

MODE SWITCHING TURN-OVER MECHANISM
FOR A TAPE RECORDER

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to a mode switching turn-over mechanism for a tape recorder wherein, each time
5 an operating member is operated to make a reciprocal motion, a turn-over member is turned over to alternately switch the operation mode between a pair of different operation modes, and more particularly to a mode switching mechanism of the type mentioned which is
10 improved to reduce the stroke of movement of and the operating force for the operating member.

2) Description of the Prior Art

A mode switching mechanism of the type mentioned is already known. An exemplary one of conventional mode
15 switching mechanisms is shown in FIGS. 9 to 11.

Referring first to FIG. 9, there is shown general construction of an automatic reversing device of a tape recorder in which a turning over mechanism is incorporated. A pair of pivotal plates 103a and 103b
20 are mounted for pivotal motion around a pair of capstans 102a and 102b disposed in a symmetrical relationship at left and right locations with respect to a magnetic head

101, respectively. The capstans 102a and 102b are normally driven to rotate in respective tape feeding directions by a motor not shown and are selectively connected to a pair of reel receivers 105a and 105b by way of a pair of transmitting gears 104a and 104b and slip mechanisms not shown, respectively, such that the reel receivers 105a and 105b may be rotated by the capstans 102a and 102b, respectively. The left and right transmitting gears 104a and 104b are supported for rotation on the pivotal plates 103a and 103b, respectively. The pivotal plates 103a and 103b are interconnected by a mode switching member 106 such that they may alternatively assume an operative position in which the transmitting gear 104a or 104b thereon establishes a rotation transmitting route from the capstan 102a or 102b to the reel receiver 105a or 105b (the position of the left pivotal plate 103a in FIG. 9) and another inoperative position (the position of the right pivotal plate 103b in FIG. 9). The mode switching member 106 is mounted for reciprocal movement in leftward and rightward directions in FIG. 9, and when it assumes a leftwardly moved position in FIG. 9, the left pivotal plate 103a assumes the operative position, but on the contrary when it assumes a rightwardly moved position, the right pivotal plate 103b assumes the

operative position. A pair of pinch rollers 107a and 107b are disposed in a left and right symmetrical relationship and associated with each other also by the mode switching member 106 such that they may be
5 alternatively pressed against the corresponding capstans 102a and 102b, respectively. The turning force of that one of the capstans 102a and 102b against which the corresponding pinch roller 107a or 107b is pressed is continuously transmitted to the reel receiver 105a or
10 105b on the same side (the left reel receiver 105a in FIG. 9) so that the reel receiver 105a or 105b is rotated in its tape winding direction to wind a tape not shown thereon.

A pair of annular eccentric cams 108a and 108b in
15 the form of inner peripheral walls and a pair of abutting radial projections 109a and 109b are provided at central locations of the transmitting gears 104a and 104b, respectively. A pair of pivotal cam followers 110a and 110b and a pair of operational error preventing
20 members 111a and 111b are disposed in a left and right symmetrical relationship, and a pair of pressing members 112a and 112b are provided on the left and right reel receivers 105a and 105b for receiving the turning force of the reel receivers 105a and 105b, respectively, each
25 via a contact friction mechanism not shown.

The turning force of that one of the reel receivers 105a and 105b which is rotating in its tape winding direction (the left reel receiver 105a in FIG. 9) is normally transmitted to the pressing member 112a or 112b so that the pressing member 112a or 112b is continuously urged to press against the cam follower 110a or 110b to engage an end projection of the cam follower 110a or 110b with the corresponding eccentric cam 108a or 108b. To the contrary, the other reel receiver 105b or 105a is not rotating in its tape winding direction and consequently the pressing member 112b or 112a thereon does not urge the cam follower 110b or 110a. Instead, the operational error preventing member 111b or 111a is engaged at one end thereof with a shaft portion of the transmitting gear 104b or 104a on the pivotal plate 103b or 103a which is in its inoperative position so that it presses at the other end thereof against a resilient finger 115b or 115a formed on the cam follower 110b or 110a. The cam follower 110b or 110a is thus urged in the clockwise or counterclockwise direction in FIG. 9 by the resiliency of the resilient finger 115b or 115a thereof to contact the end projection of the cam follower 110b or 110a slidably with the eccentric cam 108b or 108a.

