

TAPE RECORDER

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BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to a tape recorder, and more particularly to improvements in or relating to a structure of a tape recorder including a spring plate for mounting a head mounting plate on a chassis.

2) Description of the Prior Art

A tape recorder is already known which comprises a chassis having an engaging hole formed therein, a head mounting plate mounted for reciprocal movement between a home position and a moved position on the chassis and spring-biased from the moved position toward the home position, a spring plate secured to the head mounting plate for contacting with the chassis to bias the head mounting plate away from the chassis and engageable, when the head mounting plate is in the home position, at an end thereof remote from the head mounting plate with an edge of the engaging hole of the chassis to arrest the head mounting plate at the home position, and a cassette holder mounted on the chassis for movement between a rest position and a reproduction mode position, whereby the arrested condition of the head

mounting plate by the spring plate is canceled by the cassette holder when the cassette holder is moved from the rest position to the reproduction mode position.

In such a conventional tape recorder, a head mounting plate is mounted for reciprocal movement on a chassis by fitting a retaining or snap ring such as an E-snap ring on a projection which is formed on the chassis and fitted in a fitting hole perforated in the head mounting plate.

Accordingly, such a conventional tape recorder requires a retaining or snap ring such as an E-snap ring and accordingly involves a relatively large number of components. Besides, the operability in mounting a head mounting plate on a chassis is low.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a tape recorder wherein the necessity of a retaining or snap ring is eliminated and the operability in mounting a head mounting plate on a chassis is improved.

In order to attain the object, according to the present invention, there is provided a tape recorder which comprises a chassis having an engaging hole formed therein, a head mounting plate mounted for reciprocal

movement between a home position and a moved position on the chassis and spring-biased from the moved position toward the home position, a spring plate secured at one end portion thereof to the head mounting plate and
5 extending at the other end portion thereof obliquely toward the chassis for contacting with the chassis to bias the head mounting plate away from the chassis, the spring plate being engageable, when the head mounting plate is in the home position, at the other end thereof
10 with an edge of the engaging hole of the chassis to arrest the head mounting plate at the home position, and a cassette holder mounted on the chassis for movement between a rest position and a reproduction mode position, the arrested condition of the head mounting
15 plate by the spring plate being canceled by the cassette holder when the cassette holder is moved from the rest position to the reproduction mode position, the spring plate having thereon an arresting element which can extend into and engage with another edge of the engaging
20 hole of the chassis to define a limit position of the movement of the head mounting plate away from the moved position.

With the tape recorder, the arresting element on the spring plate extends into the engaging hole of the
25 chassis thereby to define the limit position of the head

mounting plate when the head mounting plate moves from the moved position to the home position.

On the other hand, when the head mounting plate is positioned at the home position, the spring plate is engaged with the edge of the engaging hole of the chassis to arrest the head mounting plate from moving from the home position toward the moved position.

When the cassette holder is moved from the rest position to the reproduction mode position, the arrested condition of the head mounting plate by the spring plate is canceled by the cassette holder.

Accordingly, various effects can be anticipated that a head mounting plate can be mounted onto a chassis by a simple operation without using such a retaining or snap ring as used in a conventional tape recorder, that the quantity of parts can be reduced, that the operability in mounting a head mounting plate can be improved, and so on.

A specific embodiment of the present invention will now be described in detail by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a mechanism of a tape recorder according to the present invention in a

rest condition;

FIG. 2 is a bottom plan view of the tape recorder mechanism of FIG. 1;

FIG. 3 is a view as viewed in a direction of an
5 arrow mark III of FIG. 1;

FIG. 4 is a perspective view of a head mounting plate;

FIG. 5 is a cross sectional view showing a structure for mounting the head mounting plate on a
10 chassis;

FIG. 6 is a perspective view of a spring plate and an engaging hole of the mounting structure of FIG. 5;

FIG. 7 is a sectional view showing the head
15 mounting plate on the chassis by the mounting structure of FIG. 5;

FIG. 8 is a perspective view of the spring plate and the engaging hole of FIG. 6 in a mounted condition of the head mounting plate on the chassis; and

20 FIG. 9 is a perspective view, partly broken, of the head mounting plate mounted on the chassis.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring first to FIGS. 1 to 3, there is shown a mechanism of a tape recorder according to the present

invention. The tape recorder mechanism shown includes a capstan shaft 2, a reel shaft 3, a motor 4 for driving the capstan shaft 2 and the reel shaft 3 to rotate, and a switch 5 for interrupting energization of the motor 4, all located on a chassis 1.

