

AUTOMATIC REVERSING TAPE FEEDING DEVICE

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates improvements in or relating to an automatic reversing tape feeding device wherein a resiliently holding mechanism for resiliently holding a tape feeding direction change-over member alternatively at one of a pair of limit positions of movement thereof in the opposite directions is mounted on a head mounting plate such that, when the head mounting plate is advanced, the position of the tape feeding direction change-over member may be modified by the resiliently holding mechanism so that a reproducing operation after high speed feeding may be done in the same tape feeding direction as that before such high speed feeding.

2) Description of the Prior Art

An automatic reversing tape feeding device is already known. One of conventional automatic reversing tape feeding devices is disclosed, for example, in Japanese Patent Laid-Open No. 61-22416 and is shown in FIG. 4 in which the tape feeding device is viewed from the back side.

Referring to FIG. 4, a pair of capstans 1a and 1b, a pair of pinch rollers 2a and 2b, a pair of reel receivers 3a and 3b, a pair of rotation transmitting gears 4a and 4b for transmitting rotation of the capstans 1a and 1b to the reel receivers 3a and 3b, respectively, and a pair of gear supporting members 5a and 5b supporting the rotation transmitting gears 4a and 4b for rotation thereon, respectively, are disposed in a symmetrical relationship on the opposite sides of a head 7 which is mounted on a head mounting plate 6. The rotation transmitting gears 4a and 4b are alternatively moved into or out of rotation transmitting routes from the capstans 1a and 1b to the reel receivers 3a and 3b by the gear supporting members 5a and 5b, respectively.

A tape feeding direction change-over member 8 is mounted for leftward and rightward movement in FIG. 4 for moving the gear supporting members 5a and 5b and the pinch rollers 2a and 2b in an interlocking relationship with each other. A manually operable change-over operating member 9 is mounted for pivotal motion and operatively connected to the tape feeding direction change-over member 8. A toggle spring 10 is connected to the change-over operating member 9 such that the tape feeding direction change-over member 8 may be resiliently held, via the change-over operating member

9, alternatively at one of the opposite end positions of movement thereof in the opposite leftward and rightward directions in FIG. 4 by the biasing force of the toggle spring 20. A high speed feeding operating member 11 is also provided for manual operation to retract the head mounting member 6 from a magnetic tape not shown to allow high speed feeding of the tape. The high speed feeding operating member 11 is normally biased in the rightward direction in FIG. 4 by a spring 12. The high speed feeding operating member 11 has a cam slot or guideway 13 formed therein while a cam follower pin 14 is securely mounted on the head mounting plate 6. The cam follower pin 14 is held in fitting engagement with the cam slot 13 so that, if the high speed feeding operating member 11 is manually pushed in to move in the leftward direction in FIG. 4 against the biasing force of the spring 12, the head mounting plate 6 is moved downwardly in FIG. 4 to retract the mounting head 7 thereon away from a magnetic tape not shown.

20 A pair of rotary disks 15a and 15b are disposed in a concentrical relationship with the reel receivers 3a and 3b such that they may receive a turning force of the reel receivers 3a and 3b, respectively. Each of the rotary disks 15a and 15b has a pressing pin 15'a or 15'b
25 securely mounted thereon. While the reel receiver 3a or

3b is rotating in its tape winding direction, a corresponding one of a pair of pivotal cam followers 16a and 16b is continuously pressed by the pressing pin 15'a or 15'b on the rotary disk 15a or 15b concentrical with
5 the rotating reel receiver 3a or 3b. Consequently, an end projection of the cam follower 16a or 16b is held in sliding contact with a corresponding one of a pair of eccentric cams 17a and 17b in the form of inner peripheral cam faces formed on the rotation transmitting
10 gears 4a and 4b, respectively. A pair of radial abutting projections 18a and 18b are provided at locations on the rotation transmitting gear 4a and 4b radially inwardly of the eccentric cams 17a and 17b, respectively. If rotation of the reel receiver 3a or 3b
15 in its tape winding direction is stopped and then the end projection of the corresponding cam follower 16a or 16b is spaced away from the corresponding eccentric cam 17a or 17b as the corresponding rotation transmitting gear 4a or 4b further rotates, the abutting projection
20 18a or 18b on the rotation transmitting gear 4a or 4b is soon engaged with and pushes the end projection of the cam follower 16a or 16b. Consequently, as the rotation transmitting gear 4a or 4b further rotates, the corresponding gear supporting member 17a or 17b is
25 pivoted by the rotation transmitting gear 4a or 4b so

that the rotation transmitting gears 4a or 4b is moved out of the rotation transmitting route from the capstan 1a or 1b to the reel receiver 3a or 3b.