It is assumed here that the left reel receiver

105a is rotating in the tape winding direction so that a
tape 113 is fed from the right to the left in FIG. 9 to
effect a reproducing or recording operation as seen in
FIG. 9. Then, if the tape 113 comes to its last end,
5 the reel receiver 105a is compulsorily stopped by the
instantaneously increasing tensile force of the tape.
Consequently, the urging force of the pressing member
112a to press against the cam follower 110a disappears
so that, as the transmitting gear 104a further rotates,
10 the end projection of the cam follower 110a is moved by
the eccentric cam 108a to and thereafter remains at a
position near the center of the transmitting gear 104a.
Then, as the transmitting gear 104a further rotates, the
radial abutting projection 109a thereon is engaged with
15 and pushes the end projection of the cam follower 110a
so that the pivotal plate 103a on which the transmitting
gear 104a is supported is pivoted in the
counterclockwise direction in FIG. 9 to move the
transmitting gear 104a thereon out of the rotation
20 transmitting route, thereby interrupting the rotation
transmitting route from the capstan 102a to the reel
receiver 105a. Upon such pivotal motion of the pivotal
plate 103a, the mode switching member 106 is moved
rightwardly until the right pinch roller 107b is
25 contacted with and stopped by the capstan 102b. Upon

such rightward movement of the mode switching member 106, the right pivotal plate 103b is pivoted in the counterclockwise direction to move the transmitting gear 104b thereon into the rotation transmitting route.

5 Consequently, the right reel receiver 105b is now rotated in its tape winding direction, and the tape 113 is fed from the left to the right in FIG. 9 to continue the reproducing or recording operation.

The automatic reversing mechanism described above
10 can be artificially rendered operative also by means of a switching mechanism 114 before the tape comes to its last end.

Construction of the mode switching mechanism 114 is such as follows.

15 Referring also FIGS. 10 and 11, each time an operating member a mounted for linear reciprocal motion is operated to make a reciprocal motion by manual operation or by means of a driving source not shown, the moving force of the operating member a acts upon one or
20 the other of a pair of inclined faces f of an angular portion e of a pivotal turn-over member d by way of a pressing pin c on a connecting member b which is connected for rocking motion to the operating member a. While the pressing pin c slidably moves on one of the
25 inclined faces f, the connecting member b is rocked in

one or the other direction until the pressing pin c comes to a stopper portion g at the last end of the inclined face f and presses against the stopper portion g to pivotally turn over the turn-over member d. The
5 turn-over member d has an engaging piece n for engaging with the mode switching member 106. Upon turning over movement of the turn-over member d, the mode switching member 106 is moved leftwardly or rightwardly by the engaging piece n of the turn-over member d. As a
10 result, the feeding direction of the tape is reversed.

The operating member a desirably has a minimized distance of movement required for operation thereof whether it is of the manually operable type or of the type wherein it is driven by a driving source such as a
15 solenoid. This is because, if the distance is great, then it is difficult to miniaturize the entire arrangement. Further, it is also desired to allow the operating member a to be operated as lightly as possible in order to attain improvement in operability and
20 miniaturization of the entire arrangement.

Commonly suggested countermeasures to reduce the distance of movement of the operating member a and to reduce the operating force for the operating member a are listed below.

25 (I) To reduce the distance of movement:

(1) The dimension L (refer to FIG. 11) from a summit h to each of the stopper portions g of the angular portion e of the turn-over member d in the direction of reciprocal motion of the operating member a is minimized.

(2) The pivoting angle α of the turn-over member d is minimized.

(II) To reduce the operating force:

(1) The dimension L_1 from a fulcrum i of pivotal motion to each of the stopper portions g of the turn-over member d in a direction perpendicular to the direction of reciprocal motion of the operating member a is maximized.