Referring to FIGS. 1 and 9, the capstan shaft 2 is fitted from the lower face side of the chassis 1 into and supported for relative rotation on a hub member 6 secured to a predetermined location of the chassis 1 and extends upwardly above an upper face of the chassis 1. A snap ring 7 such as an E-snap ring is snapped into an annular groove 2a formed around an outer periphery of the capstan shaft 2 and is located for engagement with an upper end face of the hub member 6 to prevent the capstan shaft 2 from being inadvertently pulled downwardly off the hub member 6.

Referring back to FIGS. 1 to 3, the motor 4 is electrically connected to a suitable power source not shown via the switch 5. Turning power of the motor 4 is transmitted to the capstan shaft 2 by way of a power transmitting mechanism 8.

The power transmitting mechanism 8 includes a first pulley 8a securely mounted on an output power shaft 4a of the motor 4, a second pulley 8b of a greater diameter securely mounted at a lower end of the capstan

shaft 2, and an endless belt 8c made of a rubber material or the like and extending between and around the first and second pulleys 8a, 8b.

Referring to FIGS. 2, 4 and 9, a head mounting plate 9 is mounted for movement within a predetermined range on the lower face of the chassis 1. The head mounting plate 9 has a main plate portion 9a having a substantially triangular or trapezoidal shape in plan with a wide side located at one longitudinal end and a narrow side located at the other longitudinal end thereof, a side wall 9b extending perpendicularly upwardly from the wide side of the main plate portion 9a, and a bent engaging lug 9c extending perpendicularly upwardly from a corner of the narrow side of the main plate portion 9a and having an arcuate shape in plan.

A reproducing magnetic head 10 and a pinch roller 11 are mounted on an upper face adjacent the wide side of the head mounting plate 9.

The magnetic head 10 is designed such that a front face thereof is contacted with a tape not shown within a tape cassette 12 (FIG. 5).

The pinch roller 11 is mounted for contact with the capstan shaft 2 with the tape of the tape cassette 12 interposed therebetween.

An elongated engaging hole 13 of a substantially

T-shape in plan is perforated at a location adjacent the narrow end side of the main plate portion 9a of the head mounting plate 9, and a spring plate 14 of a substantially flattened V-shape in side elevation is located at a location near the wide end side of the main plate portion 9a. The spring plate 14 is secured at a base end portion 14a thereof to the main plate portion 9a by means of a screw 15 and extends in an upwardly gently inclined relationship toward the other free end portion 14b thereof. A vertically upwardly bent arresting lug 14c is formed on a side edge of the end portion 14b of the spring plate 14. Referring to FIG. 5, a pair of engaging holes or slits 16, 17 are formed at locations adjacent opposite ends of the side wall 9b of the head mounting plate 9.

The head mounting plate 9 is mounted on the lower face of the chassis 1 in following steps. In particular, referring first to FIGS. 2, 4, 5 and 9, the head mounting plate 9 is moved upwardly toward the chassis 1 from below such that a widened portion 18a at an end of a substantially T-shaped engaging projection 18 formed as a vertically downwardly bent lug on the chassis 1 may be fitted into a widened portion 13a at an end of the engaging hole 13 of the main plate portion 9a of the head mounting plate 9. After then, the head

mounting plate 9 is moved in a leftward direction as indicated by an arrow mark in FIG. 5 toward its operative mode or moved position such that a pair of guide tabs 19, 20 formed on the chassis 1 may be fitted into the engaging holes 16, 17 of the side wall 9b of the head mounting plate 9, respectively, until a narrower portion 18b of the engaging projection 18 of the chassis 1 is engaged with a narrower portion 13b of the engaging hole 13 of the chassis 1 and the end portion 14b and the arresting lug 14c of the spring plate 14 are engaged, due to the elasticity thereof, into an engaging hole 21 of a substantially L-shape in plan perforated in the chassis 1 as shown in FIGS. 5 and 6. In the condition shown in FIGS. 5 and 6, the end portion 14b of the spring plate 14 is positioned in register with a shoulder 21c at a boundary between a widened portion 21a and a narrower portion 21b of the engaging hole 21 of the chassis 1 so that movement of the head mounting plate 9 in the leftward direction in FIG. 5 toward its operative mode position will be prevented by engagement between the shoulder 21c of the chassis 1 and the end portion 14b of the spring plate 14 on the head mounting plate 9. In FIG. 5, the head mounting plate 9 is shown at its rest position or home position in which the arresting lug 14c of the spring

plate 14 is engaged with an end edge 21d of the engaging hole 21 of the chassis 1 to prevent the head mounting plate 9 from being pulled off in the rightward direction in FIG. 14.

