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(54) MODE CHANGE-OVER DEVICES FOR RECORDING AND/OR REPRODUCING APPARATUS

(71) We, SONY CORPORATION, a corporation organised and existing under the laws of Japan, of 7—35 Kitashinagawa-6, Shinagawa-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to mode change-over devices for recording and/or reproducing apparatus, and to recording and/or reproducing apparatus including such devices.

According to the present invention there is provided a mode change-over device for a recording and/or reproducing apparatus, the device comprising:

a plurality of push-buttons corresponding respectively to selected ones of a plurality of operative modes of said apparatus;

mode selecting means movable to a selected one of a plurality of positions in accordance with the selective actuation of one of said push-buttons;

mode change-over means selectively movable from a first rest position to one of a plurality of operative positions corresponding to movement of said mode selecting means to one of said plurality of positions;

a plurality of mode selecting levers; and

a drive mechanism including a motor-driven gear means and a second gear member which is engageable with said gear means and has a cam member fixed thereto, said cam member being operatively engageable with said mode change-over means;

said drive mechanism being selectively operable by solenoid means actuated in dependence on actuation of one of said push-buttons to rotate said cam means thereby to move said mode change-over means from one of said plurality of operative positions to one of a plurality of operated positions thereby to move selected ones of said mode selecting levers from a first inoperative position to a second operative position to effect mode change in said apparatus corresponding to the operative mode selected by the particular push-button which has been actuated.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a tape recorder provided with an embodiment of mode selecting device according to the invention;

Fig. 2 is a cross-sectional view taken along the line II—II in Fig. 1;

Fig. 3 is a cross-sectional view taken along the line III—III in Fig. 1;

Fig. 4 is a cross-sectional view taken along the line IV—IV in Fig. 1;

Fig. 5 is a plan view of parts of the tape recorder of Fig. 1;

Fig. 6 is a cross-sectional view taken along the line VI—VI in Fig. 5;

Fig. 7 is a plan view showing the relationship between a mode change-over lever, a swing lever, a gear wheel and a cam fixed on the gear wheel in the tape recorder of Fig. 1; and

Figs. 8A and 8B are plan views showing the relationship between a lock lever, the swing lever, the gear wheel and the cam fixed on the gear wheel in the tape recorder of Fig. 1.

As best seen in Figs. 1 and 2, a plurality of depressible push-buttons 1 to 5 are provided for selectively placing an audio tape recorder into a selected operating mode. Referring to Fig. 2, rewind push-button 1, stop push-button 2, reproducing push-button 3, fast-forward push-button 4 and record push-button 5 are arranged in a line, and are held in an upper chassis 6*a* by a holding mechanism (not shown) so as to each be movable in a vertical direction between a first position and a second operative position.

All of the push-buttons except the stop

push-button 2, that is, the push-buttons 1, 3, 4 and 5, are locked when moved into their respective depressed position by a lock mechanism (not shown). When the stop push-button 2 is depressed, any one of the push-buttons 1, 3, 4 and 5 which is already depressed is released from the lock mechanism, and is pushed back to its first inoperative position.

Each of the push-buttons 1, 3, 4 and 5 includes a respective depending slide member 1*a*, 3*a*, 4*a* or 5*a*, terminating in a respective projection 7, 8, 9 or 10 of different lengths. The projection 7 of the rewind push-button 1 is longest (l_1); the projection 10 of the record push-button 5 is shortest (l_4); and the projection 9 of the fast-forward push-button 4 is longer than the projection 8 of the reproducing push-button 3 ($l_2 > l_3$).

As shown in Fig. 2, the lower ends of the projections 7 to 10 of the push-buttons 1, 4, 3 and 5 are at the levels *a*, *b*, *c* and *d*, respectively, when the push-buttons are depressed. As seen, the level *a* of the lower end of the projection 7 of the depressed rewind push-button 1 is the lowest; the level *d* of the projection 10 of the depressed record push-button 5 is the highest; and the level *c* of the projection 8 of the depressed reproducing push-button 3 is higher than the level *b* of the projection 9 of the depressed fast-forward push-button 4. Thus, the actuating positions of the push-buttons 1, 3, 4 and 5 are different from each other.

The mode change-over device also includes a switch operating lever 12 arranged beneath the push-button assembly and a mode selecting lever 13 so arranged beneath the switch operating lever 12 so as to be parallel with the latter. The levers 12 and 13 are rotatably supported on support pins 14 and 15, respectively, fixed on a lower chassis 6*b*.

