake force of the supply reel disc 3a.

As shown in Figures 1 and 2, a capstan 62 and an impedance roller 63 are rotatably mounted on the fixed chassis 17 at the respective right and left sides of the rotary head drum 18. A reel disc driving mechanism 64 is mounted on the fixed chassis 17 in the intermediate position between the reel disc 3a and 3b. The driving mechanism 64 comprises a gear 65, a swing gear 66 always meshed with the gear 65, and a lever 68 rotatably supported by the axis 67 of the gear 65. The swing gear 66 is rotatably supported at the distal end of the lever 68. The driving mechanism 64 is arranged in the opening 4 of the slidable chassis 1. When the gear 65 is driven in the normal or the reverse direction by a motor (not shown) for driving the capstan 62, the swing gear 66 swings in the direction of arrow h or i as shown in Figure 2 in accordance with the rotational direction of the gear 65, and is selectively meshed with a gear 69b or a gear 69a formed integrally with the respective reel discs 3b or 3a, so that either of the gears 69a and 69b is selectively driven as shown in Figure 2.

As shown in Figures 1 and 2, a tape (magnetic tape) 73 wound around a supply reel 72a and take-up reel 72b is housed in a tape cassette (8-mm VTR cassette) 71. The tape 73 is initially guided by a pair of tape guides 74 in the tape cassette 71 to travel along a front opening 75 thereof. The tape cassette 71 has a cover 76 for opening/closing the opening 75 and a bottom cutout 77 communicating with the opening 75 as shown in Figures 3 and 4.

Tape loading and tape unloading operations will now be explained with reference to Figures 1 to 9.

Before the cassette 71 is installed, the slidable chassis 1 is moved in the direction of arrow b toward an inactive position shown in Figures 1 and

3, so that the reel discs 3a and 3b are separated from the rotary head drum 18 by a large distance L_1 , Figure 3. In the inactive position, the pin 22 of the gear 21 is moved in the direction of arrow j toward an inactive position indicated in chain-dotted lines in Figure 5 and located in the linear part 23a of the guide slot 23 in the guide plate 24. Further, the tape loading means 27a and 27b, the tension detecting pin 51, the tape drawing pin 54 and the pinch roller 55 are moved toward the inactive positions shown in Figure 1.

In this state, as shown in Figure 3, when the tape cassette 71 is installed on the slidable chassis 1 by a cassette mounting device (not shown) and supported on the two cassette positioning pins 6 and the two cassette mounting bases 7, the tape loading means 27a and 27b, the tension detecting pin 51, the tape drawing pin 54 and the pin roller 55 are inserted inside the tape 73 through the bottom cutout 77 of the tape cassette 71. The cover 76 is pushed upward by an opening means (not shown) to pivot in the direction of arrow m in Figure 3, so that the front opening 75 of the tape cassette 71 is opened.

Under the above-mentioned state, the tape cassette 71 is so placed on the slidable chassis 1 as to have the tape 73 thereof sufficiently separated by a distance L_2 , Figure 1 from the rotary head drum 18 that not only the tape cassette 71 but also the tape 73 can no longer come into unexpected contact with the rotary drum head 18, particularly with the upper drum 18a, i.e. the rotary drum.

The tape loading operation is performed by driving the drive motor 39 in the normal direction after the cassette 71 is installed. That is, when the motor 39 is rotated in the normal direction, the gears 37a and 37b are rotated in the directions opposite to each other through the gear train 40 as shown in Figure 5, and the drive plates 32a and 32b are driven in the directions of arrow g by the gears 37a and 37b. Further, the gear 21 is driven by the peripheral teeth 33a of the plate 32a through the gear train 38, so that the pin 22 is rotated by a predetermined angle θ_2 in the direction of arrow k as shown in Figure 5.

While the pin 22 rotates from the inactive position indicated by chain-dotted lines to an intermediate position indicated by dotted lines in Figure 5 by an angle θ_3 , the pin 22 pushes the linear part 23a of the guide slot 23 in the guide plate 24 in the direction of arrow c. As a result, the slidable chassis 1 is driven by the pin 22 and moved from the inactive position in Figures 1 and 3 to an active position shown in Figures 2 and 4 in the direction of arrow c. After the slidable chassis 1 reaches the active position, the pin 22 moves along the curved part 23b of the guide slot 23 in the direction of

arrow k from the intermediate position to the active position indicated by solid lines in Figure 5 by the remainder, θ_4 , of angle θ_2 .