5 Such locking of the head mounting plate 9 against movement toward the operative mode position by the end portion 14b of the spring plate 14 is canceled when a cassette holder 22 is set to a reproduction mode position.

10 Referring to FIGS. 1 to 3, 5 and 7, the cassette holder 22 has a pair of side walls 22b, 22c extending vertically upwardly from opposite side edges of a bottom wall 22a thereof. The side walls 22b, 22c are mounted at one end portions thereof for pivotal motion within a
15 predetermined angular range around a horizontal axis on inner faces of one end portions of a pair of opposite side walls 1a, 1b of the chassis 1. The cassette holder 22 is supported for pivotal motion between an ejecting or reset position in which it is inclined obliquely
20 upwardly and spaced at its free end thereof away from the chassis 1 and another reproduction mode or set position in which it lies on the chassis 1. Thus, when the cassette holder 22 is pivoted downwardly, a bent pressing projection 23 (FIGS. 5 and 7) which extends
25 vertically downwardly from the cassette holder 22 is

fitted into the engaging hole 21 of the chassis 1 and presses the end portion 14b of the spring plate 14 downwardly against the spring force of the spring plate 14 until the end portion 14b of the spring plate 14 is brought out of register with the boundary shoulder 21c of the engaging hole 21 of the chassis 1 and positioned between the chassis 1 and the head mounting plate 9. In this condition, the head mounting plate 9 is allowed to move from the rest position shown in FIG. 5 to the operative mode position shown in FIG. 7, and the end portion 14b of the spring plate 14 is positioned between the chassis 1 and the head mounting plate 9. In the position of the end portion 14b of the spring plate 14, the head mounting plate 9 is biased in a direction away from the chassis 1 by the spring force of the spring plate 14, thereby eliminating a possible play of the head mounting plate 9. It is to be noted that the spring plate 14 has an upwardly swollen semi-spherical sliding contact face 14d formed at a substantially central location of an upper face of the end portion 14b of the spring plate 14 for sliding contact with the lower face of the chassis 1.

The head mounting plate 9 is mounted onto the chassis 1 in such a manner as described above. Since the spring plate 14 is located on the head mounting

plate 9 and the engaging hole 21 for engagement by the end portion 14b of the spring plate 14 is formed in the chassis 1 in this manner, a play of the head mounting plate 9 is eliminated and the timing at which movement
5 of the head mounting plate 9 toward the operation mode position is started can be synchronized assuredly with a loading operation of a cassette. Besides, the head mounting plate 9 can be mounted readily on the chassis 1 by a simple operation, and after such mounting of the
10 head mounting plate 9, the head mounting plate 9 can be prevented from being pulled off the chassis 1.

The head mounting plate 9 is normally biased toward its operation mode position, that is, in the leftward direction in FIG. 2 by a coil spring 24. The
15 coil spring 24 is secured at an end thereof to the main plate portion 9a of the head mounting plate 9 and at the other end thereof to the chassis 1.

Thus, the pinch roller 11 is pressed against the capstan shaft 2 by the biasing force of the coil spring
20 24 thereby to define a reproduction mode position of the magnetic head 10.

The head mounting plate 9 is pushed to move in the rightward direction in FIG. 2 toward its rest position against the biasing force of the coil spring 24
25 as a stopping operating member 25 which is used also for

ejecting operation is moved from its operation mode position to its rest position,

Referring to FIGS. 1 and 2, the stopping operating member 25 has a main body portion 25a, a side wall portion 25b extending vertically upwardly from a side edge of the main body portion 25a, and a front wall portion 25c extending perpendicularly outwardly from a forward end of the side wall portion 25b. The stopping operating member 25 is mounted for movement within a predetermined range with the main body portion 25a thereof located on the lower face of the chassis 1 and with the side wall portion 27b thereof located on an outer face of the side wall 1a of the chassis 1. The main body portion 25a of the stopping operating member 25 has a guide face 25d in the form of an inclined curved face formed on the other edge thereof for sliding contact with the bent engaging lug 9c of the head mounting plate 9. Thus, if the stopping operating member 25 is manually pushed to move from its operation mode position to its first actuated position or fast feeding mode position, the head mounting plate 9 is moved, through sliding engagement between the guide face 25d of the stopping operating member 25 and the bent engaging lug 9c of the head mounting plate 9, from its reproduction mode position against the biasing force of