(2) The pivoting angle α of the turn-over member d is minimized also for reduction of the operating force. This is because, where the pivoting angle α is great, unless the apex angle β of the angular portion e is reduced very sufficiently, the inclination angle of the inclined faces f at the angular portion 3 approaches 90 degrees so that the component of force of the pressing force of the pressing pin c in the direction to pivot the turn-over member d will be too small.

In conventional mechanisms, however, any of the countermeasures described above cannot make a countermeasure to reduce the distance of movement as

well as the operating force of the operating member.

In particular:

In order to reduce the dimension L as in paragraph (I)-(1), it may be suggested either to
5 increase the apex angle β of the angular portion e or to reduce the dimension L_1 . Any of the two countermeasures is not preferable because it will increase the operating force.

In case the pivoting angle of the turn-over
10 member d is decreased as in paragraph (I)-(2), the distance L_2 of movement in a direction perpendicular to the direction of reciprocating movement of the summit h of the angular portion e is decreased. As a result, unless the pressing pin c of the connecting member b is
15 returned to its neutral position with a high degree of accuracy, there is the possibility that such an operational error may take place that, when the operating member a is moved forwardly, the pressing pin c is slidably contacted with the wrong inclined face f
20 so that the turn-over member d is pivoted in the same direction again.

It is, however, very difficult itself to return the pressing pin c to its neutral position with a high degree of accuracy. The reason is given below.

25 After the operating member a is returned to its

home position by the spring force of a return spring j, the connecting member b tends to return to its neutral position due to the spring force of a tension spring k which is provided for holding the connecting member b to its neutral position. If the connecting member b returns properly to its neutral position, then the opposite ends of the tension spring k and a fulcrum m for rocking motion and the pressing pin c of the connecting member b are aligned on a straight line.

Thereupon, however, the spring force of the tension spring k has no drag against the force in the direction to rock the connecting member b. In other words, if only a little resistance (such as, for example, a contact resistance at a pivot axis portion) acts to hinder a motion of the connecting member b when the connecting member b is being rocked toward its neutral position, then the connecting member b cannot be returned correctly to the neutral position, and accordingly the pressing pin c cannot be returned to its neutral position with a high degree of accuracy. Since it is impossible to completely eliminate a contacting resistance at the pivot shaft portion for the connecting member b and so on, it is very difficult, as an actual problem, to return the pressing pin to its neutral position with a high degree of accuracy. Therefore, if

the pivoting angle α of the turn-over member d is reduced, the amount L_2 of movement in a direction perpendicular to the direction of reciprocating movement of the summit h of the angular portion e is also

5 reduced. Accordingly, there is the possibility that the pressing pin c may be slidably contacted with the wrong inclined face f of the angular portion e so that the connecting member b is rocked in the opposite direction. Even if the return spring j is strengthened, this will
10 lead to a further undesirable result because only the contacting resistance at the pivot axis portion is increased progressively.

Where the dimension L_1 is increased as in paragraph (II)-(1), the dimension L is increased
15 correspondingly so that the stroke of movement of the operating member a is increased.

Where the pivoting angle α of the turn-over member d is reduced as in paragraph (II)-(2), there is the possibility that an operational error may take place
20 unless the connecting member b is returned to its neutral position with a high degree of accuracy. Accordingly, so far as the accuracy in returning of the connecting member b to its neutral position cannot be improved, it is difficult to reduce the pivoting angle α
25 of the turn-over member d. On the contrary, where the

pivoting angle α is large, the apex angle β of the angular portion e must be reduced. If the apex angle β is reduced, however, the dimension L from the summit h to each of the stopper portions g of the angular portion e of the turn-over member d in the direction of reciprocal movement of the operating member a is still increased, and the mount of movement of the operating member a is increased.

From such reasons as described above, conventional mechanisms cannot eliminate the possibility of an operational error and cannot satisfy two requirements of reduction in stroke of movement of the operating member a and reduction in operating force.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a mode switching mechanism wherein there is no possibility of an operational error and two requirements of reduction in stroke of movement of an operating member and reduction in operating force for the operating member can be attained.