The operating lever 12 includes a stepped portion 16 which contacts an actuator 17*a* of a micro-switch 17 mounted on the lower chassis 6*b* (Fig. 3), and the switch operating lever 12 is urged upwardly (or in the counter-clockwise direction) by a spring attached to the actuator 17*a* which is contained in the micro-switch 17. In other words, the switch operating lever 12 is urged towards the push-button assembly by the spring contained in the micro-switch 17. As best shown in Fig. 4, the mode selecting lever 13 is urged in the counter-clockwise direction around the support pin 15 by a restoring spring 19 fixed on the mode selecting lever 13 and the lower chassis 6*b*.

The projections 7, 8 and 9 of the push buttons 1, 3 and 4, respectively, extend through slots 20 formed on the switch operating lever 12. Thus, when any one of the push-buttons 1, 3 and 4 is depressed, the projections 7, 8 or 9 extend through the respective slot 20 to contact the mode selecting lever 13 which is pivoted by the lower end of the corresponding projections 7, 8 or 9 of the push-buttons 1, 3 or 4, so that the mode selecting lever 13 is rotated in the clockwise direction about the support pin 15 (Fig. 4). The projection 10 of the record push-button 5 is in contact with the upper surface of the switch operating lever 12. Accordingly, when the record push-button 5 is depressed it does not extend below the switch operating lever 12 and, thus, the mode selecting lever 13 is not rotated.

Each of the slide members 1*a*, 3*a*, 4*a* and 5*a* includes a respective shoulder 21 formed above the respective projection 7, 8, 9 or 10. When a push-button 1, 3 or 4 is depressed, the switch operating lever 12 is contacted and moved by the corresponding shoulder 21 to rotate the switch operating lever 12 in a clockwise direction about the support pin 14 (Fig. 3). Depressing the push-button 5 also rotates the switch operating lever 12 as the switch operating lever 12 is moved by the lower end of the projection 10 of the record push-button 5 to rotate the switch operating lever 12 in a clockwise direction about the support pin 14. With the clockwise rotation of the switch operating lever 12, the actuator 17*a* of the micro-switch 17 is depressed by the stepped portion 16 of the switch operating lever 12. Depressing the stop of push-button 2 does not cause the switch operating lever 12 to rotate as the slide member 2*a* of the stop push-button 2 passes through a cut-out portion 22 formed in the switch operating lever 12. Accordingly, when the stop push-button 2 is depressed the switch operating lever 12 is not rotated.

As above described, the actuating positions of the three push-buttons 1, 3 and 4 are different as indicated by the levels *a*, *b* and *c*. Accordingly, when the push-buttons 1, 3 and 4 are selectively depressed, three different degrees of clockwise rotation of the mode selecting lever 13 are obtained. As shown in Fig. 4, the free end of the mode selecting lever 13 is rotated to a first position indicated as *a'* with the depression of the rewind push-button 1; it is rotated to a second position indicated as *b'* with the depression of the fast-forward push-button 4; and it is rotated to a third position indicated as *c'* with the depression of the reproducing push-button 3. It is also seen that when the record push-button 5 is depressed, the mode selecting lever 13 is not rotated. Thus, the upper end of the mode selecting lever 13 is maintained at its original position indicated as *d'*.

As best shown in Fig. 5, a recording/reproducing slide 28, a fast-forward slide 29 and a rewind slide 30 are provided and arranged above the upper chassis 6*a* so as to be parallel with each other. The three slides 28, 29 and 30 are lengthwise slidable and each includes

a pair of oblong openings 32 which receive a pair of guide pins 31 extending from the upper chassis 6*a*. The recording/reproducing slide 28 is interlocked with a reproducing mode change-over mechanism (not shown) such as a head chassis and a forward idler. The fast-forward slide 29 is interlocked with a fast-forward mode change-over mechanism (not shown) such as a fast-forward idler. The rewind slide 30 is interlocked with a rewind mode change-over mechanism (not shown) such as a rewind idler.

