

A. TAPE RECORDER

This invention relates to a tape recorder.

In a conventional cassette tape recorder, for example, a main chassis and various component parts are made of metal. It is however, difficult to form
5 a main chassis and various component parts of complicated structure as one unit. Therefore, a number of component parts are mounted in combinations, but a number of mounting members are necessary for their mounting and, moreover, the manufacturing process
10 becomes cumbersome. For example, in order to positively mount the component part, it is necessary to use a snap ring. For this reason, a snap ring remover is particularly necessary to attach and detach the snap ring. Thus, a tape recorder so manufactured
15 becomes larger in size, heavier in weight and higher in price, posing problems.

In order to make a cassette tape recorder compact in size and lower in price, attempts have recently been made to mold a chassis and various component parts
20 mounted on the chassis using plastics in place of metal. If the chassis and component parts are molded from plastics, a tape recorder can be made compact in size, lighter in weight, and lower in price. It is also easier to form a chassis and various component parts.

Moreover, there are advantages of absorbing an impact sound and vibration sound as produced when the movable members of a tape recorder mechanism are operated.

~~Whether or not the tape recorder includes components of~~
5 ~~plastics materials, it is an object of the invention to~~
~~simplify the mounting of components~~

According to the invention there is provided a tape recorder as set out in claim 1 of the claims of this specification.

10 An example of the invention will now be described with reference to the accompanying drawings in which:

~~capstan, a first engaging member attached to the pinch lever and capable of contacting the head chassis; urging means for urging the pinch lever, so that the first engaging member abuts on the head chassis,~~
5 whereby said pinch roller moves from a first position off the capstan to a second position, to abut on the capstan as the head chassis moves from the operating position to the non-operating position; and a second engaging member attached to the head chassis, being
10 engageable with the first engaging member and located downstream of the first engaging member in the direction in which the pinch lever is removed from the main chassis, to thereby prevent the pinch lever from being removed from the main chassis.

15 This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:-

Fig. 1 is a plan view showing a cassette tape recorder to which a movable member mounting mechanism
20 according to this invention is applied;

Fig. 2 is a plan view showing the cassette tape recorder of Fig. 1 with a main chassis detached from the tape recorder;

Figs. 3a and 3b are a plan view and front view,
25 respectively, showing one embodiment of a movable member _____

mounting mechanism according to one embodiment of this invention;

Figs. 4 and 5 are a plan view and a partly-omitted plan view, respectively, for explaining an operation of the embodiment of Fig. 3a; and

Figs. 6 and 7 are a side view and plan view, respectively, showing an interlocking relation between a reproduce operation member and a spring.

A mechanism for mounting first and second movable members of a tape recorder of this invention as applied to a cassette tape recorder will now be explained below by referring to the accompanying drawings.

Fig. 1 shows a basic construction of the tape recorder according to the embodiment of the invention, which will hereinafter be explained in detail. Numeral 11 denotes a main chassis of the cassette tape recorder which is formed of synthetic resin material. On the forward side (downwards of the illustration) of the main chassis 11 is provided an operating-member assembly 12 which consists of a plurality of operating members 13, 15, 16, 17, 18, and 19 for bringing the cassette tape recorder into a specified mode of operation or inoperation. The assembly 12 is so arranged as to be slidable in a direction indicated by arrows in Fig. 1. The operating member 13 is a stop/eject member for stopping the recorder operation or also for ejecting operation. By operating that stop/eject

member 13 the specified operational mode of the cassette tape recorder is stopped or an ejecting mechanism 14 is operated which serves to take out a tape cassette not shown as set. Further, the operating member 15 is a recording member which sets the tape recorder in prerecording mode. When this member is actuated, the reproducing member 16 is concurrently operated in interlocking relation with the recording member 15 by means of a substantially L-shaped projecting piece 151 (see Fig. 2) provided on one side of the member 15. Further, 17 and 18 are a rewinding member and a fast forwarding member, respectively. 19 is a pause operating member for temporarily stopping the operational mode for recording or reproduction.