In order to attain the object, according to the present invention, there is provided a mode switching mechanism wherein, each time an operating member mounted for reciprocal linear movement is operated to make a

reciprocal movement either by manual operation thereof
or by means of a driving source, a pressing portion of a
connecting member connected for rocking motion to said
operating member is first slidably contacted with one or
5 the other of a pair of inclined faces of an angular
portion of a pivotal turn-over member to rock said
connecting member in one or the other direction and is
then contacted with and pushes a stopper portion
provided in a contiguous relationship to the last end of
10 the inclined face to pivotally turn over said turn-over
member to effect switching from one to the other or from
the other to the one of two operation modes,
characterized in that an elongated slot is formed in one
of said operating member and said connecting member
15 while a pivot shaft is provided on the other of said
operating member and said connecting member and is
fitted in said elongated slot, that said elongated slot
is elongated in the direction of reciprocal movement of
said operating member so as to allow said connecting
20 member to move in the same direction as that of
reciprocal movement of said operating member relative to
said operating member while said pivotal shaft serves as
the center of rocking motion of said connecting member,
that a positioning projection is provided on one of said
25 operating member and said connecting member while a

positioning recess is provided on the other of said
operating member and said connecting member for
engaging, when said connecting member is moved in the
one direction relative to said operating member, with
5 said positioning projection to prevent rocking motion of
said connecting member relative to said operating
member, that said operating member and said connecting
member are interconnected by a spring such that said
positioning projection and said positioning recess may
10 be held in normal engagement with each other under the
biasing force of said spring, and that when said
operating member is moved forwardly until said pressing
portion thereof is contacted with the one or the other
inclined face of said angular portion, said connecting
15 member is moved toward said operating member against the
spring force of said spring so that engagement between
said positioning projection and said positioning recess
is canceled.

Preferably, the positioning recess has a pair of
20 mutually intersecting left and right symmetrical
inclined faces such that said positioning projection may
be engaged with said inclined faces near an intersecting
portion of said inclined faces to inhibit rocking motion
of said connecting member relative to said operating
25 member.

The inclined faces of said angular portion of said pivotal turn-over member are preferably inclined at portions thereof including a summit therebetween such that said angular portion may have an increased apex angle.

5 With the mode switching mechanism of the present invention, when the operating member is moved forwardly, the pressing portion thereof is contacted with one of the inclined faces of the turn-over member. Thereupon, 10 since rocking motion of the connecting member is inhibited due to engagement of the positioning recess and the positioning projection, the connecting member cannot move forwardly following the operating member. After forward movement only of the operating member by a 15 little distance, the engagement between the positioning recess and the positioning projection is canceled. Consequently, the pressing portion is thereafter slidably contacted with the inclined face to rock the connecting member until it finally pushes the stopping 20 portion contiguous to the inclined face to pivotally turn over the turn-over member.

 Then, when the operating member is moved back, the connecting member is rocked back in the direction toward its neutral position by the spring while the 25 pressing portion thereof is slidably contacted with the

one inclined face, and as the pressing portion is spaced away from the inclined face, the positioning recess and the positioning projection are engaged with each other again. Accordingly, the pressing portion is returned to
5 its neutral position with a high degree of accuracy. Consequently, the pivoting angle of the turn-over member can be reduced, and accordingly the apex angle of the angular portion can be increased without increasing the operating force for the operating member and the stroke
10 of movement of the operating member can be reduced.

Thus, according to the present invention, there is no possibility of operational error, and two requirements of reduction in stroke of movement of and reduction in operating force for an operating member can
15 both be satisfied. Accordingly, miniaturization of a device and improvement in operability can be anticipated.

