

SPECIFICATIONTITLE OF THE INVENTION:AUTOMATIC REVERSE MECHANISM FOR TAPE RECORDERBACKGROUND OF THE INVENTION

5 1) Field of the Invention:

This invention relates to an automatic reverse mechanism for a tape recorder, which can automatically play one side of a magnetic tape without need for
10 reversing both sides of the magnetic tape after the other side of the magnetic tape has been played.

2) Description of the Prior Art:

As automatic reverse devices for tape recorders,
15 there have heretofore been known those detecting electrically each end of a tape to energize a solenoid so that pinch rollers, which are provided on both sides of a magnetic head respectively, are operated alternately; those detecting mechanically the tension
20 of a tape at each end thereof and operating pinch rollers alternately by the rotary forces of their corresponding flywheels or the like; etc.

Although a variety of automatic reverse devices has been known as mentioned above, the running

direction of a tape at the beginning of each operation is the same as its running direction at the time of completion of the previous operation in each of such conventional devices.

5 Automatic reverse devices, in each of which each end of a tape is electrically detected to cause the tape to run in the reverse direction, are equipped with solenoids, thereby making their structures complex. Use of solenoids is also disadvantageous in reducing
10 the dimensions of tape recorders.

Turning next to automatic reverse devices making use of the rotary force of a flywheel to reverse the running direction of a tape, they generally have such a structure that a pin is provided upright from a portion
15 of the flywheel and a pinch roller changeover mechanism is kicked by the pin. This structure is however accompanied by such drawbacks that the balance of the flywheel may be impaired and since the tension of the tape becomes higher temporarily at the beginning of
20 each operation, this increased tension may be detected to cause a false operation.

When the contents of information recorded on both A and B sides of a tape are continuous for example, it is always desired to start the playback of
25 the information from the A side. In each of conventional automatic reverse devices, the running

direction of a tape at the beginning of an operation is the same as that at the time of completion of the previous operation. The conventional automatic reverse devices hence required a cumbersome operation to return
5 to the A side for the first time if the previous operation has been stopped in the course of the playback of the B side for example.

On the other hand, various types of automatic stop devices have been developed to stop tape recorders
10 at one ends of magnetic tapes. There is however no automatic reverse mechanism which can also be used as an automatic stop device. If an automatic stop device is provided in addition to an automatic reverse mechanism, the overall structure of the tape recorder
15 becomes unavoidably complex and renders difficult the size reduction of the tape recorder.

In a tape recorder equipped with a conventional automatic reverse mechanism, the magnetic tape, reel shafts and the like are not visible from the outside
20 especially when the tape recorder is used in a form built in a vehicle. Such a tape recorder is hence accompanied by an inconvenience that the user cannot find out in which direction the tape is running.

Furthermore, a tape recorder equipped with a
25 conventional automatic reverse mechanism does not permit free change-over from the playback mode to the

fast feeding mode, from the fast feeding mode to the playback mode in the same feeding direction, or from the fast feeding mode to the playback mode in the opposite feeding direction.

SUMMARY OF THE INVENTION

With the foregoing in view, the present invention has as a first object thereof the provision of an automatic reverse mechanism for a tape recorder, which can automatically reverse the running direction of a tape without need for accessory parts such as solenoids and hence facilitates the size reduction of the tape recorder, is free from adverse effects to the balance of flywheels and false operations.

A second object of this invention is to provide an automatic reverse mechanism for a tape recorder, which makes the running direction of the tape always the same at the beginning of an operation such as playback, recording or the like after each operation of a stop mechanism.

A third object of this invention is to achieve further size reduction and structural simplification of the automatic reverse mechanism which can achieve the second object of this invention.

A fourth object of this invention is to provide an automatic reverse mechanism for a tape recorder, which

can automatically reverse the tape without need for accessories such as solenoids and hence facilitates the size reduction of the tape recorder, is free from adverse effects to the balance of flywheels and false operations, and can also be used as an automatic stop device.

A fifth object of this invention is to provide an automatic reverse mechanism for a tape recorder, which does not require accessories such as solenoids and hence facilitates the size reduction of the tape recorder, is free from adverse effects to the balance of flywheels and false operations, and permits free change-over from the playback mode to the fast feeding mode, from the fast feeding mode to the playback mode in the same feeding direction, or from the fast feeding mode to the playback mode in the opposite feeding direction.

In one aspect of this invention, there is thus provided an automatic reverse mechanism for a tape recorder, in which capstans, pinch rollers and reel shafts are arranged symmetrically on both sides of an associated magnetic head, the capstans on both sides of the magnetic head and either one of said reel shafts are normally driven and rotated, the pinch roller on the same side as the rotating reel shaft is pressed against the corresponding capstan to cause the magnetic tape of a tape cassette inserted in the tape recorder to run in one direction, and when the magnetic tape has been fully

wound up, the running direction of the magnetic tape is automatically changed over, comprising:

a rotation transmitting means having a pair of rotation transmitting members arranged symmetrically relative to the magnetic head, said rotation transmitting members being rotated normally under rotary forces of the corresponding capstans so as to transmit the rotary forces to the corresponding reel shafts via friction mechanisms respectively;

an eccentric circular cam surface provided eccentrically about a rotary shaft of at least one of the rotation transmitting members, and an engagement portion provided with said at least one rotation transmitting member;

a reel-shaft stop detecting means for detecting each stop of at least one of the reel shafts, said means having a cam follower portion and a contact portion and adapted to receive a rotary force of said at least one reel shaft via a friction mechanism; said cam follower being maintained in sliding contact with the eccentric circular cam surface so as to avoid engagement between the contact portion and the engagement portion and when said at least one reel shaft stops, remaining at a position apart from the eccentric circular cam surface, whereby the contact portion is allowed to engage the engagement

portion and at the same time said at least one rotation transmitting member is displaced from an engagement position to a non-engagement position relative to the corresponding reel shaft by a turning force developed in said at least one rotation transmitting member; and

a reversing means operable responsive to each displacement of said at least one rotation transmitting member to the non-engagement position so that the pinch roller associated with said at least one rotation transmitting member is separated from its corresponding capstan, the other pinch roller is brought into contact with the other rotation transmitting member, and the other rotation transmitting member is displaced to an engagement position relative to its corresponding reel shaft.

In another aspect of this invention, there is also provided an automatic reverse mechanism for a tape recorder, in which capstans, pinch rollers and reel shafts are arranged symmetrically on both sides of an associated magnetic head, the capstans on both sides of the magnetic head and either one of said reel shafts are normally driven and rotated, the pinch roller on the same side as the rotating reel shaft is pressed against the corresponding capstan to cause the magnetic tape of a tape cassette inserted in the tape recorder to run in one direction, and when the magnetic tape has been fully

wound up, the running direction of the magnetic tape is automatically changed over, comprising:

a rotation transmitting means having a pair of rotation transmitting members arranged symmetrically relative to the magnetic head, said rotation transmitting members being rotated normally under rotary forces of the corresponding capstans so as to transmit the rotary forces to the corresponding reel shafts via friction mechanisms respectively;

an eccentric circular cam surface provided eccentrically about a rotary shaft of at least one of the rotation transmitting members, and an engagement portion provided with said at least one rotation transmitting member;

a reel-shaft stop detecting means for detecting each stop of at least one of the reel shafts, said means having a cam follower portion and a contact portion and adapted to receive a rotary force of said at least one reel shaft via a friction mechanism; said cam follower being maintained in sliding contact with the eccentric circular cam surface so as to avoid engagement between the contact portion and the engagement portion and when said at least one reel shaft stops, remaining at a position apart from the eccentric circular cam surface, whereby the contact portion is allowed to engage the engagement

portion and at the same time said at least one rotation transmitting member is displaced from an engagement position to a non-engagement position relative to the corresponding reel shaft by a turning force developed in said at least one rotation transmitting member;

a reversing means operable responsive to each displacement of said at least one rotation transmitting member to the non-engagement position so that the pinch roller associated with said at least one rotation transmitting member is separated from its corresponding capstan, the other pinch roller is brought into contact with the other rotation transmitting member, and the other rotation transmitting member is displaced to an engagement position relative to its corresponding reel shaft; and

a means for determining the starting side of the tape cassette by controlling the reversing means in such a way that an operating mode of the tape recorder is released to stop the tape recorder and responsive to the stop of the tape recorder one of the rotation transmitting members, said one rotation transmitting member being on a predetermined side, is displaced to the engagement position relative to the corresponding reel shaft.