A mode change-over lever 34 is provided which works selectively to operate the three slides 28, 29 and 30 so as to change over the tape recorder into either the reproducing mode of the recording mode, the fast-forward mode or the rewind mode. As shown in Fig. 6, a mode change-over pin 35 is fixed on the free end portion of the mode change-over lever 34 and projects upward through an opening 36 made in the upper chassis 6*a*. The mode change-over pin 35 when properly located selectively drives the three slides 28, 29 and 30 on a straight line path as indicated by the lines A, B, C and D in Fig. 5. The mode change-over lever 34 and its projecting mode change-over pin 35 drive the slides 28 and 30 when the pin 35 is positioned adjacent to a recess 37 in an extending projection 28*a* and 30*a* of each slide 28 and 30, respectively, and drives the slide 29 when the pin 35 is adjacent to a recess 37 in an end 29*a* of the slide 29. The projection 28*a* of the reproducing slide 28 includes a pair of recesses 37 so that the mode change-over pin 35 can be selectively positioned in either recess 37 to move the slide 28 along the paths indicated at C and D. Positioning of the pin 35 is controlled by a plunger-solenoid 39 fixed to the lower chassis 6*b* which controls movement of the mode change-over lever 34 to position the pin 35 in the selected recess 37 of the levers 28, 29 and 30.

Next, the relationship between the mode change-over lever 34 and the mode selecting lever 13, and a mechanism for driving the mode change-over lever 34 with the solenoid 39 will be described.

Referring to Fig. 1, a drive gear 43 is provided fixed to a capstan 42. The drive gear 43 engages a gear wheel 44 having a toothless segment 44*a* supported by a shaft 45 so as to be rotatable relative to the lower chassis 6*b*. A cam 46 is fixed on the upper surface of the gear wheel 44. The cam 46, as will be explained hereinbelow, cooperates with a swing lever 47 rotatably supported by a support pin 48 so as to be rotatable relative to the lower chassis 6*b*. The swing lever 47 is urged to pivot in the counter-clockwise direction (Fig. 1) about the pin 48 by a tension spring 49. The swing lever 47 is also connected to one end of the mode change-over lever 34 by a pin 50 fixed on the lower end of the swing lever 47 which is pivotally connected to the mode change-over lever 34.

A substantially L-shaped stop lever 51 is also provided and is rotatably supported on the lower chassis 6*b* by a support pin 52. One arm of the stop lever 51 contacts the free end portion of the mode selecting lever 13 (see Fig. 4 as well). The rotational position of the stop lever 51 is determined by its contact with the free end portion of the mode selecting lever 13. As shown, four angular positions can be selected by the mode selecting lever 13 depending on the rotational position of the mode selecting lever 13. The mode selecting lever 13 includes an end segment having a first surface 24, a step forming a second surface 25 and a step forming a third surface 26. Depending upon the angular position of the mode selecting lever 13, that is whether it is in any of the positions indicated as *a'*, *b'*, *c'* or *d'*, the stop lever 51 can move to any of the positions indicated as *a''*, *b''*, *c''* or *d''* in Fig. 1.

An interconnecting lever 53 is provided which is pivoted at one end to a pin 54 secured to the stop lever 51. The interconnecting lever 53 includes an extending segment at the other end provided with an oblong opening 56 into which a pin 55 projecting downwardly from the mode change-over lever 34 is inserted. Thus the interconnecting lever 53 engages with the mode change-over lever 34. A transmission lever 57 is provided which is rotatably supported by a support pin 58 fixed on the lower chassis 6*b*. One end of the transmission lever 57 is connected by an interconnecting slide member 59 to the extensible rod 60 of the solenoid 39. A pin 61 is fixed on the other end of the transmission lever 57 and is disposed within an oblong opening 62 formed in the lower end portion of the interconnecting lever 53.

The levers 53 and 54 are spring biased, with the interconnecting lever 53 being biased to be urged upwardly (Fig. 1) by a restoring spring 63 having one end secured to the interconnecting lever 53 and the other end secured to a post 63*a* fixed to the lower chassis 6*b*. The transmission lever 57 is connected to the interconnecting lever 53 through a restoring spring 64 and an auxiliary lever 79 and is urged in the clockwise direction (Fig. 1) about the pin 58 by a spring 71.

A lock lever 65 is also provided and is pivoted at one end to a pin 66 extending from the swing lever 47 and is urged in the counter-clockwise direction (Fig. 1) about the pin 66 by a restoring spring 67 extending between one part of the swing lever 47 and one end of the lock lever 65. Thus the lock lever 65 is always urged towards a lock pin 68 extending from the lower chassis 6*b*. The lock lever 65 includes two locking portions

65*a* and 65*b* for engagement with the lock pin 68 and two lock-release projections 65*c* and 65*d*.