The reel discs 3a and 3b with the tape cassette 71 are moved in the direction of arrow c by the slidable chassis 1, so that the distance between the reel discs 3a and 3b and the rotary head drum 18 is shortened to a small distance L_3 , Figure 4. Then, the tape cassette 71 approaches the rotary head drum 18. As the tape 73 is so close to the rotary head drum 18 as to be partially inserted in the tape cassette 71 from the opening 75, the tape 73, which travels linearly between the tape guides 74, is brought into partial contact with the outer surface of the rotary head drum 18 as indicated by chain-dotted lines in Figure 2.

The first guide rails 9a and 9b are moved together with the slidable chassis 1, and approach the two sides of the rotary head drum 18 as shown in Figure 2, 7 and 9, so that the front end portion 11 of the first guide rail 9a, 9b is connected to the distal end portion 48 of the second guide rails formed by the positioning stands 46a and 46b and engaged with the upper and lower edges of the distal end portions 48. Hence, the first guide rails 9a and 9b are reliably connected to the second guide rails formed by the positioning plates 46a and 46b.

Meanwhile, as the slidable chassis 1 is moved in the direction of arrow c, the tape loading means 27a and 27b are moved in the direction of arrow e by the drive plates 32a and 32b which are driven in the direction of arrow g in Figure 5 from the inactive positions shown in Figures 1 and 3 to the active positions near the two sides of the rotary head drum 18 as shown in Figures 3 and 4. That is, the tape loading means 27a and 27b are moved in the direction of arrow e along the respective first guide rails 9a and 9b, which are moved in the direction of arrow c together with the slidable chassis 1. The tape loading means 27a and 27b are moved near to the distal ends of the first guide rails 9a and 9b while the drive pin 22 moves in the direction of arrow k by angle θ_3 and are transferred from the first guide rails 9a and 9b to the second guide rails formed by the positioning stands 46a and 46b while the pin 22 moves by angle θ_4 . When the tape loading means 27a and 27b reach the active positions, the movable blocks 28 are mounted on the respective positioning stands 46a and 46b, and the guide pins 31a and 31b are fitted in the respective guide grooves 47. The tape loading means 27a and 27b are positioned in the active positions by bias forces of the springs 42. Although the roller guides 29 of the tape loading means 27a and 27b stand vertically in the active positions, the inclined guides 30 incline predetermined angles against the rotary head drum

18. Further, as the first guide rails 9a and 9b are formed of a synthetic resin and a friction coefficient thereof is lower than that of a metal, the tape loading means 27a and 27b can be moved smoothly along the first guide rails 9a and 9b with small torque, and the motor 39 can be made compact.

The tape 73 in the tape cassette 71 is drawn from the front opening 75 by the vertical roller guides 29 of the tape loading means 27a and 27b, and helically wound substantially in the shape of the letter M around the inclined rotary head drum 18 as shown in Figures 2 and 4. The contact angle and helical angle of the tape 73 against the rotary head drum 18 are defined by the inclined guides 30 of the tape loading means 27a and 27b, and further, the inclined guides 30 serve to curve the path of the tape 73 between the rotary head drum 18 and tape cassette 71. In addition, the tension detecting pin 51, the tape drawing pin 54 and the pinch roller 55 are driven at a speed synchronous with the movement of the slidable chassis 1, which is moved in the direction of arrow c by another drive mechanism (not shown), to be moved in the directions of arrows n, o and g from the inactive positions shown in Figure 1 to the active positions shown in Figure 2, so that the tape 73 is passed on between the impedance roller 63 and the capstan 62. Thus, the tape loading operation is finished and the motor 39 is stopped.

During this operation, the swing gear 66 of the reel disc driving mechanism 64 is positioned in an intermediate position between the gears 69a and 69b formed integrally with the respective reel discs, and meshed with neither of the gears 69a and 69b. At the time of tape loading, the tape 73 is generally paid out from the take-up reel 72b of the tape cassette 71.