In a further aspect of this invention, there is also provided an automatic reverse mechanism for a tape recorder, in which capstans, pinch rollers and reel shafts are arranged symmetrically on both sides of an associated

magnetic head, the capstans on both sides of the magnetic head and either one of said reel shafts are normally driven and rotated, the pinch roller on the same side as the rotating reel shaft is pressed against the corresponding capstan to cause the magnetic tape of a tape cassette inserted in the tape recorder to run in one direction, and when the magnetic tape has been fully wound up, the running direction of the magnetic tape is automatically changed over, comprising:

a rotation transmitting means having a pair of rotation transmitting members arranged symmetrically relative to the magnetic head, said rotation transmitting members being rotated normally under rotary forces of the corresponding capstans so as to transmit the rotary forces to the corresponding reel shafts via friction mechanisms respectively;

an eccentric circular cam surface provided eccentrically about a rotary shaft of at least one of the rotation transmitting members, and an engagement portion provided with said at least one rotation transmitting member;

a reel-shaft stop detecting means for detecting each stop of at least one of the reel shafts, said means having a cam follower portion and a contact portion and adapted to receive a rotary force of said at least one reel shaft via a friction mechanism; said cam follower

being maintained in sliding contact with the eccentric circular cam surface so as to avoid engagement between the contact portion and the engagement portion and when said at least one reel shaft stops, remaining at a position apart from the eccentric circular cam, whereby the contact portion is allowed to engage the engagement portion and at the same time said at least one rotation transmitting member is displaced from an engagement position to a non-engagement relative to the corresponding reel shaft by a turning force developed in said at least one rotation transmitting member;

a reversing means operable responsive to each displacement of said at least one rotation transmitting member to the non-engagement position so that the pinch roller associated with said at least one rotation transmitting member is separated from its corresponding capstan, the other pinch roller is brought into contact with the other rotation transmitting member, and the other rotation transmitting member is displaced to an engagement position relative to its corresponding reel shaft; and

a means for determining the starting side of the tape cassette by controlling the reversing means in such a way that an operating mode of the tape recorder is released to stop the tape recorder and responsive to the stop of the tape recorder one of the rotation trans-

mitting members, said one rotation transmitting member being on a predetermined side, is displaced to the engagement position relative to the corresponding reel shaft;

wherein the rotation transmitting means includes, in addition to said pair of rotation transmitting members, a pair of turnable members which are arranged symmetrically relative to the magnetic head, are turnable respectively about predetermined central axes, carry the corresponding rotation transmitting members rotatably thereon, and are connected at one end thereof to the reversing means, and the starting-side determining means is equipped with a reverse mode selector means which permits manual selection of either one of two positions and stops an operation of the tape recorder responsive to a displacement of one of the turnable members only at one of the two positions.

In a still further aspect of this invention, there is also provided an automatic reverse mechanism for a tape recorder, in which capstans, pinch rollers and reel shafts are arranged symmetrically on both sides of an associated magnetic head, the capstans on both sides of the magnetic head and either one of said reel shafts are normally driven and rotated, the pinch roller on the same side as the rotating reel shaft is pressed against the corresponding capstan to cause the magnetic tape

of a tape cassette inserted in the tape recorder to run in one direction, and when the magnetic tape has been fully wound up, the running direction of the magnetic tape is automatically changed over, comprising:

a rotation transmitting means having a pair of rotation transmitting members arranged symmetrically relative to the magnetic head, said rotation transmitting members being rotated normally under rotary forces of the corresponding capstans so as to transmit the rotary forces to the corresponding reel shafts via friction mechanisms respectively;

an eccentric circular cam surface provided eccentrically about a rotary shaft of at least one of the rotation transmitting members, and an engagement portion provided with said at least one rotation transmitting member;

a reel-shaft stop detecting means for detecting each stop of at least one of the reel shafts, said means having a cam follower portion and a contact portion and adapted to receive a rotary force of said at least one reel shaft via a friction mechanism; said cam follower being maintained in sliding contact with the eccentric circular cam surface so as to avoid engagement between the contact portion and the engagement position and when said at least one reel shaft stops, remaining at a position

apart from the eccentric circular cam surface, whereby the contact portion is allowed to engage the engagement position and at the same time said at least one rotation transmitting member is displaced from an engagement position to a non-engagement position relative to the corresponding reel shaft by a turning force developed in said at least one rotation transmitting member;

a reversing means operable responsive to each displacement of said at least one rotation transmitting member to the non-engagement position so that the pinch roller associated with said at least one rotation transmitting member is separated from its corresponding capstan, the other pinch roller is brought into contact with the other rotation transmitting member, and the other rotation transmitting member is displaced to an engagement position relative to its corresponding reel shaft;

a fast forward feeding member for causing the magnetic head to retreat when the fast forward feeding member is manually pushed in a playback mode;

a lock means for holding the fast forward feeding member at a pushed position upon manual pushing of the fast forward feeding member, said lock means releasing the holding of the fast forward feeding member when the fast forward feeding member is pushed again; and

a fast forward feeding release means for releasing the holding of the fast forward feeding member responsive to an operation of the reversing means when the fast forward feeding member is held at its pushed position by the lock means.

Accordingly, the automatic reverse mechanisms of this invention for a tape recorder can bring about one or more of the following advantageous effects:

(1) In the above-described construction, the pinch roller changeover member is not actuated while either one of the reel shafts is rotating. When either one of the reel shafts has stopped, the changeover member is moved in the opposite direction to alternately actuate the left-hand and right-hand pinch rollers. Accordingly, it does not require accessory parts such as solenoids and facilitates the size reduction.

(2) The automatic reverse mechanism is free from such dangers that the balance of rotation of the flywheels may be deleteriously affected and false operations may take place at start.

(3) Since the running direction of the tape is always the same at the beginning of a playback or recording operation, it is unnecessary to perform the cumbersome operation to reverse the running direction of the tape at the beginning of each playback operation, for example,

even if the contents of information on the A and B sides of the tape are continuous.

(4) The automatic reverse mechanism has such an advantage that it can also be used as an automatic stop device by suitably selecting the position of one of the selecting members.

(5) The automatic reverse mechanism permits free manual change-over from the playback mode to the fast feeding mode, from the fast feeding mode to the playback mode in the same feeding direction and/or from the fast feeding mode to the playback mode in the opposite feeding direction, and can hence provide a wide variety of functions.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become apparent from the following description and the appended claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 to FIGURE 4 schematically illustrate the structure of an automatic reverse mechanism according to a first embodiment of this invention;

FIGURE 5 is a cross-section view taken along line V-V in FIGURE 4;

FIGURE 6 to FIGURE 10 schematically show the structure of an automatic reverse mechanism according to a second embodiment of this invention;

FIGURE 11 to FIGURE 12 schematically show the structure of an automatic reverse mechanism according to a third embodiment of this invention;

FIGURE 13 to FIGURE 16 schematically depict the structure of an automatic reverse mechanism according to a fourth embodiment of this invention;

FIGURE 17 is a cross-sectional view taken along line XVII-XVII in FIGURE 14; and

FIGURE 18 to FIGURE 21 schematically illustrate the structure of an automatic reverse mechanism according to a fifth embodiment of this invention.

DETAILED DESCRIPTION OF THE INVENTION
AND PREFERRED EMBODIMENTS

FIGURE 1 to FIGURE 5 show the first embodiment of this invention. A right-hand reel shaft 1a is rotated in FIGURE 1 while a left-hand reel shaft 1b is driven in FIGURE 4. FIGURE 2 and FIGURE 3 illustrate the automatic reverse mechanism in the course of its change from the state shown in FIGURE 1 to its state depicted in FIGURE 4.