A pair of pressing members 19a and 19b are provided for operation by shafts of the rotation transmitting gears 4a and 4b on the gear supporting members 5a and 5b, respectively. Each of the pressing members 19a and 19b acts, when the corresponding reel receiver 3a or 3b is not rotating in its tape winding direction, upon the corresponding cam follower 16a or 16b to assure contacting engagement of the end projection of the cam follower 16a or 16b with the eccentric cam 17a or 17b.

In FIG. 4, the tape feeding device is shown in a reproducing condition wherein the reel receiver 3b on the reverse feeding side is rotating in its tape winding direction. If a tape not shown is wound to its last end so that the reel receiver 3b is stopped by the tension of the tape, then the gear supporting member 5b is pivoted in the clockwise direction in FIG. 4 around the capstan 1b. Upon such pivotal motion of the gear supporting member 5b, the tape feeding direction change-over member 8 is moved in the leftward direction in FIG. 4 against the biasing force of the toggle spring 10 so that the other gear supporting member 5a is pivoted

in the clockwise direction to move the rotation transmitting gear 4a into the rotation transmitting route from the capstan 1a to the reel receiver 3a, thereby changing over the tape feeding direction.

5 In case it is intended to feed the tape at high speed during reproduction wherein the tape is fed, for example, in the reverse direction as shown in FIG. 4, the high speed feeding operating member 11 will be manually pushed in, that is, moved in the leftward
10 direction in FIG. 4, against the spring 12. Thereupon, the head mounting plate 6 is retracted or moved downwardly in FIG. 4 so that the head 7 and the pinch roller 2b are spaced away from the tape. Consequently, the tape will be then wound onto a reel not shown on the
15 reverse side reel receiver 3b at a high speed independent of the speed of rotation of the capstan 1b.

 In case it is intended to change over the feeding direction of the tape to the forward side while the tape is being wound at a high speed onto the reel on the
20 reverse side reel receiver 3b in this manner, the change-over operating member 9 will be manually pivoted from its "R" position for the reverse feeding to its "F" position for the forward feeding as seen in FIG. 4. Thereupon, the tape feeding direction change-over member
25 8 is moved in the leftward direction in FIG. 4 so that

the rotation transmitting gear 4b on the reverse side is moved out of the rotation transmitting route from the capstan 1b to the reel receiver 3b while at the same time the rotation transmitting gear 4a on the forward side is moved into the rotation transmitting route from the capstan 1a to the reel receiver 3a, thereby changing over the tape feeding direction to the forward side.

With the conventional automatic reversing tape feeding device having such a construction as described above, in case it is intended, during reproduction wherein a tape is being fed in one direction, to rewind the tape by a desired amount in order to listen to the sounds of the same portion of the tape again, following several steps of operation are required. In particular, at first the high speed feeding operating member 11 and the change-over operating member 9 are manually operated successively to rewind the tape by a desired amount at a high speed, and the change-over operating member 9 is manually operated again to restore the initial tape feeding direction, whereafter the high speed feeding operating member 11 is manually returned to its normal inoperative position to resume a reproducing operation. It is a problem, therefore, that the operability is very low.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an automatic reversing tape feeding device wherein the operability is improved when it is attempted, during reproduction wherein a tape is being fed in one direction, to rewind the tape by a desired amount in order to listen to the sounds of the same portion of the tape again.