After completion of the tape loading operation, the tape 73 is pressed against the capstan 62 by the pinch roller 55 as shown in Figure 2 and run under constant speed along the loading path, so that the tape 73 is paid out from the supply reel 72a and taken up by the take-up reel 72b, and recording and reproducing are performed by rotation of the upper drum 18a of the rotary head drum 18. During the recording/reproducing mode, the tension of the tape 73 is detected by the tension detecting pin 51, and the brake force of the band brake 60 of the supply reel disc 3a is automatically adjusted to make the back tension of the tape 73 constant. In the recording/reproducing or fast forward mode, the gear 65 of the reel disc driving mechanism 64 is rotated in the normal direction, and the swing gear 66 swings in the direction of arrow h indicated in broken lines in Figure 2 to be meshed with the gear 69b formed integrally with the take-up reel disc 3b, so that the reel disc 3b is rotated. On the other hand, in a rewind mode, the

gear 65 is rotated in the reverse direction, and the swing gear 66 swings in the direction of arrow i indicated in chain-dotted lines in Figure 2 to be meshed with the gear 69a formed integrally with the supply reel disc 3a, so that the reel disc 3a is rotated.

In the meantime, the unloading operation of the tape is conducted by the motor 39 being rotated in the reverse direction, in other words, through almost reversing the above-mentioned loading operation of the tape, but until the tape loading means 27a, 27b are transferred from the second guide rails formed by the positioning stands 48a, 48b to the first guide rails 9a, 9b after the drive plates 32a, 32b begin to move in the direction of arrow f in Figure 5, the slidable chassis 1 is not moved in the direction of arrow b, because the pin 22 of the gear 21 is guided in the direction of arrow j in Figure 5 by the curved part 23b of the guide slot 23. After the tape loading means 27a and 27b are mounted on the first guide rails 9a and 9b, the pin 22 is guided by the linear part 23a of the guide slot 23 and thereby, the slidable chassis 1 is moved in the direction of arrow b from the active position shown in Figures 2 and 4 to the inactive position shown in Figures 1 and 3.

The tape cassette 71 is moved together with the reel discs 3a and 3b in the direction of arrow b by the slidable chassis 1 and separated by the sufficient distance L_2 from the rotary head drum 18 as shown in Figures 1 and 4. After the tape loading means 27a and 27b, the tension detecting pin 51, the tape drawing pin 54, and the pinch roller 55 are moved to the inactive positions shown in Figure 1, the motor 39 is stopped. Thus, the tape unloading operation is finished. During the unloading operation, the swing gear 66 is meshed with the gear 69a formed integrally with the take-up reel disc 3b as indicated in dotted lines in Figure 2, so that the take-up reel disc 3b is driven with small torque. The tape 73 is then wound on the take-up reel 72b and withdrawn in the tape cassette 71. If desired the slidable chassis 1 and the first guide rails 9a and 9b could be moulded integrally with each other of synthetic resin of high strength.

The present invention is not limited to an 8-mm VTR with a built-in camera, but can be applied to various other cassette type recording and/or reproducing apparatus.

Claims

1. A tape loading device for cassette type tape recording and/or reproducing apparatus comprising:
 - a main chassis (17) on which a rotary head drum (18) is mounted;
 - a sub-chassis (1) slidably mounted on the

18. Further, as the first guide rails 9a and 9b are formed of a synthetic resin and a friction coefficient thereof is lower than that of a metal, the tape loading means 27a and 27b can be moved smoothly along the first guide rails 9a and 9b with small torque, and the motor 39 can be made compact.

The tape 73 in the tape cassette 71 is drawn from the front opening 75 by the vertical roller guides 29 of the tape loading means 27a and 27b, and helically wound substantially in the shape of the letter M around the inclined rotary head drum 18 as shown in Figures 2 and 4. The contact angle and helical angle of the tape 73 against the rotary head drum 18 are defined by the inclined guides 30 of the tape loading means 27a and 27b, and further, the inclined guides 30 serve to curve the path of the tape 73 between the rotary head drum 18 and tape cassette 71. In addition, the tension detecting pin 51, the tape drawing pin 54 and the pinch roller 55 are driven at a speed synchronous with the movement of the slidable chassis 1, which is moved in the direction of arrow c by another drive mechanism (not shown), to be moved in the directions of arrows n, o and g from the inactive positions shown in Figure 1 to the active positions shown in Figure 2, so that the tape 73 is passed on between the impedance roller 63 and the capstan 62. Thus, the tape loading operation is finished and the motor 39 is stopped.

During this operation, the swing gear 66 of the reel disc driving mechanism 64 is positioned in an intermediate position between the gears 69a and 69b formed integrally with the respective reel discs, and meshed with neither of the gears 69a and 69b. At the time of tape loading, the tape 73 is generally paid out from the take-up reel 72b of the tape cassette 71.