Referring first of all to FIGURE 1, capstans 3a, 3b, pinch rollers 4a, 4b and the above-mentioned reel

shafts 1a,1b are symmetrically arranged on both sides of a magnetic head 2. Small diameter gears 5a, 5b and flywheels

6a,6b are respectively secured on the capstans 3a,3b.

Further, rotation transmitting members, namely,

5 turnable levers 7a,7b are also provided on their corresponding capstans 3a,3b in such a way that the turnable levers 7a,7b are allowed to turn about their corresponding capstans 3a,3b. Rotation transmitting

units composed in combination of large diameter gears 10 8a,8b and small diameter gears 9a,9b respectively are supported on one ends of the turnable levers 7a,7b via shafts 10a,10b. Eccentric circular cam surfaces 11a, 11b are formed respectively about the shafts 10a, 10b. In addition, cams 12a, 12b also project from and in

15 continuation with the shafts 10a, 10b at positions where the eccentric circular cam surfaces 11a, 11b have the maximum radii. On the other hand, the other ends of the turnable levers 7a,7b terminate in bent end portions 13a,13b.

20 The pinch rollers 4a,4b are supported on brackets 15a,15b, which are pivotal about pivots 14a,14b respectively, so that the pinch rollers 4a,4b can be releasably brought into contact with their corresponding capstans 3a,3b. Bent edge portions 25 16a,16b are also provided on the brackets 15a,15b.

Designated at numeral 17 is a pinch roller
changeover member, namely, a changeover bar which is
slidable horizontally as viewed in FIGURE 1. This
changeover bar 17 is provided with lugs 18a,19 in such
5 a way that the bent end portion 13a of the right-hand
lever 7a is interposed between the lugs 18a,19.
Furthermore, a lug 18b is provided on the changeover
bar 17 at a position on the left of the bent end
portion 13b of the left-hand turnable lever 7b. The
10 changeover bar 17 also defines openings 20a,20b which
receive the bent edge portions 16a,16b of the brackets
15a,15b respectively. Tilted edges 21a,21b are formed
by the openings 20a,20b. When the changeover bar 17
moves rightwards, the left-hand tilted edge 21b is
15 caused to slide on the bent edge portion 16b of the
left-hand bracket 15b as illustrated in FIGURE 1,
whereby the left-hand pinch roller 4b is separated from
its corresponding capstan 3b. When the changeover bar
17 moves leftwards, the right-hand tilted edge 21a is
20 caused to slide on the bent edge portion 16a of the
right-hand bracket 15a as illustrated in FIGURE 4,
whereby the right-hand pinch roller 4a is separated
from its corresponding capstan 3a. However, the
respective brackets 15a,15b are urged by their corres-

ponding unillustrated springs in such directions that the respective pinch rollers 4a,4b are pressed against their corresponding capstans 3a,3b.

5 An engagement pin 22 is provided upright at a position on the changeover bar 17. The changeover bar 17 is normally biased rightwards by a tension spring 13.

10 At a location near the changeover bar 17, a hook member 24 is provided turnably. This hook member 24 has an engagement tab 24a corresponding to the engagement pin 22 and a pressure-receiving portion 24b corresponding to the bent end portion 13b of the left-hand turnable lever 7b, and is urged by a tension spring 25 in a counterclockwise direction as viewed in
15 the drawings.

Of the large diameter gears 8a,8b and small diameter gears 9a,9b which in combination constitute the rotation transmitting units, the large diameter gears 8a,8b are maintained in meshing engagement with
20 the small diameter gears 5a,5b provided integrally with their corresponding capstans 3a, 3b while the small diameter gears 9a,9b are selectively engageable with large diameter gears 26a,26b provided coaxially with the reel shafts 1a,1b. By the way, the meshing engagement between the gears 9a and 26a and that between the gears
25 9b and 26b are controlled respectively by the turning movements of the turnable levers 7a,7b. Both of the

turnable levers 7a,7b are however urged by their corresponding tension springs 27a,27b in such directions that the gears 9a,9b are brought into meshing engagement with their corresponding gears 26a,26b. On the other hand, the turning movements of the turnable levers 7a,7b are controlled by the horizontal movement of the changeover bar 17. The turnable levers 7a,7b and changeover bar 17 are linked together in such a way that while one of the gears (for example, the right-hand gear 9a) is maintained in meshing engagement with the gear 26a, the other gear 9b is maintained out of engagement from the gear 26b.

Mounted on the reel shafts 1a,1b are rotary members 28a,28b which rotate together with their corresponding reel shafts 1a,1b. Pin-like pushing and urging portions 29a,29b are fixedly provided on the rotary members 28a,28b respectively. Friction mechanisms (not shown) are interposed between the reel shafts 1a,1b and the rotary members 28a,28b and between the reel shafts 1a,1b and the large diameter gears 26a,26b respectively. For example, the large diameter gear 26a can still be allowed to rotate even when the rotation of the reel shaft 1a is stopped. In this case, the corresponding friction mechanism undergoes slipping.

Designated at numer 30, FIGURE 1 is a fixing plate on which cam followers 31a, 31b and auxiliary holding members 32a, 32b are pivotally supported.

5 The cam followers 31a,31b have contact portions 33a,33b at locations farthest from their fulcrums, pressure receiving portions 34a,34b located respectively on the orbits of revolutions of the pushing and urging portions 29a,29b, and elastic fingers 35a,35b in the vicinity of the fulcrums.

10 On the other hand, the auxiliary holding members 32a,32b have a substantially L-like configuration. Lower arms 36a,36b are located outside the shafts 10a,10b, while upper arms 37a,37b are positioned in opposition to the elastic fingers 35a,35b of the cam
15 followers 31a,31b.

Numeral 38 indicates a stop lever provided displaceably back and forth across the changeover bar 17. The stop lever 38 serves as an interlocking member for determining the starting side of a cassette. The
20 stop lever 38 has a bulge 39 at a part of the upper surface thereof and is normally biased in the retreating direction by a tension spring 40. When this stop lever 38 is caused to advance or retreat, the bulge 39 slides onto the lower surface of the turning end portion
25 of the hook member 24 and lifts the hook member 24 in an upward direction as illustrated in FIGURE 5. If the engagement pin 22

of the changeover bar 17 is in engagement with the engagement tab 24a of the hook member 24 at this time, their engagement is released owing to the upward displacement of the hook member 24.

5 The operation of the automatic reverse mechanism according to the first embodiment of this invention will next be described.

10 In FIGURE 1, the magnetic head 2 is held at the play position and at the same time, the right-hand pinch roller 4a is pressing the capstan 3a and the rotation of the capstan 3a, the direction of which is indicated by an arrow, is being transmitted via the gears 5a, 8a, 9a, 26a and the unillustrated friction mechanism to the right-hand reel shaft 1a so that a
15 playback operation is being performed (note: the magnetic tape is omitted from the drawing).

 At this time, the rotary force of the reel shaft 1a is being transmitted to the cam follower 31a by way of the pushing and urging portion 29a, whereby the
20 contact portion 33a of the cam follower 31a is maintained in sliding contact with the cam surface 11a. So long as the contact portion 33a is maintained in sliding contact with the cam surface 11a in the above-described manner, the contact portions 33a is maintain-
25 ed out of contact with the cam 12a.

Since the left-hand reel shaft 1b serves as the paying-out side while the playback operation is performed with the tape being taken up on the right-hand reel shaft 1a in the above-described manner, the pushing and urging portion 29b is not pressing the pressure-receiving portion 34b of the cam follower 31b. In this state, the left-hand rotation transmitting unit (gears 8b,9b) has however been separated from the large diameter gear 26b to the non-engagement position relative to the reel shaft 1b. Accordingly, the lower arm 36b of the auxiliary holding member 32b is being pressed by the shaft 10b.

As a result, the upper arm 37b of the auxiliary holding member 32b is pressing the elastic finger 35b of the cam follower 31b so that the auxiliary holding member 32b in place of the pushing and urging portion 29b maintains the contact portion 33b of the cam follower 31b in sliding contact with the cam surface 11b.