In order to attain the object, according to the present invention, there is provided an automatic reversing tape feeding device wherein a pair of capstans, a pair of pinch rollers, a pair of reel receivers, a pair of rotation transmitting gears for individually transmitting rotation of the capstans to corresponding ones of the reel receivers, and a pair of gear supporting members individually supporting the rotation transmitting gears for rotation thereon and selectively movable to move the rotation transmitting gears into rotation transmitting routes from the capstans to the reel receivers are disposed in a symmetrical relationship on the opposite sides with respect to a head which is mounted on a head mounting plate, and wherein it includes a reciprocally movable tape feeding direction change-over member for moving the

gear supporting members and the pinch rollers in an interlocking relationship with each other, a resiliently holding mechanism for resiliently holding the tape feeding direction change-over member alternatively at one of a pair of limit positions of movement in the opposite directions, and a manually operable high speed feeding operating member for changing over the position of the tape feeding direction change-over member to selectively cause high speed feeding of a magnetic tape in the opposite directions while the head mounting plate is in its retracted position and the head and the pinch rollers are spaced away from the magnetic tape, whereby, when rotation of one of the reel receivers which is rotating in its winding direction is stopped, a corresponding one of the winding side gear supporting members is pivoted in response to such stopping of the one reel receiver to move the tape feeding direction change-over member against the resilient holding force of the resiliently holding mechanism so that the tape feeding direction is changed over, the automatic reversing tape feeding device being characterized in that the resiliently holding mechanism is mounted on the head mounting plate and an engaging portion and a pair of inclined faces contiguous to the engaging portion are provided in a symmetrical relationship on the tape

feeding direction change-over member while an engaging element for engaging with the engaging portion of the tape feeding direction change-over member is provided on the resiliently holding mechanism, whereby the

5 engagement between the engaging element and the engaging portion is interrupted when the head mounting plate is moved from its advanced position to its retracted position, but when the head mounting plate is moved from the retracted position to the advanced position, the

10 engaging element may be slidably contacted with one of the inclined faces to modify the position of the tape feeding direction change-over member to the same position as that before the high speed feeding operating member has been operated.

15 In case it is intended, during reproduction wherein a tape is being fed in one direction, to rewind the tape by a desired amount in order to listen to the sounds of the same portion of the tape again, the high speed operating member is manually operated to change

20 over the feeding direction of the tape while the head mounting plate is retracted. Then, after the tape is rewound at a high speed by a desired amount, the operating force upon the high speed operating member is canceled so that the head mounting plate is advanced

25 again. Thereupon, the position of the tape feeding

direction change-over operating member is automatically modified to its initial position so that a reproducing operation is resumed in the same tape feeding direction as that before such high speed feeding.

5 Accordingly, the operability when it is intended, during reproduction wherein a tape is being fed in one direction, to rewind the tape by a desired amount and listen to the sounds of the same portion of the tape again is improved remarkably, and the object of the
10 present invention described above can be attained.

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

BRIEF DESCRIPTION OF THE DRAWINGS

15 FIGS. 1 to 3 are schematic bottom plan views of an automatic reversing tape feeding device in different operating conditions with a chassis or like base members omitted showing a preferred embodiment of the present
invention; and

20 FIG. 4 is a schematic bottom plan view showing an exemplary one of conventional automatic reversing tape feeding devices with a chassis or like base members omitted.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring to FIGS. 1 to 3, there is shown an automatic reversing tape feeding device to which the present invention is applied. The automatic reversing
5 tape feeding device shown has a generally similar construction to that of the conventional automatic reversing tape feeding device of FIG. 4. Accordingly, in FIGS. 1 to 3, like parts are denoted by like reference symbols to those of FIG. 4, and overlapping
10 description thereof is omitted herein to avoid redundancy.

The automatic reversing tape feeding device shown includes a resiliently holding mechanism 20 for resiliently holding a tape feeding direction change-over
15 member 8 alternatively at one of a pair of end positions of movement thereof in the opposite leftward and rightward directions in FIG. 1. The resiliently holding mechanism 20 is mounted substantially at a central location on a head mounting plate 6 which is normally
20 biased in a forward (upward in FIG. 1) direction by a spring not shown.

A triangular hole 21 of an isosceles triangular shape is formed at a substantially central portion of the tape feeding direction change-over member 8, and an

engaging recess 22 is formed at an upper end in FIG. 1 of the triangular hole 21. A pair of hypotenuses of the triangular hole 21 contiguous to the engaging portion 22, that is, hypotenuses 23a and 23b are disposed in a left and right symmetrical relationship with respect to the direction of back and forth movement (downward and upward movement in FIG. 1) of the head mounting plate 6.