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

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view, partly broken, of a mode selection mechanism showing an embodiment of the present invention;

FIG. 2 is a plan view of the turning over mechanism of FIG. 1;

FIGS. 3 to 6 are similar views but showing different stages of operation of the turning over mechanism of FIG. 1;

FIG. 7 is a plan view of a turn-over member of a modified form;

FIG. 8 is a perspective view of a mode switching mechanism showing another embodiment of the present invention;

FIG. 9 is a schematic plan view of a tape recorder in which a conventional mode switching mechanism is incorporated;

FIG. 10 is a perspective view, partly broken, of the turn-over mechanism of FIG. 9; and

FIG. 11 is an enlarged plan view of the turn-over mechanism of FIG. 9.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Referring first to FIGS. 1 and 2, there is shown a mode switching mechanism according to the present invention. The turn-over mechanism shown includes an operating member 2 mounted for linear reciprocal movement in the directions of arrow marks A and B on an upper face of a main chassis 1. The operating member 2

is biased in its returning direction, that is, in the direction of the arrow mark B, by a return spring 3. The return spring 3 extends between a lateral projection 4 at an end of the operating member 2 and the main chassis 1.

A connecting member 5 is connected for rocking motion on an upper face of the operating member 2. An elongated slot 6 is formed at an end portion of the connecting member 5 while a pressing portion 7 in the form of a pin is provided on an upper face at the other end portion of the connecting member 5. The elongated slot 6 is elongated in the direction of reciprocal motion of the operating member 2. The elongated slot 6 is fitted with a pivot shaft 8 securely mounted on the upper face at an end portion of the operating member 2. The connecting member 5 is thus mounted for rocking motion around the pivot shaft 8 and also for linear motion in the direction of reciprocal motion of the operating member 2 relative to the operating member 2.

A positioning recess 9 is formed in a contiguous relationship to a base end (lower end in FIG. 2) of the elongated slot 6 in the connecting member 5. The positioning recess 9 is partly defined by a pair of inclined faces or edges 9a and 9b of the connecting member 5 which extend in a left and right symmetrical

relationship and intersect each other in such a manner as to entirely present a substantially V-shape in plan. A positioning projection 10 in the form of a pin is securely mounted on the upper face of the operating member 2 for engaging with the positioning recess 9 of the connecting member 5.

The positioning recess 9 and the positioning projection 10 are normally held in engagement with each other under the biasing force of a tension spring 12 which extends between another lateral projection 11 at the end of the operating member 2 and the end portion of the connecting member 5.

A turn-over member 14 is mounted for pivotal motion within a predetermined angular range around a shaft 15 on an upper face of a sub chassis 13 disposed above the connecting member 5. The turn-over member 14 has an angular portion 16 provided at a front side thereof, a pair of stopper portions 17a and 17b provided at the opposite ends of a pair of inclined faces or edges 16a and 16b of the angular portion 16, and an engaging piece 18 provided on the other side thereof remote from a summit 16c of the angular portion 16 with respect to the shaft 15. An elongated hole 19 is perforated in the sub chassis 13 in an arc centered at the shaft 15 for the turn-over member 14, and the

pressing pin 7 of the operating member 2 extends upwardly through the elongated hole 19 so that it can slidably contact with the inclined face 16a or 16b of the angular portion 16 of the turn-over member 14. A
5 second elongated hole 20 is perforated in the sub chassis 13 in an arc concentrical with the elongated hole 19, and the engaging piece 18 of the turn-over member 14 extends downwardly through the second elongated hole 20 so that it is received in an engaging
10 recess 21a formed at an end portion of a mode switching member 21. The end portion of the mode switching member 21 is disposed between the connecting member 5 and the sub chassis 13 and is mounted for reciprocal movement in a direction perpendicular to the direction of reciprocal
15 motion of the operating member 2, that is, in the directions of arrow marks D and E in FIGS. 1 and 2.

The turn-over member 14 is adapted to make a pivotal motion within the range of the second elongated hole 20 and make a toggle action under the spring force
20 of a turn-over or toggle spring 22. The turn-over spring 22 is secured at one end thereof to a spring anchoring piece 14a of the turn-over member 14 and at the other end thereof to the sub chassis 1.

Subsequently, operation of the mode switching
25 mechanism of the present invention having such a

construction as described above will be described with additional reference to FIGS. 3 to 6.