When the tape has been fully wound up on the right-hand reel, slipping is developed in the friction mechanism interposed between the large diameter gear 26a and the reel shaft 1a so that the reel shaft 1a stops. The contact portion 33a which has been kept in sliding contact with the cam surface 11a is hence separated from the cam surface 11a at a location where the contact portion 33a is closest to the shaft 10a and

as illustrated in FIGURE 2, the pushing and urging portion 12a is brought into contact with the contact portion 33a. Since the fulcrum of the cam follower 31a does not move, the rotation transmitting member, namely, the turnable lever 7a is hence caused to turn against the force of the spring 27a so that the gear 9a is separated from the large diameter gear 26a. As a result, the transmission of the rotary force to the large diameter gear 26a is stopped.

10 On the other hand, a turning movement of the turnable lever 7a causes the bent end portion 13a thereof to press the lug 19 of the changeover bar 17 from the right as shown in FIGURE 3, thereby moving the changeover bar 17 leftwards. As a result, the engagement pin 22 provided on the changeover bar 17 is brought into engagement with the engagement tab 24a of the hook member 24 (see, FIGURE 4).

 Here, the left-hand inclined edge 21b of the change-over bar 17 releases the bracket 15b as depicted in FIGURE 4. Conversely, the right-hand inclined edge 21a causes the bracket 15a to turn in a direction opposite to its biased direction. As a result, the left-hand pinch roller 4b is pressed against the capstan 3b while the right-hand pinch roller 4a is separated from the capstan 3a.

Further, the left-hand turnable lever 7b is pulled by the spring 27b and is hence caused to turn clockwise, whereby the small diameter gear 9b is brought into meshing engagement with the large diameter gear 26b in the same rotation transmitting unit.

As shown in FIGURE 4, the automatic reverse mechanism therefore is brought into a state opposite to the state illustrated in FIGURE 1. Hence, the left-hand reel shaft 1b is caused to rotate in the winding direction and a playback or recording operation is performed while the tape is being wound up on the left-hand reel.

When the tape has been taken up fully on the left-hand reel in the above-described manner, slipping takes place in the unillustrated friction mechanism interposed between the large-diameter gear 26b and reel shaft 1b so that the reel shaft 1b stops. Accordingly, the contact portion 33b which has been kept in sliding contact with the cam surface 11b is caused to move closest to the shaft 10b and is then separated from the cam surface 11b, and similar to the operation shown in FIGURE 2, the cam 12b is brought into contact with the contact portion 33b. Since the fulcrum of the cam follower 31b does not move once the above-described state is reached, the rotation transmitting unit, i.e. the turntable lever 7b is caused to turn against the force of the spring 27b so that the gear 9b

is separated from the large diameter gear 26b. As a result, the transmission of the rotary force to the large diameter gear 26b is stopped (see, FIGURE 1).

On the other hand, the bent end portion 13b of the turnable lever 7b presses the pressure receiving portion 24b of the hook member 24 from the left by the counterclockwise rotation of the turnable lever 7b, whereby the hook member 24 is caused to turn so as to release the engagement pin 22 from the engagement tab 24a. The changeover bar 17 is hence allowed to return in the rightward direction owing to the provision of the tension spring 23. As a consequence, the right-hand inclined edge 21a of the changeover bar 17 releases the bracket 15a as depicted in FIGURE 1 while the left-hand inclined edge 21b causes the bracket 15b to turn in a direction opposite to the biased direction. The right-hand pinch roller 4a is therefore pressed against the capstan 3a and the left-hand pinch roller 4b is separated from the capstan 3b.

Further, the right-hand turnable lever 7a is pulled by the spring 27a and is caused to turn counterclockwise, whereby the small diameter gear 9a is brought into meshing engagement with the large diameter gear 26 in the same rotation transmitting unit and the tap is again caused to run in the rightward direction.

When it is desired to stop the playback opera-

tion, it is only necessary to push the stop lever 38. By this operation, the magnetic head 2 is caused to return to the stop, namely, eject position from the play position and at the same time, the tape-driving
5 motor is stopped, thereby bringing the tape recorder into a stopped state. Description of this mechanism is however omitted here because it is commonly known.

On the other hand, the pushing of the stop lever 38 causes the bulge 39 provided with the stop lever 38
10 to slide onto the lower surface of the hook member 24 so that the hook member 24 is lifted as depicted in FIGURE 5. If the automatic reverse device is at this time in the state shown in FIGURE 4 in which the engagement pin 22 is maintained in engagement with the
15 engagement tab 24a and the changeover bar 17 has been moved in the leftward direction, the engagement pin 22 is released from the engagement tab 24a by the upward displacement of the hook member 24 as a result of the sliding contact of the bulge 39 so that the changeover
20 bar 17 is allowed to return in the rightward direction. Therefore, the tap is always allowed to run in the leftward direction when the next playback or recording operation is started.

The stop lever 38 has been described in the
25 first embodiment as one example of the interlocking member for determining the starting side of the

cassette. It is also possible to provide a play lever or recording lever with a function to release the hook member 24, so that when the previous operation was stopped during the rotation of the left-hand reel shaft, the changeover bar 17 is changed over in the rightward direction at the same time as the pushing of the play lever or recording lever.

FIGURE 6 to FIGURE 10 illustrate the automatic reverse mechanism according to the second embodiment of this invention, which is suitable for use in a tape recorder. The same elements of structure as those depicted in FIGURE 1 to FIGURE 5 are identified by the same reference numerals. Description of the same elements of structure is therefore omitted herein.

In the second embodiment, a two-state lever 125 which is pivotal in a two-state fashion between paired stopper pins 123 and 124 by a toggle spring 122 is provided in the vicinity of one end of the changeover bar 17 as shown in FIGURE 6. These two-state lever 125 and toggle spring 122 constitute a pinch roller changeover mechanism together with the changeover bar 17. When the changeover bar 17 has moved, for example, in the leftward direction and the two-state lever 125 has been turned to a point beyond the neutral point, the changeover bar 17 is moved further in the leftward direction owing to the turning force of the two-state

lever 125, whereby the right-hand pinch roller 4a is separated from the capstan 3a.

On the other hand, the magnetic head 2 is provided on a head mounting plate 138 which is
5 displaceable back and forth in a direction perpendicular to the longitudinal direction of the changeover bar 17. The head mounting plate 138 is biased normally in the retreating direction (towards the stop, i.e., eject position) by means of two torsion springs 139a, 139b.
10 An engagement pin 140 as a locked member is provided upright at a rear end position on the upper surface of the head mounting plate 138. The rear end portion of the head mounting plate 138 forms a push button 141.

Underneath the changeover bar 17, there is
15 provided a plate-like lock member 142 which is slidable horizontally in parallel with the changeover bar 17. The lock member 142 has a hook portion 143, which cooperates with the engagement pin 140. A pressure-receiving pin 144 is also provided on the upper surface
20 of the lock member 142 at a position near the hook portion 143. The lock member 142 is normally urged by means of a torsion spring 145 in the rightward direction as viewed in the drawing.

A selector member 146 is also provided at a part
25 of the changeover bar 17 with one end thereof secured pivotally on the changeover bar 17. This selector

member 146 has, at the other end thereof, a stepped pressing portion 147 which is engageable with the pressure-receiving pin 144. The selector member 146 is pivotally urged by a torsion spring 148 in a direction where the stepped pressing portion 147 is brought into engagement with the pressure-receiving pin 144.

Designated at numeral 149 is a selector lever which is provided displaceably back and forth in a direction perpendicular to the length of the changeover bar 17. This selector lever 149 has a lock pin 150 and is normally urged by a torsion spring 151 in the retreating direction. The lock pin 150 engages the selector member 146 and holds the selector member 146 at a position where the the selector member 146 is maintained out of engagement from the pressure-receiving pin 144. By pushing the selector lever 149 against the force of the spring 151, the selector member 146 is however caused to turn following the lock pin 150 so that the stepped pressing portion 147 is brought into engagement with the pressure-receiving pin 144 as indicated by an imaginary line in FIGURE 6. Incidentally, the selector lever 149 has a hook portion 152 at a position on one of the side edges thereof. By bringing this hook portion 152 into engagement with a spring stud 153 on which the tension spring 151 is

hooked, the selector lever 149 is held at its pushed position.