After completion of the tape loading operation, the tape 73 is pressed against the capstan 62 by the pinch roller 55 as shown in Figure 2 and run under constant speed along the loading path, so that the tape 73 is paid out from the supply reel 72a and taken up by the take-up reel 72b, and recording and reproducing are performed by rotation of the upper drum 18a of the rotary head drum 18. During the recording/reproducing mode, the tension of the tape 73 is detected by the tension detecting pin 51, and the brake force of the band brake 60 of the supply reel disc 3a is automatically adjusted to make the back tension of the tape 73 constant. In the recording/reproducing or fast forward mode, the gear 65 of the reel disc driving mechanism 64 is rotated in the normal direction, and the swing gear 66 swings in the direction of arrow h indicated in broken lines in Figure 2 to be meshed with the gear 69b formed integrally with the take-up reel disc 3b, so that the reel disc 3b is rotated. On the other hand, in a rewind mode, the

gear 65 is rotated in the reverse direction, and the swing gear 66 swings in the direction of arrow i indicated in chain-dotted lines in Figure 2 to be meshed with the gear 69a formed integrally with the supply reel disc 3a, so that the reel disc 3a is rotated.

In the meantime, the unloading operation of the tape is conducted by the motor 39 being rotated in the reverse direction. In other words, through almost reversing the above-mentioned loading operation of the tape, but until the tape loading means 27a, 27b are transferred from the second guide rails formed by the positioning stands 46a, 46b to the first guide rails 9a, 9b after the drive plates 32a, 32b begin to move in the direction of arrow f in Figure 5, the slidable chassis 1 is not moved in the direction of arrow b, because the pin 22 of the gear 21 is guided in the direction of arrow j in Figure 5 by the curved part 23b of the guide slot 23. After the tape loading means 27a and 27b are mounted on the first guide rails 9a and 9b, the pin 22 is guided by the linear part 23a of the guide slot 23 and thereby, the slidable chassis 1 is moved in the direction of arrow b from the active position shown in Figures 2 and 4 to the inactive position shown in Figures 1 and 3.

The tape cassette 71 is moved together with the reel discs 3a and 3b in the direction of arrow b by the slidable chassis 1 and separated by the sufficient distance l_2 from the rotary head drum 18 as shown in Figures 1 and 4. After the tape loading means 27a and 27b, the tension detecting pin 51, the tape drawing pin 54, and the pinch roller 55 are moved to the inactive positions shown in Figure 1, the motor 39 is stopped. Thus, the tape unloading operation is finished. During the unloading operation, the swing gear 66 is meshed with the gear 69a formed integrally with the take-up reel disc 3b as indicated in dotted lines in Figure 2, so that the take-up reel disc 3b is driven with small torque. The tape 73 is then wound on the take-up reel 72b and withdrawn in the tape cassette 71. If desired the slidable chassis 1 and the first guide rails 9a and 9b could be moulded integrally with each other of synthetic resin of high strength.

The present invention is not limited to an 8-mm VTR with a built-in camera, but can be applied to various other cassette type recording and/or reproducing apparatus.

Claims

1. A tape loading device for cassette type tape recording and/or reproducing apparatus comprising:
 - a main chassis (17) on which a rotary head drum (18) is mounted;
 - a sub-chassis (1) slidably mounted on the



main chassis (17) to accommodate a tape cassette (71);

a chassis drive mechanism (80) arranged between the main chassis (17) and the sub-chassis (1) so as to move the sub-chassis (1) from a first position in which the cassette (71) can be exchanged to a second position in which the cassette (71) can be recorded/reproduced and vice versa;

tape loading means (27a, 27b) to draw out a tape from within the cassette (71) and guide the tape (73) to the periphery of the rotary head drum (18); and

guide rail means (9a, 9b, 46a, 46b) to guide movement of the tape loading means (27a, 27b) therealong; characterised in that the guide rail means comprise first guide rail means (9a, 9b) on the sub-chassis (1) and

second guide rail means (46a, 46b) second guide rail means (46a, 46b) with the first guide rail means (9a, 9b) in the second position of the sub-chassis (1) whereby the tape loading means (27a, 27b) can be transferred between the sub-chassis (1) and the main chassis (17) to position the tape loading means (27a, 27b) adjacent the rotary drum head (18).

2. A tape loading device according to claim 1; wherein:

the first guide rail means (9a, 9b) is made of moulded resin and on the tip thereof, has coupling means (14a, 14b), whereby the first guide rail means (9a, 9b) are coupled to the second guide rail means (46a, 46b, 47) when the sub-chassis (1) is moved towards the rotary head drum (18).