The turn-over mechanism is shown in its normal condition in FIG. 2, and in this condition, the positioning projection 10 on the operating member 2 engages with portions of the two inclined faces 9a and 9b of the positioning recess 9 in the connecting member 5 near an intersecting portion 9c (refer to FIG. 3) of the inclined faces 9a and 9b. Accordingly, rocking motion of the connecting member 5 by the operating member 2 in either direction is inhibited by the positioning projection 10 and the pressing pin 7 is held at its neutral portion while the turn-over member 14 is held at a limit position of pivotal motion thereof in the clockwise direction in FIG. 2 under the spring force of the turn-over spring 22. As the turn-over member 14 is held in this manner, the mode switching member 21 is held at a limit position of movement in the direction of the arrow mark E. With the mode switching member 14 positioned at the limit position, a tape recorder in which the turn-over mechanism is incorporated is in an operation mode such as, for example, a reproduction mode wherein a tape is fed in one direction.

In this condition, if the operation member 2 is pushed to move in the direction of the arrow mark A

against the biasing force of the return spring 3 by manual operation thereof or by means of a driving source not shown, the pivot shaft 8 of the operating member 2 is soon contacted with an end of the elongated slot 6 of the connecting member 5 as shown in FIG. 3 while the tension spring 12 is extended a little by the operating member 2. Simultaneously, the positioning projection 10 on the operating member 2 is spaced away from the inclined faces 9a and 9b of the positioning recess 9 near the intersecting portion 9c to cancel inhibition of rocking motion of the connecting member 5 by the operating member 2 to allow pivotal motion of the connecting member 5 while the pressing pin 7 on the connecting member 5 is contacted with the inclined face 16a of the angular portion 16 of the turn-over member 14.

As the operating member 2 moves further in the direction of the arrow mark A in FIG. 3, the connecting member 5 is moved in the same direction in an integral relationship by the operating member 2. Upon such forward movement of the connecting member 5, the pressing pin 7 thereon is guided by and slidably moves along the inclined face 16a of the angular portion 16 of the turn-over member 14 so that the connecting member 5 is pivoted in the counterclockwise direction in FIG. 3

around the pivot shaft 8 until the pressing pin 7 is contacted with the stopper face 17a of the turn-over member 14 as seen in FIG. 4.

As the operating member 2 further moves forwardly in the direction of the arrow mark A from the position shown in FIG. 4, the pressing pin 7 pushes the stopper portion 17a of the turn-over member 14 so that now the turn-over member 14 is pivoted in the counterclockwise direction in FIG. 4 around the shaft 15 against the biasing force of the turn-over spring 22. During such counter-clockwise pivotal motion of the turn-over member 14, just after the end of the turn-over spring 22 which is anchored at the spring anchoring piece 14a of the turn-over member 14 passes a neutral position, that is, a line interconnecting the shaft 15 for the turn-over member 14 and the other end of the turn-over spring 22 which is anchored at the sub chassis 13, the turn-over member 14 is now biased in the counterclockwise direction in FIG. 5 by the turn-over spring 22 so that it is turned over and pivoted in the counterclockwise direction to its another pivoted position shown in FIG. 5. Upon such turning over pivotal motion of the turn-over member 14, the mode switching member 21 is moved in the direction of the arrow mark D in FIG. 4 to its another limit position shown in FIG. 5 thereby to

turn over the tape recorder to another operation mode such as, for example, another reproduction mode wherein the tape is fed in the other direction.

If the pushing force at the operating member 2 is removed after such a condition as shown in FIG. 5 has been reached, the operating member 2 is moved reversely in the direction of the arrow mark B in FIG. 5 back to its initial position by the biasing force of the return spring 3. Upon such returning movement of the operating member 2, the connecting member 5 is pivoted back in the clockwise direction in FIG. 5 and the pressing pin 7 thereon is finally engaged again with the inclined faces 9a and 9b of the positioning recess 9 near the intersecting portion 9c as seen in FIG. 6 similarly as at the initial stage of FIG. 2 while the pivot shaft 8 is contacted with the base end of the elongated slot 6. Consequently, rocking motion of the connecting member 5 is inhibited by the operating member 2 and the pressing pin 7 is held at its neutral portion.