A description will next be made of the operation of the automatic reverse mechanism according to the second embodiment of this invention.

In FIGURE 6, the head mounting plate 138 has moved forward and the engagement pin 140 has been brought into engagement with the hook portion 143 of the lock member 142, whereby the magnetic head 2 is held at the play position thereof. Furthermore, the right-hand pinch roller 4a is being pressed against the capstan 3a so that the rotation, the direction of which is indicated by an arrow, of the capstan 3a is transmitted to the right-hand reel shaft 1a by way of the gears 5a, 8a, 9a, 26a and the unillustrated friction mechanisms. Accordingly, a playback mode is being performed there (note: the magnetic tape is omitted in the drawing).

When the playback mode is performed in the manner described above, the movements of the cam followers 31a, 31b, the auxiliary holding members 32a, 32b and the like are the same as those described above in connection with the first embodiment. Namely, the rotary force of the reel shaft 1a is transmitted at this time to the cam follower 31a via the pushing and urging portion 29a, thereby bringing the contact portion 33a of the cam follower 31a into sliding contact with the cam surface 11a. So long as the contact portion 33a is maintained

in sliding contact with the cam surface 11a in the above-described manner, the contact portion 33a and cam 12a are not allowed to contact each other.

When the playback mode is performed with the tape being wound up on the right-hand reel shaft 1a in the above-described manner, the left-hand reel shaft 1b serves as a releasing reel shaft. Therefore, the pushing and urging portion 29b is not pressing the pressure-receiving portion 34b of the cam follower 31b. In this state, the left-hand rotation transmitting unit (the gears 8b, 9b) have however already separated from the large diameter gear 26 and moved to the non-engagement position relative to the reel shaft 1b, so that the lower arm 36b of the auxiliary holding member 32b is being pressed by the shaft 10b. The upper arm 37b of the auxiliary holding member 32b is hence pressing the elastic finger 35b of the cam follower 31b, whereby the auxiliary holding member 32b instead of the pushing and urging portion 29b is holding the contact portion 33b of the cam follower 31b in sliding contact with the cam surface 11b.

When the tape has been fully wound up on the right-hand reel, slipping takes place in the friction mechanism interposed between the large diameter gear 26a and reel shaft 1a so that the reel shaft 1a stops. The contact portion 33a which has been maintained in sliding contact with the cam surface 11a is then

separated from the cam surface 11a at a position closest to the shaft 10a, so that the cam 12a is brought into contact with the contact portion 33a as shown in FIGURE 2 of the first embodiment. Since the
5 fulcrum of the cam follower 31 does not move, the rotation transmitting member, namely, the turnable lever 7a is caused to turn against the force of the spring 27a to separate the gear 9a from the large diameter gear 26a. As a result, the transmission of
10 the rotary force to the large diameter gear 26a is stopped.

Further, the turning movement of the turnable lever 7a causes the bent end portion 13a of the turnable lever 7a to press a lug 19a of the changeover
15 bar 17 from the right as illustrated in FIGURE 7, so that the changeover bar 17 is moved in the leftward direction. In response to the leftward movement of the changeover bar 17, the two-state lever 125 is caused to turn clockwise while compressing the toggle spring 122.
20 As soon as the toggle spring 122 is moved beyond the neutral point, the spring force of the spring 122 acts in the direction that the two-state lever 125 is turned further in the clockwise direction. Hence, the changeover bar 17 is caused to move rapidly in the
25 leftward direction.

At this time, the left-hand inclined edge 21b of the changeover bar 17 releases the bracket 15b as shown in FIGURE 8 while the right-hand inclined edge 21a causes the bracket 15a to turn in the direction
5 opposite to its urged direction. As a result, the left-hand pinch roller 4b is pressed against the capstan 3b and the right-hand pinch roller 4a is separated from the capstan 3a.

Further, the left-hand turnable lever 7b is
10 turned clockwise under the pulling force of the spring 27b, whereby the small diameter gear 9b of the rotation transmitting unit is brought into meshing engagement with the large diameter gear 26b in the same rotation transmitting unit.

As illustrated in FIGURE 8, the automatic
15 reverse mechanism has thus been brought into a state opposite to that shown in FIGURE 6. A playback or recording mode is performed while the left-hand reel shaft 1b is rotating in the winding direction and the
20 tape is being wound up on the left-hand reel.

In the above-described operation, the reversing operation of the magnetic tape is carried out repeatedly. When it is desired to stop this operation, it is only necessary to cause the lock member 142 to
25 move in the leftward direction as viewed in the drawings against the force of the spring 145 by a

predetermined stopping operation so that the hook portion 143 is released from the engagement pin 140 to allow the head mounting plate 138 to return to the retreated position.

5 When it is desired to automatically stop the tape recorder in a playback or recording mode when the magnetic tape has been fully wound up on the right-hand reel, it is only necessary to push the selector lever 149.

10 When the selector lever 149 is pushed to bring the hook portion 152 into engagement with the spring stud 153 as depicted in FIGURE 9, the selector member 146 is caused to turn by the spring 148 following the lock pin 150 so that the stepped pressing portion 147
15 assumes a position on a side of the pressure-receiving pin 144 provided on the lock member 142.

 The magnetic tape is wound fully on the right-hand reel in the above-described state. When the changeover bar 17 has moved in the leftward direction,
20 the stepped pressing portion 147 pushes the pressure-receiving pin 144 in the leftward direction. Accordingly, the lock member 142 is caused to move leftwards to release the hook portion 143 from the engagement pin 140. As a result, the head mounting
25 plate 138 is hence retreated by the springs 139a, 139b

so that the magnetic head 2 is caused to return to the stop, i.e., eject position.

Since the changeover bar 17 has moved to the left when the tape recorder was automatically stopped
5 by pushing the selector lever 149, the left-hand reel always serves as a winding reel when a next playback or recording operation is started. Therefore, the magnetic tape runs in the leftward direction.

As an alternative, the play or recording lever
10 may be allowed to return to its original position when the selector member has moved together with the changeover lever (i.e., pinch roller changeover member) to urge the engagement pin (locked portion), whereby the magnetic head is caused to return to its stop,
15 i.e., eject position.

FIGURE 11 and FIGURE 12 show the third embodiment of this invention. The same elements of structure as those depicted in FIGURE 1 to FIGURE 10 are identified by the same reference numerals.
20 Description of the same elements of structure is therefore omitted herein.

In the third embodiment, a two-state plate 224 which is pivotal by a toggle spring 222 in a two-state fashion within a range defined by a stopper pin 223 is
25 connected in the vicinity of one end of the changeover bar 17. These two-state plate 224 and toggle spring

222 constitutes a pinch roller changeover mechanism together with the changeover bar 17. When the changeover bar 17 has moved, for example, in the leftward direction and the two-state plate 224 has
5 turned to a point beyond the neutral point, the changeover bar 17 is moved further in the leftward direction owing to the spring force of the two-state plate 224. As a result, the right-hand pinch roller 4a is separated from the capstan 3a. Namely, they exhibit
10 the same function as the toggle spring 122, stopper pins 123, 124 and two-state lever 125 in the second embodiment (see, FIGURE 6).

In addition, a tape running direction indicator 225 is fixedly attached to the two-state plate 224. On
15 the outer casing (not illustrated) of the tape recorder, an indicator for indicating the position of the tape running direction indicator 25, in other words, the running direction of the magnetic tape such as "F" and "R" is also provided.