3. A tape loading device according to claim 1; wherein:

the tape loading means (27a, 27b) is driven by a drive mechanism (81) provided on the main chassis.

4. A tape loading device according to claim 1; wherein:

the tape loading means (27a, 27b) are provided as a pair and move along either side of the rotary head drum (18).

5. A tape loading device according to claim 2; wherein:

the first guide rail means (9a, 9b) are provided as a pair and extend along either side of the rotary head drum (18).

6. A tape loading device according to claim 1; wherein:

the second guide rail means (46a, 46b) are

provided as a pair and extend along either side of the rotary head drum (18) with each of the second guide rail means corresponding to a respective one of the first guide rail means (9a, 9b).

7. A tape loading device according to claim 5; wherein:

the first pair of guide rail means (9a, 9b) have respective guide grooves (10) so as to guide the respective tape loading means (27a, 27b).

8. A tape loading device according to claim 6; wherein:

the second guide rail means (46a, 46b) have respective guide grooves (47) so as to position the respective tape loading means (27a, 27b).

9. A tape loading device according to claim 3; wherein:

the drive mechanism (81) has a pair of drive plates (32a, 32b) provided on the main chassis (17).

Revendications

1. Dispositif de chargement de bande pour un appareil d'enregistrement, et/ou de reproduction de bande du type à cassette comportant :

un châssis principal (17) sur lequel est monté un tambour de tête rotative (18);

un sous-châssis (1) monté de façon coulissante sur le châssis principal (17) afin de recevoir une cassette à bande (71);

un mécanisme d'entraînement de châssis (80) disposé entre le châssis principal (17) et le sous-châssis (1) de façon à déplacer le sous-châssis (1) d'une première position dans laquelle la cassette (71) peut être changée vers une deuxième position dans laquelle la cassette (71) peut être enregistrée/reproduite et vice versa;

des moyens de chargement de bande (27a, 27b) destinés à extraire une bande de l'intérieur de la cassette (71) et à guider la bande (73) vers la périphérie du tambour de tête rotative (18); et

des moyens de rail de guidage (9a, 9b, 46a, 46b) destinés à guider le déplacement des moyens de chargement de bande (27a, 27b) sur leur longueur; caractérisé en ce que les moyens de rail de guidage consistent en premiers moyens de rail de guidage (9a, 9b) sur le sous-châssis et en deuxièmes moyens de rail de guidage (46a, 46b) sur le châssis principal (17) devant être alignés avec les premiers moyens de rail de guidage (9a, 9b) dans la deuxième position du sous-châssis (1), les



moyens de chargement de bande (27a, 27b) pouvant être transférés entre le sous-châssis (1) et le châssis principal (17) afin de positionner les moyens de chargement de bande (27a, 27b) de façon adjacente au tambour de tête rotative (18).

2. Dispositif de chargement de bande selon la revendication 1, dans lequel :
les premiers moyens de rail de guidage (9a, 9b) sont réalisés en résine moulée et possèdent, sur le bout, des moyens de couplage (14a, 14b), les premiers moyens de rail de guidage (9a, 9b) étant couplés aux deuxièmes moyens de rail de guidage (46a, 46b, 47) lorsque le sous-châssis (1) est déplacé vers le tambour de tête rotative (18).
3. Dispositif de chargement de bande selon la revendication 1, dans lequel :
les moyens de chargement de bande (27a, 27b) sont entraînés par un mécanisme d'entraînement (81) prévu sur le châssis principal.
4. Dispositif de chargement de bande selon la revendication 1, dans lequel :
les moyens de chargement de bande (27a, 27b) sont prévus sous forme d'une paire et se déplacent le long de chaque côté du tambour de tête rotative (18).
5. Dispositif de chargement de bande selon la revendication 2, dans lequel :
les premiers moyens de rail de guidage (9a, 9b) sont prévus sous forme d'une paire et s'étendent le long de chaque côté du tambour de tête rotative (18).
6. Dispositif de chargement de bande selon la revendication 1, dans lequel :
les deuxièmes moyens de rail de guidage (46a, 46b) sont prévus sous forme d'une paire et s'étendent le long de chaque côté du tambour de tête rotative (18) avec chacun des deuxièmes moyens de rail de guidage correspondant à un respectif des premiers moyens de rail de guidage (9a, 9b).
7. Dispositif de chargement de bande selon la revendication 5, dans lequel :
la première paire de moyens de rail de guidage (9a, 9b) a des rainures de guidage (10) respectives de façon à guider les moyens de chargement de bande (27a, 27b) respectifs.
8. Dispositif de chargement de bande selon la revendication 6, dans lequel :
les deuxièmes moyens de rail de guidage

(46a, 46b) ont des rainures de guidage respectives (47) de façon à positionner les moyens de chargement de bande (27a, 27b) respectifs.