The resiliently holding mechanism 20 includes a pivotal member 24, a toggle spring 25 and an engaging element 26 in the form of a projection or pin. The pivotal member 24 is supported at a central portion thereof for pivotal motion between a pair of limit positions defined by a pair of stoppers 25a and 25b. The toggle spring 25 is connected at one end thereof to an end of the pivotal member 24 and at the other end thereof to the head mounting plate 6. The toggle spring 25 has a function to resiliently hold the pivotal member 24 at either of the limit positions defined by the stoppers 25a and 25b. The engaging projection 26 is mounted at the other end of the pivotal member 24 and fitted in the triangular hole 21 in the tape feeding direction change-over member 8. When the head mounting plate 6 is in its advanced position (upwardly moved position in FIG. 1), the engaging element 26 engages with the engaging recess 22 in the tape feeding

direction change-over member 8 to control the tape feeding direction change-over member 8 to either one of a pair of limit positions. To the contrary, if the head mounting plate 6 is retracted (moved downwardly in FIG. 1), the engaging element 26 is disengaged from the engaging portion 22 but is not engaged with the inclined faces 23a and 23b either.

When the head mounting plate is moved from the retracted to the advanced position, the engaging element is slidably contacted with either one of the inclined faces of the triangular hole of the tape feeding direction change-over member to modify the position of the tape feeding direction change-over member to its initial position prior to operation of a manually operable high speed feeding operating member.

The high speed feeding operating member is denoted at 27 and mounted for back and forth movement in leftward and rightward directions in FIG. 1 in a parallel relationship to the direction of movement of the tape feeding direction change-over member 8. An engaging recess 29 is formed on a side edge of the high speed feeding operating member 27 opposing the tape feeding direction change-over member 8. A lateral projection or finger 28 is formed at an end of the tape feeding direction change-over member 8 and is fitted in

the engaging recess 29 of the high speed feeding
operating member 27 such that the tape feeding direction
change-over member 8 and the high speed feeding
operating member 27 may be connected to each other in a
5 lost motion connection. A head mounting plate engaging
recess 30 and a switch engaging recess 31 are formed on
the other side edge of the high speed feeding operating
member 27.

The head mounting plate engaging recess 30 has an
10 inverted V-shape with a pair of inclined edges or faces,
and an engaging pin 32 is received in the head mounting
plate engaging recess 30. The engaging pin 32 is
securely mounted at an end of a downward extension in
FIG. 1 of the head mounting plate 6. Meanwhile, the
15 switch engaging recess 31 has a small inverted V-shape
and is located for engagement by a projection 34 at an
end of one of a pair of resilient contacts of a leaf
switch 33 of the normally open type for high speed
control of a motor 38 which is provided for driving the
20 capstans 1a and 1b to rotate. A knob 35 is securely
mounted on the high speed feeding operating member 27
for manual operation of the same.

A leaf switch 36 of the normally open type for
low speed control of the motor 38 is also provided. A
25 projection 37 at an end of one of a pair of resilient

contacts of the leaf switch 36 is positioned forwardly of the head mounting plate 6 for operation by the latter. The two switches 33 and 36 are connected in parallel circuit between the motor motor 38 and a power source 39. A governor circuit 40 for controlling the rotational speed of the motor 38 to a fixed low speed value is interposed between the low speed controlling leaf switch 36 and the motor 38.

With the construction described above, if the head mounting plate 6 is moved forwardly to such a position as shown in FIG. 1 by the biasing force of the spring not shown in response to manual operation, for example, of a reproducing operating member, the head 7 is contacted with a tape not shown while a pinch roller 2b on the reverse side, for example, is pressed against the capstan 1b with the tape held therebetween. At the same time, the lower speed controlling leaf switch 36 is turned on to electrically connect the motor 38 to the power source 39 so that a reproducing operation is started.