20 Owing to the above-described construction, the automatic changeover of the running direction of the tape can be performed in the same principle as the second embodiment, namely, the embodiment illustrated in FIGURE 6 through FIGURE 10. In the third
25 embodiment, the tape running direction indicator 225 is at the "F" position as shown in FIGURE 11 while the

pinch roller 4a is being pressed against the capstan 3a and the tape is running in the rightward direction. So long as the pinch roller 4b is being pressed against the capstan 3b and the tape is running in the leftward direction, the tape running direction indicator 225 is maintained at the "R" position as depicted in FIGURE 12. Since the tape running direction indicator 225 connected to the changeover bar 17 can therefore indicate the running direction of the tape, it is possible to find out immediately in which direction the tape is running, in other words, whether the tape is running leftwards or rightwards by simply taking a look at the tape running direction indicator 225 even in such an application mode that the magnetic tape, reel shafts and the like are not visible from the outside as in the case of their use in a state assembled in a vehicle. This is extremely convenient. Moreover, the running direction of the tape can be manually changed over by manually turning the indicator 225 clockwise or counterclockwise as the case may be.

FIGURE 13 to FIGURE 16 show the fourth embodiment of this invention. The same elements of structure as those depicted in FIGURE 11 to FIGURE 12 are identified by the same reference numerals. Description of the same elements of structure is therefore omitted herefrom.

In the fourth embodiment, a fast feeding mechanism is additionally incorporated in the third embodiment described above.

Designated at numeral 238 in FIGURE 13 is a head mounting member, with the magnetic head 2 mounted thereon, which is provided displaceably back and forth in a direction perpendicular to the length of the changeover bar 17. A cam pin 239 projects from an end portion of the head mounting member 238. The cam pin 239 is fit in a cam slot 241 of a fast feeding control member 240 which is provided displaceably in the horizontal direction. The fast feeding member 240 has an engagement jaw 242 at a position near the cam slot 241 and is normally urged by a tension spring 243 in the rightward direction as viewed in the drawing. Owing to the spring force of the spring 243, the head mounting plate 238 is urged toward the play position where the magnetic head is maintained in contact with the magnetic tape. On the other hand, an engagement pin 244 is provided upright at a central part of the changeover bar 17. As illustrated in FIGURE 14 to FIGURE 16, one end of an interlocking member 245 is fit over the pin 244. The interlocking member 245 is pivotally supported at a central part thereof on a base (not illustrated) of the tape recorder and is equipped at the other end thereof with a bulge 246.

Numeral 247 indicates a hook member in FIGURE 14 to FIGURE 17. This hook member 247 defines an engagement recess 248 engageable with the engagement

jaw 242 to lock the fast feeding control member 240 at its pushed position, a stopper portion 249 formed in opposition to the engagement recess 248, an inclined edge portion 250 formed in adjacent to the engagement
5 recess 248, a release recess 251 confronting the inclined edge portion 250, a sliding lug 252 located on the moving line of the bulge 246 of the interlocking member 245, and a projection 254 which may be brought into contact with a stopper pin 253 provided on the
10 fixing plate (not shown) so as to limit the range of the turning motion of the hook member 247. The hook member 247 is normally biased by a spring 255 in the counterclockwise direction as viewed in the drawings.

Owing to the above-described construction, the
15 automatic reverse mechanism according to the fourth embodiment of this invention can perform the automatic changeover of the running direction of a tape in the same principle as the mechanism shown in FIGURE 11 to FIGURE 12, and moreover, permits a fast feeding operation.

20 When it is desired to perform a fast feeding operation of the tape, it can be achieved in the following manner. Namely, the fast feeding control member 240 is pushed as shown in FIGURE 15 so that the engagement jaw 242 is brought into engagement with the
25 engagement recess of the hook member 247. Thereafter, the finger is removed from the fast feeding control

member 240. Here, the cam pin 239 provided on the head mounting plate 238 moves along the cam slot 241 of the fast feeding member 240 so that the head mounting member 238 is allowed to retreat to separate the magnetic head from the magnetic tape. At the same time, both left-hand and right-hand brackets 15a, 15b cause the pinch rollers 4a, 4b to separate from the capstans 5a, 5b in response to the retreating motion of the head mounting member 238. As a result, the tape is allowed to run at a fast speed in the same direction so that the fast feeding operation is performed.

In order to have the tape recorder return from this fast feeding mode to the playback or recording mode, there are the following two methods.

When it is desired to return to the playback or recording mode without changing the running direction of the tape, it is necessary to push the fast feeding control member 240 again. As a result, the engagement jaw 242 of the fast feeding control member 240 is released from the engagement recess 248 and is then caused to move into the release recess 251 to assume a position in front of the inclined edge portion 250. Upon simple removal of the finger, the engagement jaw 242 moves along the lower surface of the inclined edge portion 250 so that the engagement jaw 242 separates from the hook member 247, thereby allowing the fast

feeding control member 240 to return to the position shown in FIGURE 14. Therefore, the tape recorder has been changed from the fast feeding mode to the playback or recording mode again.

5 When it is desired to change the tape recorder to the playback or recording mode by changing the running direction of the tape on the other hand, it is only necessary to change the tape running direction indicator 225 in the clockwise or counterclockwise
10 direction. Owing to the resulting sliding movement of the changeover bar 17, the interlocking member 245 is caused to rotate. Here, the bulge 246 of the interlocking member 245 is brought into sliding contact with the sliding lug 252, as shown in FIGURE 17, so as to lift the hook member
15 247. The engagement jaw 242 of the fast feeding control member 240 is hence released from the engagement recess 248 of the hook member 247, thereby allowing the fast feeding control member 240 to return to the position shown in FIGURE 14. Since the
20 changeover bar 17 is also moved in the above-described operation, the running direction of the tape is changed over to perform a playback or recording operation.

 When such an automatic reverse mechanism is incorporated in a cassette tape recorder, the above-
25 described fast feeding control member 240 may also be provided with the cassette-ejecting function. Namely,

it may be designed to allow the fast feeding control member 240 to be pushed beyond its position depicted in FIGURE 15 and to actuate the eject mechanism by the extra pushing stroke.

5 The changeover bar 17 may also be moved by a separate member instead of moving it directly by the members which carry the rotation transmitting units. In addition, the tape running direction indicator 225 is not limited to the pivotal structure shown in the
10 above-described fourth embodiment but may take the horizontally sliding structure or may be composed of a pair of members provided respectively at both ends of the two-state member 224.

15

20

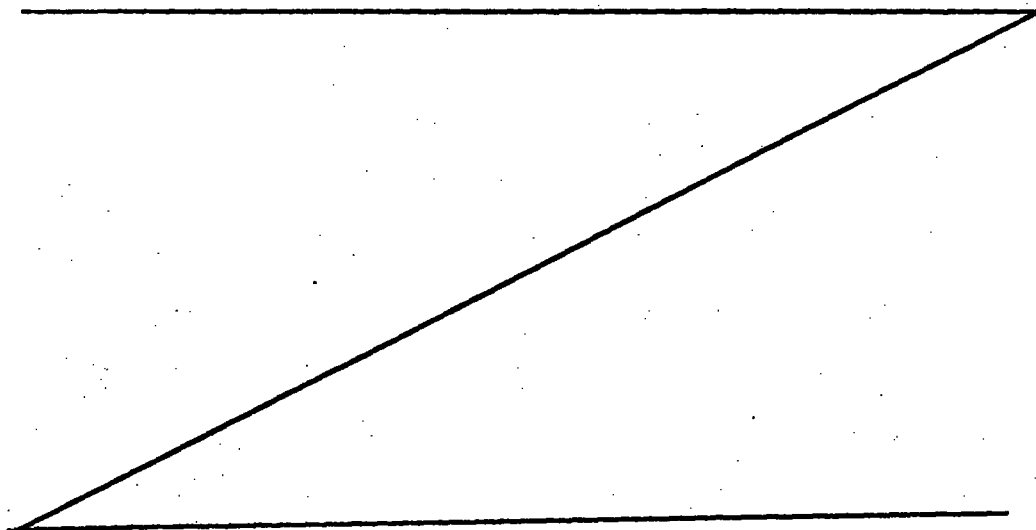


FIGURE 18 to FIGURE 21 illustrate the fifth embodiment of this invention. In FIGURE 18, the right-hand reel shaft 1a is rotating. The left-hand reel
25 shaft 1b is rotating in FIGURE 21. FIGURE 19 and

FIGURE 20 illustrate the automatic reverse mechanism in the course of its change from the state shown in FIGURE 18 to its state depicted in FIGURE 21.