On the upper surface of the said main chassis 11 is provided a metallic head chassis 20 (first movable member) which is a movable member. The head chassis 20 is formed with notches 53 and 54 to be fitted under those engaging projections 51 and 52 (guide members) as later described which are integrally provided for the main chassis 11. The head chassis 20 is so arranged as to be made slidable, in interlocking relation with the operation of the reproducing member 16, in the same direction as that in which the reproducing member 16 operates. On a specified portion of the head chassis 20 includes an attaching member 21 which is formed of synthetic resin material. On this member 21 are

provided a recording and reproducing head 22, eraser head 23, tape-stop detecting lever 24 and a spring 25. The spring 25 serves to bring the head chassis 20 into interlocking relation with the reproducing member 16, which relation will be described later. Further, on the attaching member 21 are formed an elastic bifurcate holding section 211 ~~erected on the flat surface of the head chassis 20~~ and another similar section 212 in the neighborhood thereof. Each of such sections 211 and 212 is for the purpose of collectively sandwiching the connecting leads 26, 27 which are connected to the recording and reproducing head.

At the left side end of the attaching member 21 is formed an elastic thin piece 213. The main chassis 11 is integrally formed with an engaging piece 111 which is so arranged as to be engageable with the elastic thin piece 213.

The recording and reproducing head 22 is connected to a recording and reproducing circuit not shown through leads 26 and 27 indicated by one-dot chain line in the Figure.

On the right side of the illustrated head chassis 20 is provided a pinch lever 29 made of synthetic resin material which, with the sliding movement of the head chassis 20, is rotatable or swingable in two opposite directions A, B about a ~~hollow cylindrical~~ shaft 28 which is received in a hole in the lever 29. At one end of the

pinch lever 29 is provided a pinch roller 31 which is pressed against a capstan 30 when the pinch lever 29 is rotated in a direction indicated by an arrow A, which capstan 30 is provided coaxially with a flywheel as later described.

On the rearward side (the upper side of the illustration) of the main chassis 11 is provided an error-erasure preventing mechanism 32 made of synthetic resin material which detects the presence or absence of an error-erasure preventing pawl provided on the said tape cassette, thereby to render the recording member 15 operative or inoperative.

Numerals 33 and 34 designate guide pins, respectively. Numerals 35 and 36 denote left and right reel rest, respectively, and numeral 37 shows a motor.

Fig. 2 schematically shows the construction of various mechanisms provided beneath the chassis 11 of the cassette tape recorder shown in Fig. 1. The above-mentioned recording, reproducing, rewinding and fast forwarding members 15 to 18 are arranged to be locked at their respective operating positions by a locking plate 38 which is provided in such a manner that it intersects the members 15 to 18 substantially at right angles thereto and so that it can slide in opposite directions C and D by being engaged with the members 15 to 18. Further, a switch slider 39 is provided substantially in parallel with the locking plate 38 so that it can slide in opposite directions E and F by

being engaged with the said members 15 to 18. When moved in the direction E, that switch slider 39 acts to turn on a power supply switch 40 of the motor 37.

Further, each of the reproducing and rewinding members 16 and 17 is given a biasing force to urge it downwards of the illustration by a coil-like spring 41 bent in the form of substantial V-shape. The recording member 15 is rendered inoperative by the rearward end portion of an erroneous-recording preventing mechanism 42 made of synthetic resin material when the remaining member 16, 17, and 18 are under operation in advance of the operation of the member 15. Further, the tape-travel stop detecting lever 24 is arranged to drive an automatic operation stop mechanism 43, made of synthetic resin material and provided at the right and lower side of the illustrated chassis 11 in Fig. 2.

Numeral 44 denotes a flywheel which is connected to the motor 37 through a rotating pulley 45 and belt 46 so as to permit a rotating force from the motor 37 to be transmitted to the flywheel 44.