If the operating member 2 is moved forwardly again in the direction of the arrow mark A in the condition of FIG. 6, at first inhibition of rocking motion of the connecting member 5 by the operating member 2 is canceled so that the operating member 2 becomes free in a similar manner as described above and

the pressing pin 7 is contacted with the other inclined face 16b of the angular portion 16 of the turn-over member 14. After then, as the operating member 2 moves further forwardly in the direction of the arrow mark A, the pressing pin 7 presses against the other stopper portion 17b so that the turn-over member 14 is pivotally turned over in the clockwise direction in FIG. 6. As the turn-over member 14 is pivotally turned over in this manner, the mode switching member 21 is moved in the direction of the arrow mark E in FIG. 6 so that the tape recorder is turned over again to the former operation mode, that is, the reproduction mode wherein the tape is fed in the one direction. After then, if the pushing force at the operating member 2 is removed, the operating member 2 is moved back in the direction of the arrow mark B in a similar manner as described above so that the initial condition shown in FIG. 2 is restored wherein the pressing pin 7 is held at its neutral position.

Referring now to FIG. 7, there is shown a modified form of the turn-over member 14 described above. In the modification shown, both inclined faces 16a and 16b of the turn-over member 14 are inclined at portions 16d and 16e thereof including a summit 16c therebetween toward the inside such that they may

present an increased apex angle while in the embodiment of FIGS. 1 to 6 the inclination angle of the inclined faces 16a and 16b of the turn-over member 14 is fixed from the opposite ends of them to the summit 16c as indicated by broken lines in FIG. 7. The portions 16d and 16e of the inclined faces 16a and 16b have such a sufficient extent that, when the operating member 2 is moved forwardly, the pressing pin 7 may be first contacted with the portion 16d or 16e of the inclined face 16a or 16b. With the modified turn-over member 14, comparing with the turn-over member 14 of the embodiment of FIGS. 1 to 6, the distance from the center of the shaft 15 to the summit 16c is reduced by l . Consequently, the pressing pin 7 can be disposed nearer to the turn-over member 14 by a distance equal to the reduced distance, and also the stroke of movement of the operating member 2 can be reduced. Meanwhile, since the pressing pin 7 first presses against the portion 16d or 16e of a more gentle inclination, the reactive force is greater and accordingly it will extend the tension spring 12 readily.

Referring now to FIG. 8, there is shown a turning over mechanism according to a second embodiment of the present invention. The turning over mechanism shown includes an operating member 52 mounted for sliding

movement on an upper face of a casing 73 which is in turn mounted on an upper face of a main chassis 51. The operating member 52 is connected to an iron core 75 of a solenoid 74 serving as a driving source and mounted in the casing 73. A leaf spring 76 is secured at one end thereof to the operating member 52 and contacted at the other end portion thereof with one end of a connecting member 55. An engaging slot 77 is perforated in a turn-over member 64, and a movable piece 79 of a mode switching switch 78 is fitted in the engaging slot 77.

In the present embodiment, an elongated slot 56 and a positioning recess 59 of the connecting member 55 are not formed in a contiguous relationship to each other.

The turning over mechanism is shown in its initial condition in FIG. 8. In this condition, if the solenoid 74 is energized, the operating member 52 is moved forwardly in the direction indicated by an arrow mark A by the iron core 75 of the solenoid 74. Upon such forward movement of the operating member 52, the connecting member 55 is also moved forwardly by the leaf spring 76 together with the operating member 52, and upon such forward movement of the connecting member 55, a pressing pin 57 on the connecting member 55 is first contacted with and slidably moves along an inclined face

66b of an angular portion 66 of the turn-over member 64 so that the connecting member 55 is pivoted in the counterclockwise direction in FIG. 8 around the center of a pivot shaft 58. The pressing pin 57 is

5 subsequently contacted with and pushes a stopper portion 67b at the last end of the inclined face 66b so that the turn-over member 64 is pivotally turned over in the clockwise direction in FIG. 8. Upon such pivotal turning over motion of the turn-over member 64, the

10 movable piece 79 of the mode switching switch 78 is moved in the direction of an arrow mark F so that a tape recorder in which the turning over mechanism is incorporated is put into an operation mode.