In these figures, the same elements of structure as those in the first embodiment (FIGURE 1 to FIGURE 5) are identified by the same reference numerals. Description of the same elements of structure is therefore omitted herein.

In the fifth embodiment, an eccentric circular cam surface 11 is formed about the shaft 10a of the large diameter gear 8a on one side only. In addition, a cam 12 projects from and in continuation with the shaft 10a at the position where the eccentric circular cam surface 11 has the maximum radius.

Further, an engagement pin 322 projects out from a part of the changeover bar 17. At a position near the changeover bar 17, a hook member 324 is provided turnably. This hook member 324 is urged clockwise as viewed in the drawings by a spring 325 provided at the fulcrum of its pivotal movement.

Numerical 330 indicates a fixing plate, on which a cam follower 331 is pivotally supported. This cam follower 331 has pressure receiving arms 332a, 332b corresponding respectively to the pressing and urging members 29a, 29b. In addition, a third arm extends toward the eccentric circular cam surface 11, and a contact

portion 333, which can undergo sliding contact with the eccentric circular cam surface 11 is provided at an end portion of the third arm.

5 The hook member 324 is provided with its free end directed toward the right. By the spring force of the spring 325, the free end of the hook member 324 is normally maintained in engagement with the engagement pin 322. The hook member 324 defines a locking recess 324 engageable with the engagement pin 322 so as to
10 hold the changeover bar 17 at the leftwardly-moved position thereof, a stopper portion 335 confronting the locking recess 334, an inclined portion 336 located in adjacent to the locking recess 334, and a release recess 337 opposing the inclined portion 336.

15 Designated at numeral 338 is a stop lever provided displaceably back and forth at a right angle with respect to the changeover bar 17. This stop lever 338 has a bulge 339 at a part of the upper surface thereof and is normally urged in the retreating
20 direction by a torsion spring 340. When this stop lever 338 advances and retreats, the bulge 339 slides on the lower surface of the free end portion of the hook member 324 so as to lift the hook member 324 upwards. If the engagement pin 322 of the changeover
25 bar 17 is in engagement with the locking recess 334 of the hook member 324 at this time, their engagement is

released as a result of the upward displacement of the hook member 324.

The operation of the automatic reverse mechanism according to the fifth embodiment will next be
5 described.

In FIGURE 18, the magnetic head 2 is maintained at the play position and the right-hand pinch roller 4a is being pressed against the capstan 3a. The rotation of the capstan 3a, the direction of which is indicated
10 by an arrow, is being transmitted to the right-hand reel shaft 1a by way of the gears 5a, 8a, 9a, 26a and the unillustrated friction mechanisms, whereby a playback operation is under way (note: the magnetic tape is omitted in the drawing).

15 In the above state, the rotary force of the reel shaft 1a is transmitted to the pressure-receiving arm 332a of the cam follower 331 via the pushing and urging portion 29a so that the contact portion 333 of the cam follower 331 is brought into sliding contact with the
20 cam surface 11. So long as the contact portion 333 is maintained in sliding contact with the cam surface 11 in the above manner, the contact portion 333 and cam 12 are maintained out of contact.

When the tape has been fully wound up on the
25 right-hand reel, slipping takes place in the unillustrated friction mechanism interposed between the

large diameter gear 26a and reel shaft 1a and the reel shaft 1a stops accordingly. At this time, the contact portion 333 which has been maintained in sliding contact with the cam surface 11 is separated from the cam surface 11 at a position closest to the shaft 10a and as shown in FIGURE 19, the cam 12 is then brought into contact with the contact portion 333. Since the fulcrum of the cam follower 331 does not move, the rotation transmitting unit, namely, the turnable lever 7a is caused to turn against the force of the spring 27a so that the gear 9a is separated from the large diameter gear 26a. As a result, the transmission of the rotary force to the large diameter gear 26a is stopped.

On the other hand, by the turning of the turnable lever 7a, the bent end portion 13a of the turnable lever 7a pushes the lug 19 of the changeover bar 17 from the right as shown in FIGURE 20 whereby the changeover bar 17 is moved in the leftward direction. As a result, the engagement pin 322 provided on the changeover bar 17 is brought into engagement with the locking recess 334 of the hook member 324 (FIGURE 21).

At this time, as shown in FIGURE 21, the left-hand inclined edge 21b of the changeover bar 17 releases the bracket 15b while the right-hand inclined edge 21a causes the bracket 15a to turn in the

direction opposite to its urged direction. As a result, the left-hand pinch roller 4b is pressed against the capstan 3b while the right-hand pinch roller 4a is separated from the capstan 3a.

5 In addition, the left-hand turnable lever 7b is caused to turn clockwise under the pulling force of the spring 27b, thereby bringing the small diameter gear 9b in the rotation transmitting unit into meshing engagement with the large diameter gear 26b in the same
10 rotation transmitting unit.

As shown in FIGURE 21, the automatic reverse mechanism is hence brought into a state opposite to that depicted in FIGURE 18 and the left-hand reel shaft 1b is driven in the winding direction. A playback or
15 recording operation is hence performed while the tape is being taken up on the left-hand reel.

When the tape has been fully wound up on the left-hand reel in the above-described manner, slipping takes place in the unillustrated friction mechanism
20 interposed between the large diameter gear 26b and reel shaft 1b, resulting in stoppage of the reel shaft 1b. Accordingly, the contact portion 333 which has been maintained in sliding contact with the cam surface 11 is caused to come closest to the shaft 10a and is then
25 separated from the cam surface 11. Similar to the state shown in FIGURE 19, the cam 12 is brought into

contact with the contact portion 333. As a result, the turnable lever 7a is turned against the force of the spring 27a as stated above and the changeover bar 17 is pushed again in the leftward direction by the bent end portion 13a. As
5 a consequence, the engagement pin 322 is allowed to advance in the locking recess 334 to a position in the release recess 337, said position being located in front of the inclined portion 336. Upon elimination of the pressing force from the bent end portion 13a, the
10 engagement pin 322 enters underneath the lower surface of the inclined portion 336 so that the changeover bar 17 is allowed to return simply in the rightward direction owing to the pulling force of the tension spring 23. Here, as shown in FIGURE 18, the right-hand
15 inclined edge 21a of the changeover bar 17 releases the bracket 15a while the left-hand inclined edge 21b causes the bracket 15b to turn in the direction opposite to its urged direction. As a result, the right-hand pinch roller 4a is pressed against the
20 capstan 3a while the left-hand pinch roller 4b is separated from the capstan 3b.

Furthermore, the right-hand turnable lever 7a is caused to turn counterclockwise under spring force of the spring 27a whereby the small diameter gear 9a in
25 the rotation transmitting unit is brought into meshing engagement with the large diameter gear 26a in the same

rotation transmitting unit. As a result, the tap is caused to run rightwards again.

When it is desired to stop the playback operation, it is only necessary to push the stop lever 5 338. By this operation, the magnetic head 2 is caused to return from the play position to the stop, i.e., eject position and the tape driving motor (not shown) is turned off, so that the tape recorder is stopped. This mechanism is omitted herein because it is commonly 10 known.

When the stop lever 338 is operated on the other hand, the bulge 339 provided on the stop lever 338 slides on the lower surface of the end portion of the hook member 324 so that the hook member 324 is lifted. 15 If the engagement pin 322 is in engagement with the hook member 324 and the changeover bar 17 is in the state moved leftwards as shown in FIGURE 21 at this time, the engagement pin 322 is released from the locking recess 334 when the hook member 324 is lifted 20 upwardly owing to the sliding contact of the bulge 339. As a consequence, the changeover bar 17 is allowed to return in the rightward direction. The tape always begins to run in the leftward direction when the next playback or recording operation is started. It is 25 hence possible to omit the cumbersome operation to return to the side A even when the contents of information on the sides A and B of a tape is continuous.