the coil spring 24 to its fast feeding mode position in which the pinch roller 11 is spaced by a little distance from the capstan shaft 2. If the stopping operating member 25 is further pushed to move from the first
5 actuated position to a second actuated position or ejection/rest position, the head mounting plate 9 is further moved, through sliding contact between the guide face 25d and the bent engaging lug 9c, against the biasing force of the coil spring 24 to a rest position
10 or ejecting position in which the pinch roller 24 is spaced by a maximum distance from the capstan shaft 2. The stopping operating member 25 is normally biased toward the reproduction mode position in an upward direction in FIG. 2 by a coil spring 26. The coil
15 spring 26 is secured at one end thereof to the lower face of the chassis 1 and at the other end thereof to a lower face of the main body portion 25a of the stopping operating member 25.

After the stopping operating member 25 is moved
20 from the reproduction mode position to the first actuated position, it is thereafter arrested at the first actuated position.

By moving the stopping operating member 25 to its ejecting position, the cassette holder 22 is pivoted
25 from the set position to the reset position. To the

contrary, by putting a tape cassette 12 into the cassette holder 22 and pushing the tape cassette 12 in to a predetermined position, the cassette holder 22 is pivoted from the reset position to the set position.

5 As the cassette holder 22 is pivoted from the reset position to the set position, one of a pair of capstan shaft fitting holes not shown and one of a pair of reel shaft fitting holes not shown either of a tape cassette 12 inserted in the cassette holder 22 are
10 fitted on the capstan shaft 2 and the reel shaft 3, respectively, while the magnetic head 10 and the pinch roller 11 are moved into the tape cassette 12 through openings not shown formed in the tape cassette 12 until they are contacted with a tape not shown within the tape
15 cassette 12.

Then, as the cassette holder 22 is pivoted from the set position to the reset position, the capstan shaft 2 and the reel shaft 3 are removed from the capstan shaft fitting hole and the reel shaft fitting
20 hole of the tape cassette 12, respectively, while the magnetic head 10 and the pinch roller 11 are also removed from within the tape cassette 12 and from the tape.

The cassette holder 22 is operatively connected
25 to the stopping operating member 25. In particular,

when the stopping operating member 25 is moved forwardly from the reproduction mode position to the ejecting position, the cassette holder 22 is pivoted away from the chassis 1 to the reset position. After pivotal
5 motion of the cassette holder 22 to the reset position, the stopping operating member 25 is arrested at its ejecting position against the biasing force of the coil spring 26. To the contrary, when the stopping operating member 25 is moved reversely from the ejecting position
10 to the reproduction mode position, the cassette holder 22 is pivoted toward the chassis 1 to its set position.

Now, operation of the tape recorder according to the present invention having such a construction as described above will be described. In FIGS. 1 to 3, the
15 tape recorder is shown in its rest condition. In this condition, the cassette holder 22 is in its reset position, the stopping operating member 25 is in its rest position, and the head mounting plate 9 is held, due to engagement of the engaging lug 9c thereof with
20 the guide face 25d of the stopping operating member 25, at its rest position in which the pinch roller 11 thereon is spaced farthest away from the capstan shaft 2 as shown in two dot chain lines in FIG. 9 against the biasing force of the coil spring 24 and the switch 5 is
25 held at an off or motor deenergizing position. In this

condition, the end portion 14b of the spring plate 14 engages with the boundary shoulder 21c of the engaging hole 21 of the chassis 1 as seen in FIG. 5 to prevent the head mounting plate 9 from moving toward the operative mode position. On the other hand, since the arresting lug 14c of the spring plate 14 is engaged with the side edge of the engaging hole 21, the head mounting plate 9 is held from being pulled off farther than the rest position.

10 In this condition, if a tape cassette 12 is inserted into the cassette holder 22 and pushed in strongly, the cassette holder 22 is pivoted to the set position in which the capstan shaft 2 and the reel shaft 3 are fitted in corresponding ones of the capstan shaft fitting holes and the reel shaft fitting holes of the
15 tape cassette 12, respectively.

 As the cassette holder 22 is pivoted to the set position, the pressing projection 23 on the lower face thereof is passed through the engaging hole 21 of the
20 chassis 1 and pushes down the front end portion 14b of the spring plate 14 against the spring force of the spring plate 14 to yieldably bend the spring plate 14 until the end portion 14b of the spring plate 14 is positioned between the chassis 1 and the head mounting
25 plate 9 and is no more engaged with the boundary

shoulder 21c of the engaging hole 21 as seen in FIGS. 7 and 8. Meanwhile, as the cassette holder 22 is pivoted to the set position, the stopping operating member 25 is released from the arrested condition at the rest position so that it is allowed to be moved to the operative mode position by the biasing force of the coil spring 26. Upon such movement of the stopping operating member 25, the switch 5 is turned on to allow energization of the motor. Consequently, the motor 4 is rotated in the clockwise direction in FIG. 2.