Fig. 3a and Fig. 3b each shows the above-mentioned head chassis 20 in detail. The head chassis 20 made of metallic material is formed into a substantial L-shape. The rearward end portion 201 and the forward end angular portion 202 of the head chassis 20 are formed with notches 53 and 54 serving as substantially rectangular

engaging portions, respectively. The notches 53 and 54 are fitted under those engaging projections 51 and 52 integrally formed on the main chassis 11, respectively, which serve as guiding portions each of a substantial T-shape as taken when viewing the tape recorder from in front thereof. The head chassis 20 is thus slidable in opposite directions G and H. In the deepest portion of the notch 54 is formed an enlarged notched portion 541 which has a size permitting a top portion 521 of the said engaging projection 52 to be inserted thereinto. The head chassis 20 is thus attached to the main chassis 11 by taking the procedure of inserting the top portion 521 of the engaging projection 52 thereof into the said enlarged notched portion 541 formed in the notch 54 of the head chassis 20.

Further, the head chassis 20 is covered with the attaching member 21 at a specified portion of its lower end portion illustrated in Fig. 3a. A protruded portion 55 is formed on that portion of the attaching member 21 which covers the angular portion 203 of the side end portion of the head chassis 20. On the tip end portion of the protruded portion 55 is formed a bent engaging-stopper piece 551 (first position restricting member) which serves as a position regulating member.

The pinch lever 29 provided with the said pinch roller 31 is formed in the shape of a substantial L seen in Fig. 3a. The pinch lever 29 is rendered

rotatable in the arrow indicated directions A and B about the pivotal shaft 28 integrally formed on the chassis 11, by being fitted over the pivotal shaft 28. The pinch lever 29 is formed with an engaging-stopper section 291 at its one
5 end portion, said section 291 having a spring 58 engaged therewith. The spring 58 is engaged with and stopped by the section 291 at one end of the spring 58 and, after wound around a cylindrical protrusion 56 formed on the
attaching member 21, is engaged with and stopped by a bent
10 engaging-stopper section 57 similarly formed on the attaching member 21. The cylindrical protrusion 56 and the bent engaging-stopper section 57 are both vertical members, spaced apart by a predetermined distance.

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10 engaged with and stopped by a bent engaging-stopper
~~section 57 similarly formed on the attaching member 21.~~
By the spring 58 the pinch lever 29 is given a biasing
force to cause the same 29 to rotate about the pivotal
shaft 28 in the arrow A indicated direction. One end
15 of the pinch lever 29 is formed with an engaging piece
292 (second position restricting member) extended
toward the head chassis 20. This piece serves as a
member for regulating the position of the pinch lever
29. The protruded portion 55 of the attaching member
20 21, as above mentioned, is formed with a bent engaging-
stopper piece 551 against which said engaging piece 292
abuts. The bent engaging-stopper piece 551 projects
upwards to a specified length from the protruded portion
55 and is so constructed as to be bent in the arrow H
25 indicated direction. Accordingly, the forward rotation
of the pinch lever 29 is limited to a position at which
the piece 292 abuts on said bent engaging-stopper piece

551. Therefore, when the reproducing member 16 shown in Fig. 1 is not operated, that is to say, when the head chassis 20 is situated at a position illustrated in Fig. 3a, the pinch roller 31 is kept disengaged from the capstan 30.

Further, the bent engaging-stopper piece 551 does not only act to regulate the rotation of the pinch lever 29 but also to restrict movement of the pinch lever 29 in a direction indicated by an arrow I (see Fig. 3b). Namely, when a force is so given as to disconnect the pinch lever 29 from the rotating shaft 28 from above, the engaging piece 292 of the pinch lever 29 engages the bent engaging-stopper piece 551 thereby to prevent such disconnection. ~~Further, in the normal state of operation, the height of the pinch lever 29 i.e., the height of the pinch roller 31 is defined by the bent engaging-stopper piece 551.~~

Hereinafter, we explain the procedure of attaching the head chassis 20 and pinch lever 29 to the main chassis 11 as stated above. Firstly, the head chassis 20 is moved in the arrow G indicated direction while it is kept attached to the main chassis 11 by the said engaging projections 51 and 52 as mentioned above. In this state, the pinch lever 29 is brought to a position at which it is fully rotated in the arrow B indicated direction and its angular portion is fitted over the pivotal shaft 28. Then, without having the _____

engaging piece 292 of the pinch lever 29 engaged with the bent engaging-stopper piece 551 of the attaching member 21, the pinch lever 29 is fully fitted over the rotating shaft 28. At this time, however, a
5 cylindrical projection 59 is attached to the other end of the pinch lever 29 in a manner that it extends into the upper surface of the main chassis 11. The projection 59 is inserted through an opening 60 formed in the main chassis 11.