In the condition, if the solenoid 74 is

15 deenergized, the operating member 52 is moved back in the direction of the arrow mark B by and together with the iron core 75 of the solenoid 74, and the connecting member 55 is moved back in the direction of the arrow mark B together with the operating member 52 until a

20 positioning projection 60 is engaged with inclined faces 59a and 59b of the positioning recess 59 near an intersecting portion 59c as seen in FIG. 8 to thereafter inhibit rocking motion of the connecting member 55 relative to the operating member 52.

25 In this condition, if the solenoid 74 is

energized again to move the operating member 52 forwardly in the direction of the arrow mark A, the pressing pin 57 of the connecting member 55 is now contacted with the other inclined face 66a of the angular portion 66 of the turn-over member 64 and then with the other stopper portion 67a at the last end of the inclined face 66a. Consequently, the turn-over member 64 is pivotally turned over now in the counter-clockwise direction in FIG. 8, and as the turn-over member 64 is pivotally turned over in this manner, the movable piece 79 is moved in the direction of an arrow mark G in FIG. 8 to turn over the tape recorder to another operative mode.

After then, if the solenoid 74 is deenergized, the connecting member 55 is moved in the direction of the arrow mark B together with the operating member 52 back to its initial position shown in FIG. 8 again.

It is to be noted that while in each of the embodiments described above the elongated slot 6 or 56 is formed in the connecting member 5 or 55 while the pivot shaft 8 or 58 is provided on the operating member 2 or 52, alternatively the elongated slot 6 or 56 may be formed in the operating member 2 or 52 with the pivot shaft 8 or 58 provided on the connecting member 5 or 55. Further, the positioning recess 9 or 59 may be provided

on the operating member 2 or 52 with the positioning
projection 10 or 60 provided on the connecting member 5
or 55.



CLAIMS:

1. A mode switching turn-over mechanism for a tape recorder wherein, each time an operating member mounted for reciprocal linear movement is operated to
5 make a reciprocal movement either by manual operation thereof or by means of a driving source, a pressing portion of a connecting member connected for rocking motion to said operating member is first slidably contacted with one or the other of a pair of inclined
10 faces of an angular portion of a pivotal turn-over member to rock said connecting member in one or the other direction and is then contacted with and pushes a stopper portion provided in a contiguous relationship to the last end of the inclined face to pivotally turn
15 over said turn-over member to effect switching from one to the other or from the other to the one of two operation modes, characterized in that an elongated slot is formed in one of said operating member and said connecting member while a pivot shaft is
20 provided on the other of said operating member and said connecting member and is fitted in said elongated slot, that said elongated slot is elongated in the direction of reciprocal movement of said operating member so as to allow said connecting member to move in the same
25 direction as that of reciprocal movement of said



operating member relative to said operating member while
said pivotal shaft serves as the center of rocking
motion of said connecting member, that a positioning
projection is provided on one of said operating member
5 and said connecting member while a positioning recess is
provided on the other of said operating member and said
connecting member for engaging, when said connecting
member is moved in the one direction relative to said
operating member, with said positioning projection to
10 prevent rocking motion of said connecting member
relative to said operating member, that said operating
member and said connecting member are interconnected by
a spring such that said positioning projection and said
positioning recess may be held in normal engagement with
15 each other under the biasing force of said spring, and
that when said operating member is moved forwardly until
said pressing portion thereof is contacted with the one
or the other inclined face of said angular portion, said
connecting member is moved toward said operating member
20 against the spring force of said spring so that
engagement between said positioning projection and said
positioning recess is canceled.

2. A mode switching turn-over mechanism for a
tape recorder as set forth in claim 1, wherein said
positioning recess has a pair of mutually intersecting

left and right symmetrical inclined faces, and said positioning projection is engaged with said inclined faces near an intersecting portion of said inclined faces to inhibit rocking motion of said connecting member relative to said operating member.

3. A mode switching turn-over mechanism for a tape recorder as set forth in claim 2, wherein said inclined faces of said angular portion of said pivotal turn-over member are inclined at portions thereof including a summit therebetween such that said angular portion may have an increased apex angle.

4. A mode switching turn-over mechanism for a tape recorder substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