Further, as the stopping operating member 25 is moved to its operative mode position, the head mounting plate 9 is released from its arrested condition at the rest position by the stopping operating member 25 so that it is moved in the leftward direction in FIG. 2 by the biasing force of the coil spring 24 to its operative mode position, that is, its reproduction mode position in which the magnetic head 10 contacts with a tape within the tape cassette 12 and the pinch roller 11 is pressed against the capstan shaft 2 via the tape. Since the turning power of the motor 4 is transmitted to the capstan shaft 2 via the power transmitting mechanism 8, the capstan shaft 2 is rotated in the clockwise direction in FIG. 2. The turning power of the motor 4 is also transmitted to rotate the reel shaft 3 in the

clockwise direction in FIG. 2. Accordingly, the tape of the tape cassette 12 is fed from one of a pair of reels not shown in the tape cassette 12 which is not fitted on the reel shaft 3 to the other shaft fitted on the reel shaft 3 in order to effect operation for the reproduction mode.

Operation of the reproduction mode is effected in this manner. Then, if the tape is completely wound up from the one to the other reel within the tape cassette 12, rotation of the reel shaft 3 is stopped. As a result of stopping of rotation of the reel shaft 3, transmission of the power between the reel shaft 3 and the motor 4 is interrupted and the switch 5 is turned off. Consequently, energization of the motor 4 is stopped to stop rotation of the capstan shaft 2.

In this condition, if the stopping operating member 25 is pushed in in the downward direction in FIG. 2 to its rest position against the biasing force of the coil spring 26 in order to remove the tape cassette 12 from the cassette holder 22, the engaging lug 9c of the head mounting plate 9 is pressed by the guide face 25d of the stopping operating member 25 so that the head mounting plate 9 is moved from a position shown in solid lines in FIG. 9 to another position shown in two dot chain lines in FIG. 9 against the biasing force of the

coil spring 24 until the pinch roller 11 comes to its rest position in which it is spaced farthest away from the capstan shaft 2 and the pinch roller 11 and the magnetic head 10 are spaced away from the tape of the

5 tape cassette 12. Meanwhile, as the stopping operating member 25 is moved to its rest position, it is thereafter arrested at the rest position in which the switch 5 assumes its motor deenergizing position while the cassette holder 22 is pivoted to the reset position.

10 Upon such pivotal motion of the cassette holder 22, the tape cassette 12 is pushed outwardly of the cassette holder 22 and the cassette holder 22 is thereafter arrested at its reset position.



CLAIMS:

1. A tape recorder, comprising a chassis having an engaging hole formed therein, a head mounting plate mounted for reciprocal movement between a home position
5 and a moved position on said chassis and spring-biased from the moved position toward the home position, a spring plate secured at one end portion thereof to said head mounting plate and extending at the other end portion thereof obliquely toward the chassis for
10 contacting with said chassis to bias said head mounting plate away from said chassis, said spring plate being engageable, when said head mounting plate is in the home position, at the other end thereof with an edge of said engaging hole of said chassis to arrest said head
15 mounting plate at the home position, and a cassette holder mounted on said chassis for movement between a rest position and a reproduction mode position, the arrested condition of said head mounting plate by said spring plate being canceled by said cassette holder when
20 said cassette holder is moved from the rest position to the reproduction mode position, said spring plate having thereon an arresting element which can extend into and engage with another edge of said engaging hole of said chassis to define a limit position of the movement of



said head mounting plate away from the moved position.

2. A tape recorder as set forth in claim 1, wherein said arresting element is a bent lug formed on a side edge of the other end portion of said spring plate.

5 3. A tape recorder as set forth in claim 1 or 2, wherein said spring plate has a swollen semi-spherical sliding contact face formed at the other end portion thereof for sliding contact with a face of said chassis.

10 4. A tape recorder as set forth in any one of the preceding claims, wherein said engaging hole of said chassis has a widened portion and a narrower portion which define at a boundary therebetween a shoulder which provides the edge with which the end of said spring plate is to engage.

15 5. A tape recorder as set forth in claim 4, wherein the edge of said engaging hole with which said arresting element is to engage opposes to the edge provided by said shoulder.

20 6. A tape recorder as claimed in claim 1 and substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.