10 When the reproducing member 16 is actuated, the head chassis 20 is also moved in the arrow G indicated direction and in interlocking relation with such actuation. Thus, the head chassis 20 is brought to a position illustrated in Fig. 4. At this time, with
15 this movement of the head chassis 20, the pinch lever 29 is also rotated in the arrow A indicated direction by the action of the biasing force of the spring 58. Thus, the pinch roller 31 is pressed against the capstan 30, whereby the head chassis 20 and the pinch
20 roller 31 are brought to the positions which correspond to the operational condition intended by the actuation of the reproducing member 16. It is also to be noted here that the rearward movement of the head chassis 20 in the arrow G indicated direction is limited to a
25 position at which the engaging piece 204 formed on one side portion of the head chassis 20 abuts against the guide pin 34.

Assume now that the pinch lever 29 has been rotated in the arrow B indicated direction as shown in Fig. 5 for the purpose of drawing the pinch lever 29 out of the pivotal shaft 28 with the reproducing member 16 kept inoperative. Then, however, such forward rotation of the pinch lever 29 is limited to a position at which the projection 59 thereof abuts against one side of the opening 60 formed in the main chassis 11. Since, therefore, at that position, the engaging piece 292 of the pinch lever 29 is still kept engageable with the bent engaging stopper piece 551 of the attaching member 21, the pinch lever 29 still remains incapable of being drawn out of the pivotal shaft 28.

We will now explain the interlocking relationship of the reproducing member 16 with the head chassis 20. As shown in Fig. 6, the head chassis 20 is provided with a pin 205 projecting downwards. The main chassis 11 and the reproducing member 16 are formed with openings 112 and 161, respectively, through which said pin 205 is inserted. The opening 112 of the main chassis 11 is set to a size which does not prevent the sliding movement of the head chassis 20. On the attaching member 21 provided on the head chassis 20 are formed a projection 62 being wound with the spring 25 and an engaging stopper portion 61 which one end portion 252 of the spring 25 is engaged with and stopped by. In the reproducing member 16 is formed an engaging stopper

notched portion 63 which the other end portion 251 of the spring 25 is engaged with and stopped by. Thus, as shown, the spring 25 is wound around the projection 62 and is supported by the attaching member 21 by having its said one end 252 engaged with the engaging stopper portion 61. Said other end 251 of the spring 25 is engaged with the engaging stopper portion 63 of the reproducing member 16 while it is being given a biasing force acting in the arrow M indicated direction. By this biasing force imparted to said other end 251 of the spring 25, the pin 205 is biased in the arrow K indicated direction and thus is pressed against the end face of the opening 161 as shown in Fig. 7. Thus, the head chassis 20 and the reproducing member 16 provided, respectively, on the upside and downside of the main chassis 11 are integrally connected and thus are brought into a mutually interlocked relation. Note here that Fig. 7 shows the state in which said other end portion 251 of the spring 25 is kept engaged with and stopped by the engaging stopper portion 63 of the reproducing member 16 and in which the pin 205 is also kept engaged with the end face of the opening 161.

When the reproducing member 16 kept in such state is actuated in the arrow K indicated direction, the head chassis 20 engaged with the member 16 is also moved in the same direction. When the reproducing member 16 is locked by the locking plate 38 at its

operating position, the head chassis 20 is also stopped at the corresponding position. Note here that since in this state the forward movement of the head chassis 20 is limited by the guide pin 34, the pin 205 is kept at a position slightly spaced from the end face of the opening 161. At this time, when, as shown in Fig. 2, the locked state of the reproducing member 16 is unlocked by actuating, for example, the stop/eject member 13, the reproducing member 16 is returned by the biasing force of the spring 41 to the original position and at the same time the head chassis 20 is also returned to the original position. The position of the head chassis 20 at this time is the position illustrated in Fig. 3a. Namely, this position is a one at which the notches 53 and 54 of the head chassis 20 are not disengaged from the engaging projections 51 and 52 of the main chassis 11, respectively.