During such a reproducing operation, if the tape is wound to its last end and the reel receiver 3b is stopped, the gear supporting member 5b on the winding side is pivoted in the clockwise direction in FIG. 1 so that the tape feeding direction change-over member 8 is

moved in the leftward direction in FIG. 1 against the resilient holding force of the resiliently holding mechanism 20, thereby changing over the tape feeding direction. Thereupon, the pivotal member 24 of the
5 resiliently holding mechanism 20 is pivoted in the clockwise direction in FIG. 1 from one of the limit positions of pivotal motion thereof to the other limit position through engagement between the engaging recess 22 of the tape feeding direction change-over member 8
10 and the engaging element 26 on the pivotal member 24. On the other hand, while the tape feeding direction change-over member 8 is moved leftwardly in FIG. 1, the high speed feeding operating member 27 is not moved by the tape feeding direction change-over member 8 because
15 they are connected to each other by the lost motion connection provided by the projection 28 and the engaging recess 29. Besides, since the engaging pin 32 of the head mounting plate 6 and the projection 34 of the resilient contact of the motor high speed
20 controlling leaf switch 33 are held in engagement with the center of the head mounting plate engaging recess 30 and the switch engaging recess 31 of the high speed feeding operating member 27, respectively, inadvertent movement of the high speed feeding operating member 27
25 in the leftward and rightward directions in FIG. 1 is

inhibited during the reproducing operation.

In case it is intended to change over the feeding speed of the tape to high speed feeding during such a reproducing operation as shown in FIG. 1, the high speed feeding operating member 27 will be slidably moved by manual operation thereof in the rightward direction in FIG. 1. Upon such movement of the high speed feeding operating member 27, the engaging pin 32 on the head mounting plate 6 is slidably engaged with a right-hand side one of the pair of inclined faces of the head mounting plate engaging recess 30 so that the head mounting plate 6 is moved rearwardly (downwardly in FIG. 1). Upon such rearward movement of the head mounting plate 6, the motor low speed controlling leaf switch 36 is turned off so that the motor 38 is stopped once. Upon the retracting movement of the head mounting plate 6, also the engaging element 26 is disengaged from the engaging portion 22 so that the cooperating relationship between the resiliently holding mechanism 20 and the tape feeding direction change-over member 8 is interrupted. Meanwhile, upon the manual rightward movement of the high speed feeding operating member 27, the projection 34 at the end of the resilient contact of the motor high speed controlling leaf switch 33 escapes from the switch engaging recess 31 as shown in FIG. 2 so

that the switch 33 is turned on. Consequently, the motor 38 is energized to rotate at a high speed so that the tape is wound at a high speed onto a reel on the reverse side reel receiver 3b.

5 On the other hand, if it is intended, while the tape is being wound at a high speed onto the reel on the reverse side reel receiver 3b in this manner, to change over the feeding direction of the tape to the forward side, the high speed feeding operating member 27 will be
10 manually slidably moved in the leftward direction in FIG. 2 farther than its neutral position. In this instance, the projection 34 at the end of the resilient contact of the motor high speed controlling leaf switch 33 is first engaged with and then escaped from the
15 switch engaging recess 31 so that the switch 33 is turned off and then on and the motor 38 is first stopped and then driven to rotate at a high speed. Meanwhile, due to engagement between the pressing engaging recess 29 of the high speed feeding operating member 27 and the
20 projection 28 of the tape feeding direction change-over member 8, the tape feeding direction change-over member 8 is slidably moved in the leftward direction in FIG. 1 so that the tape feeding direction is changed over to the forward side as shown in FIG. 3.

25 To the contrary, when it is intended, during the

reproducing operation shown in FIG. 1, to change over the tape feeding condition to high speed feeding in the forward direction, the high speed feeding operating member 27 will be manually operated to move leftwardly in FIG. 1. Also in this instance, the head mounting plate 6 is moved rearwardly so that the motor low speed controlling leaf switch 36 is turned off while the motor high speed controlling leaf switch 33 is turned on to cause the motor 38 to rotate at a high speed.

Meanwhile, the tape feeding direction change-over member 8 is slidably moved in the leftward direction in FIG. 1 so that the tape feeding direction is changed over to the forward side as shown in FIG. 3.