CLAIMS:

1. An automatic reverse mechanism for a tape recorder, in which capstans, pinch rollers and reel shafts are arranged symmetrically on both sides of an associated magnetic head, the capstans on both sides of
5 the magnetic head and either one of said reel shafts are normally driven and rotated, the pinch roller on the same side as the rotating reel shaft is pressed against the corresponding capstan to cause the magnetic tape of a tape cassette inserted in the tape recorder
10 to run in one direction, and when the magnetic tape has been fully wound up, the running direction of the magnetic tape is automatically changed over, comprising:

a rotation transmitting means having a pair of
15 rotation transmitting members arranged symmetrically relative to the magnetic head, said rotation transmitting members being rotated normally under rotary forces of the corresponding capstans so as to transmit the rotary forces to the corresponding reel
20 shafts via friction mechanisms respectively;

an eccentric circular cam surface provided eccentrically about a rotary shaft of at least one of the rotation transmitting members, and an engagement



portion provided with said at least one rotation transmitting member;

5 a reel-shaft stop detecting means for detecting each stop of at least one of the reel shafts, said means having a cam follower portion and a contact portion and adapted to receive a rotary force of said at least one reel shaft via a friction mechanism; said cam follower being maintained in sliding contact with the eccentric circular cam surface so as to avoid
10 engagement between the contact portion and the engagement portion and when said at least one reel shaft stops, remaining at a position apart from the eccentric circular cam surface, whereby the contact portion is allowed to engage the engagement portion and
15 at the same time said at least one rotation transmitting member is displaced from an engagement position to a non-engagement position relative to the corresponding reel shaft by a turning force developed in said at least one rotation transmitting member; and

20 a reversing means operable responsive to each displacement of said at least one rotation transmitting member to the non-engagement position so that the pinch roller associated with said at least one rotation transmitting member is separated from its corresponding
25 capstan, the other pinch roller is brought into contact with the other rotation transmitting member, and the



other rotation transmitting member is displaced to an engagement position relative to its corresponding reel shaft.

2. The automatic reverse mechanism as claimed
5 in Claim 1, wherein the cam follower portion also serves as the contact portion.

3. The automatic reverse mechanism as claimed
in Claim 1, wherein the rotation transmitting means
includes, in addition to said pair of rotation
10 transmitting members, a pair of turnable members which are arranged symmetrically relative to the magnetic head, are turnable respectively about predetermined central axes, carry the corresponding rotation transmitting members rotatably thereon, and are
15 connected at one ends thereof to the reversing means.

4. The automatic reverse mechanism as claimed
in Claim 3, wherein the reel-shaft stop detecting means comprises, with respect to each of the reel shafts, a pushing and urging member provided at a position other
20 than the center of the corresponding reel shaft and adapted to receive a rotary force of the corresponding reel shaft via the associated friction mechanism, and a cam follower member and auxiliary holding member both



supported pivotally; the cam follower member has the corresponding cam follower portion and contact portion, a pressure receiving portion positioned on the path of rotation of the pushing and urging member, and an elastic finger; and the auxiliary holding member has two arms, one located outside the rotary shaft of the corresponding rotation transmitting member and the other facing the elastic finger of the corresponding cam follower member.

10 5. The automatic reverse mechanism as claimed in Claim 3, wherein the reel-shaft stop detecting means is equipped with pushing and urging members, which are provided at positions other than the centers of the respective reel shafts and are adapted to receive
15 rotary forces of the respective reel shafts via the associated friction mechanisms, and a cam follower common to both reel shafts, said cam follower being supported pivotally; and the cam follower member has two pressure-receiving portions, which correspond to
20 the pushing and biasing members respectively, the cam follower portion, and the contact portion.

6. The automatic reverse mechanism as claimed in Claim 3, wherein the eccentric circular cam surface is an inner peripheral wall of a recess formed around



the rotary shaft of the rotation transmitting member and the engagement portion is provided as an engaging projection in the recess.

5 7. The automatic reverse mechanism as claimed
in Claim 3, wherein the reversing means comprises a
changeover bar, which is connected to both turnable
members and displaceable reciprocally between a first
position and second position, and a toggle spring for
10 biasing the changeover bar selectively to either the
first or the second position in cooperation with the
turnable members.

8. The automatic reverse mechanism as claimed
in Claim 7, wherein a manually-operable member is
interposed between the changeover bar and the toggle
15 spring.

9. The automatic reverse mechanism as claimed
in Claim 8, wherein the manually-operable member also
serves as a member for indicating the running direction
of the magnetic tape.

20 10. An automatic reverse mechanism according
to Claim 1, having a means for determining the starting
side of the tape cassette by controlling the reversing



means in such a way that an operating mode of the tape recorder is released to stop the tape recorder and responsive to the stop of the tape recorder one of the rotation transmitting members, said one rotation
5 transmitting member being on a predetermined side, is displaced to the engagement position relative to the corresponding reel shaft.

11. The automatic reverse mechanism as claimed in Claim 3, having a means for determining the starting side
10 of the tape cassette by controlling the reversing means in such a way that an operating mode of the tape recorder is released to stop the tape recorder and responsive to the stop of the tape recorder one of the rotation transmitting members, said one rotation transmitting
15 member being on a predetermined side, is displaced to the engagement position relative to the corresponding reel shaft.

12. The automatic reverse mechanism as claimed in Claim 11, wherein the reversing means comprises a
20 changeover bar connected to both turnable members and displaceable reciprocally between a first position and second position, a spring for biasing the changeover bar toward the first position, and a hook for holding the changeover bar, which has been displaced by one of the
25 rotation transmitting members toward the second position against the spring, so as to hold the



changeover bar at the second position and for releasing its engagement with the changeover bar located at the second position by the other rotation transmitting member and the starting-side determining means.

5 13. The automatic reverse mechanism as claimed
in Claim 12, wherein the starting-side determining
means comprises a means for stopping the operation of
the tape recorder and a release means for releasing the
changeover bar from the hook by an action of the
10 stopping means.

 14. The automatic reverse mechanism as claimed
in Claim 13, wherein the release means is a projection
for lifting the hook, which has engaged a pin provided
upright on the changeover bar and is holding the
15 changeover bar at the second position, responsive to
the stop means, whereby the engagement between the hook
and pin is released.

 15. An automatic reverse mechanism according to
Claim 10 wherein the starting-side determining means is
20 equipped with a reverse mode selector means which permits
manual selection of either one of two positions and stops
an operation of the tape recorder responsive to a
displacement of one of the turnable members only at one
of the two positions.



16. The automatic reverse mechanism as claimed in Claim 15, wherein the reversing means comprises a changeover bar connected to both turnable members and displaceable reciprocally between a first position and second position, a spring for biasing the changeover bar toward the first position, and a hook for holding the changeover bar, which has been displaced by one of the rotation transmitting members toward the second position against the spring, so as to hold the changeover bar at the second position and for releasing its engagement with the changeover bar located at the second position by the other rotation transmitting member and the starting-side determining means; and the reverse mode selector means is equipped with a selector member mounted on the changeover bar in such a state that the selector member can select either one of two positions, and the selector member causes the magnetic head to return to a stop position only when the changeover bar moves in one direction in a state that one of the positions has been selected.

17. An automatic reverse mechanism according to Claim 1, having

a fast forward feeding member for causing the magnetic head to retreat when the fast forward feeding member is manually pushed in a playback mode;

a lock means for holding the fast forward feeding



member at a pushed position upon manual pushing of the fast forward feeding member, said lock means releasing the holding of the fast forward feeding member when the fast forward feeding member is pushed again; and

5 a fast forward feeding release means for releasing the holding of the fast forward feeding member responsive to an operation of the reversing means when the fast forward feeding member is held at its pushed position by the lock means.

10 18. An automatic reverse mechanism for a tape recorder substantially as any one of the specific embodiments hereinbefore described with reference to, and as shown in, the accompanying drawings.