9. Dispositif de chargement de bande selon la revendication 3, dans lequel :
le mécanisme d'entraînement (81) possède une paire de plaques d'entraînement (32a, 32b) prévues sur le châssis principal (17).

Patentansprüche

1. Bandladevorrichtung für ein Bandkassetten-Aufnahme- und/oder Wiedergabegerät mit einem Hauptchassis (17), auf dem eine drehbare Kopftrommel (18) montiert ist, einem Subchassis (1) zur Aufnahme einer Bandkassette (71), das auf dem Hauptchassis (17) gleitbar montiert ist, einem zwischen dem Hauptchassis (17) und dem Subchassis (1) angeordneten Chassis-Antriebsmechanismus (80) zum Bewegen des Subchassis (1) aus einer ersten Position in eine zweite Position und umgekehrt, wobei in der ersten Position die Bandkassette (71) ausgewechselt werden kann, und in der zweiten Position auf der Bandkassette (71) aufgezogen bzw. von ihr wiedergegeben werden kann, Bandlademitteln (27a, 27b) zum Herausziehen des Bandes aus der Bandkassette (71) und zum Führen des Bandes (71) zu der Peripherie der drehbaren Kopftrommel (18) und Führungsschienenmittel (9a, 9b, 46a, 46b) für die Bewegungsführung der Bandlademittel (27a, 27b), dadurch gekennzeichnet, daß die Führungsschienenmittel erste Führungsschienenmittel (9a, 9b) auf dem Subchassis (1) umfassen sowie zweite Führungsschienenmittel (46a, 46b) auf dem Hauptchassis (17), wobei letztere in der genannten zweiten Position des Subchassis (1) mit den ersten Führungsschienenmitteln (9a, 9b) fluchten, so daß die Bandlademittel (27a, 27b) zwischen dem Subchassis (1) und dem Hauptchassis (17) übertragen werden können, um die Bandlademittel (27a, 27b) in der Nähe der drehbaren Kopftrommel (18) zu positionieren.
2. Bandladevorrichtung nach Anspruch 1, bei der die ersten Führungsschienenmittel (9a, 9b) als Kunststoff-Formteile ausgebildet sind und an ihrer Vorderseite Kupplungsmittel (14a, 14b) aufweisen, durch die sie mit den zweiten Führungsschienenmitteln (46a, 46b, 47) verbunden werden, wenn das Subchassis (1) in Richtung auf die drehbare Kopftrommel (18) bewegt



wird.

3. Bandladevorrichtung nach Anspruch 1, bei der die Bandlademittel (27a, 27b) durch einen auf dem Hauptchassis angeordneten Antriebsmechanismus (81) angetrieben werden. 5

4. Bandladevorrichtung nach Anspruch 1, bei der die Bandlademittel (27a, 27b) paarweise vorgesehen sind und längs der beiden Seiten der drehbaren Kopftrommel (18) bewegt werden. 10

5. Bandladevorrichtung nach Anspruch 2, bei der die ersten Führungsschienenmittel (9a, 9b) paarweise vorgesehen sind und entlang der beiden Seiten der drehbaren Kopftrommel (18) verlaufen. 15

6. Bandladevorrichtung nach Anspruch 1, bei der die zweiten Führungsschienenmittel (46a, 46b) paarweise vorgesehen sind und entlang der beiden Seiten der drehbaren Kopftrommel (18) verlaufen, wobei jedes von ihnen mit jeweils einem der ersten Führungsschienenmittel (9a, 9b) korrespondiert. 20
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7. Bandladevorrichtung nach Anspruch 5, bei der das erste Paar von Führungsschienenmitteln (9a, 9b) jeweils Führungsnuten (10) zum Führen des entsprechenden Bandlademittels (27a, 27b) aufweist. 30

8. Bandladevorrichtung nach Anspruch 6, bei der die zweiten Führungsschienenmittel (46a, 46b) jeweils Führungsnuten (47) zum Positionieren des entsprechenden Bandlademittels (27a, 27b) aufweisen. 35

9. Bandladevorrichtung nach Anspruch 3, bei der der Antriebsmechanismus (81) zwei auf dem Hauptchassis (17) angeordnete Antriebsplatten (32a, 32b) aufweist. 40

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