If it is intended to listen to the sounds of the same portion of the tape again after the tape has been rewound by a desired amount in this manner, the operating force to manually hold the high speed feeding operating member 27 at its leftwardly moved position is removed. Consequently, the head mounting plate 6 is moved forwardly by the biasing force of the spring not shown. Thereupon, the engaging element 26 of the resiliently holding mechanism 20 is slidably contacted with and pushes the inclined face 23b of the tape feeding direction change-over lever 8 so that the tape feeding direction change-over member 8 is moved back by

the engaging element 26 of the resiliently holding mechanism 20 to its initial position which has been occupied by the same upon the preceding reproducing operation, that is, to the position shown in FIG. 1.

5 Meanwhile, the engaging pin 32 provided on the head mounting plate 6 is slidably contacted with and pushes the right-hand side inclined face of the head mounting plate engaging recess 30 of the high speed feeding operating member 27 so that the high speed feeding
10 operating member 27 is moved in the rightward direction in FIG. 3 to its neutral position in which the engaging pin 32 engages with the center of the head mounting plate engaging recess 30 to thereafter inhibit inadvertent leftward and rightward movement of the high
15 speed feeding operating member 27 in FIG. 1. When the high speed feeding operating member 27 is returned to its neutral position in this manner, the resilient contact projection 34 of the motor high speed controlling leaf switch 33 is engaged with the switch
20 engaging recess 31 so that the switch 33 is turned off. Since the motor low speed controlling leaf switch 36 is turned on upon the forward movement of the head mounting plate 6, however, the motor 38 is driven to rotate at a low speed again. Accordingly, a reproducing operation
25 is resumed wherein the tape feeding operation is the

same as that during the preceding reproducing operation.



CLAIMS:

1. An automatic reversing tape feeding device wherein a pair of capstans, a pair of pinch rollers, a pair of reel receivers, a pair of rotation transmitting
5 gears for individually transmitting rotation of said capstans to corresponding ones of said reel receivers, and a pair of gear supporting members individually supporting said rotation transmitting gears for rotation thereon and selectively movable to move said rotation
10 transmitting gears into rotation transmitting routes from said capstans to said reel receivers are disposed in a symmetrical relationship on the opposite sides with respect to a head which is mounted on a head mounting plate, and wherein

15 it includes a reciprocally movable tape feeding direction change-over member for moving said gear supporting members and said pinch rollers in an interlocking relationship with each other, a resiliently holding mechanism for resiliently holding said tape
20 feeding direction change-over member alternatively at one of a pair of limit positions of movement in the opposite directions, and a manually operable high speed feeding operating member for changing over the position of said tape feeding direction change-over member to



selectively cause high speed feeding of a magnetic tape
in the opposite directions while said head mounting
plate is in its retracted position and said head and
said pinch rollers are spaced away from the magnetic
5 tape, whereby,

when rotation of one of said reel receivers which
is rotating in its winding direction is stopped, a
corresponding one of said winding side gear supporting
members is pivoted in response to such stopping of the
10 one reel receiver to move said tape feeding direction
change-over member against the resilient holding force
of said resiliently holding mechanism so that the tape
feeding direction is changed over, characterized in that

said resiliently holding mechanism is mounted on
15 said head mounting plate and an engaging portion and a
pair of inclined faces contiguous to said engaging
portion are provided in a symmetrical relationship on
said tape feeding direction change-over member while an
engaging element for engaging with said engaging portion
20 of said tape feeding direction change-over member is
provided on said resiliently holding mechanism, whereby
the engagement between said engaging element and said
engaging portion is interrupted when said head mounting
plate is moved from its advanced position to its
25 retracted position, but when said head mounting plate is



moved from the retracted position to the advanced position, said engaging element may be slidably contacted with one of said inclined faces to modify the position of said tape feeding direction change-over member to the same position as that before said high speed feeding operating member has been operated.

2. An automatic reversing tape feeding device as set forth in claim 1, wherein said resiliently holding mechanism includes, in addition to said engaging element, a pivotal member supported for pivotal motion on said head mounting plate, and a toggle spring connected at the opposite ends thereof to one end of said pivotal member and said head mounting plate, said engaging element being in the form of a projection provided at the other end of said pivotal member.

3. An automatic reversing tape feeding device substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.