The head chassis 20 is mounted as one unit on the chassis 11 by fitting the notches 53, 54 of the head chassis over the projections 51, 52 of the main chassis 11. The pinch lever 29 is mounted on the chassis 11 by engaging the engaging piece 292 with the bent engaging-stopper piece 551. The head chassis 20 and pinch lever 29 are interlockingly moved by the spring 58 in response to the operation of the reproducing member 16 to a corresponding operative position.

As a result, the movable member mounting mechanism

can be easily manufactured with a lesser number of component parts and without requiring any extra mounting parts. The recording and reproducing head 22 is disposed on the attaching member 21 and the height of the pinch roller 31 is determined by the bent engaging-stopping piece 551 of the attaching member 21. Since the height of the recording and reproducing head 22 and pinch roller 31 is determined by the same attaching member 21, high accuracy and better performance are assured without being influenced by a cumulative dimensional error.

~~This invention is not restricted by the above mentioned embodiment. This invention can be applied not only to the mounting of, for example, the head chassis and pinch lever, but also to the mounting of a manipulation lever, operation lever and drive lever with respect to idlers for fast forwarding, rewinding, etc.~~

As set out above, according to this invention movable members to be mounted can be mounted on the chassis of the tape recorder without using extra mounting members etc. Therefore, the tape recorder of this invention is simple in construction, easy to manufacture, requires a lesser number of parts, and is relatively compact, light-weight and low-cost unit.



CLAIMS:

1. A tape recorder which comprises:
 - a main chassis;
 - a head chassis with a magnetic head mounted on it, said head chassis being mounted on the main chassis and
5 movable between a non-operating position and an operating position;
 - a pinch lever mounted on the main chassis, being removable in the operating position from the main chassis in a direction perpendicular to the main chassis and
10 being rotatable about a predetermined axis;
 - a pinch roller rotatably mounted on the pinch lever and capable of contacting a capstan;
 - a first engaging member on the pinch lever and capable of contacting the head chassis;
 - 15 a spring connected between the head chassis and the pinch lever to urge the first engaging member against the head chassis, whereby said pinch roller moves from a first position off the capstan to a second position, to abut on the capstan as the head chassis moves to the operating position
20 from the non-operating position; and
 - a second engaging member on the head chassis, being engageable with the first engaging member and located downstream of the first engaging member in said direction, so as to prohibit removal of the pinch lever in
25 said non-operating position of the head chassis, the pinch lever being rotatable about the predetermined axis against the action of the spring to withdraw the first engaging member from its position upstream of the second engaging member so that the pinch lever can then be removed from the main chassis in said
30 direction, in said operating position of the head chassis.



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2. A tape recorder according to claim 1, wherein
said main chassis has a shaft at a position
close to the head chassis, and said pinch lever has
a hole to receive the shaft and may rotate
5 with the shaft inserted in the hole.

10 3. A tape recorder according to claim 1, wherein
said spring is a torsion coil spring consisting of a
coiled portion, a first straight end portion pro-
truding from one end of the coiled portion and a
second straight end portion protruding from the other
15 end of the coiled portion.

4. A tape recorder according to claim 3, wherein
said head chassis has a first vertical member and a
second vertical member spaced apart from the first
vertical member by a predetermined distance, and the
20 coiled portion of said torsion coil spring is wound
around the first vertical member, with one end abutting
on the pinch lever and the other end abutting on the
second vertical member.

5. A tape recorder according to any one of the
25 preceding claims, wherein said main chassis has a
through hole close to the pinch lever, said pinch lever

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has a pin inserted in the through hole, and said through hole is of such a size as to allow the pinch roller to rotate between the first and second positions and prevent the first engaging member from
5 rotating so as to disengage from the second engaging member while said head chassis stays in the non-operating position.

6. A tape recorder, substantially as hereinbefore described with reference to the accompanying drawings.