A lock-release lever 69 is provided and is pivotally connected at one end to a pin 70 fixed on the transmission lever 57. The lock-release lever 69 is urged to pivot in the counter-clockwise direction (Fig. 1) about the pin 70 by the spring 71. The other end of the lock-release lever 69 includes a lock-release pin 72 arranged selectively to engage the lock-release projections 65*c* and 65*d*.

An L-shaped gear lock lever 73 is rotatably supported adjacent to the gear wheel 44 by a support pin 74 fixed on the lower chassis 6*b*. The gear lock lever 73 is urged to pivot in the counter-clockwise direction (Fig. 1) about the pin 74 by a restoring spring 75 having one end 75*a* fixed on an arm of the gear-lock lever 73 and its other end secured to the chassis in any convenient manner. The upper end of the gear-lock lever 73 contacts a pin 76 extending from the lower surface of the gear wheel 44 to lock the gear wheel 44. Pivoting of the gear-lock lever 73 moves the upper end of the gear-lock lever 73 away from the pin 76 to release the lock of the gear wheel 44. The gear-lock lever 73 is also provided with an extending pin 77′ which will be referred to below.

Mode change-over operations will now be described.

Fig. 1 illustrates the device in the stop mode of the tape recorder in which each of the levers, slides and pins is located at its original at rest position. The pin 35 of the mode change-over lever 34 lies at the position A′ on the line D, as shown in Fig. 5. When a power switch is turned on to supply electric power to the tape recorder, the capstan 42 is rotated in the counter-clockwise direction. However, since the drive gear 43 faces the toothless segment 44*a* of the gear wheel 44, the gear wheel 44 is not driven by the drive gear 43.

To place the tape recorder in a record mode, the record push-button 5 is depressed. With the depression of the record push-button 5, the switch operating lever 12 is rotated to its operative position, as described above (dotted line position shown in Fig. 3), to push the actuator 17*a* of the micro-switch 17 at its stepped portion 16. The micro-switch 17 is turned on and energizes the solenoid 39. Since the record push-button 5 when it is depressed is locked in its depressed position, the micro-switch 17 remains in an on condition.

With the energization of the solenoid 39, the rod 60 is pulled inwardly to rotate the transmission lever 57 in a counter-clockwise direction (Fig. 1) about its support pin 58 through the slide member 59, and the lock-release lever 69 is moved downwardly (Fig. 1), since it is connected through the pin 70 with the transmission lever 57. The lock-release projection 65*c* of the lock lever 65 is pushed by the pin 72 fixed on the free end of lock-release lever 69, as shown by the arrow in Fig. 8A, so that the lock lever 65 is also rotated in a clockwise direction about the pin 66 against its restoring spring 67, as shown by the curved arrow in Fig. 8A. With this movement, the locking portion 65*a* of the lock lever 65 is separated from the lock pin 68 and, as a result, the swing lever 47 is released from its locked position. At the same time, since the pin 77′ fixed on the gear-lock lever 74 is pushed by moving the lock lever 65, the gear-lock lever 73 is rotated in a clockwise direction (Fig. 1) about its support pin 74 against the urging of its restoring spring 75 to remove the gear-lock lever 73 from abutting contact with the pin 76 fixed on the gear wheel 44. Accordingly, the gear wheel 44 is released from its locked position.

With the counter-clockwise rotation of the transmission lever 57, the interconnecting lever 53 is pulled by the auxiliary lever 79 and the restoring springs 64 and 63. Thus a counter-clockwise rotational force is imparted to the stop lever 51 about the support pin 52. However, since the stop lever 51 contacts the uppermost surface 24 of the free end portion of the mode selecting lever 13, which is at rest at its original position *d*′ as shown in Fig. 4, the stop lever 51 is not rotated, but stops at position *d*″ (Fig. 1). Accordingly, further movement of the interconnecting lever 53 is arrested. The mode change-over pin 35 on the mode change-over lever 34 is maintained at the position shown at A′ on line D (Fig. 5).

However, since the gear wheel 44 is released from the lock lever 73, the swing lever 47 is rotated in a counter-clockwise direction (Fig. 1) about the support pin 48 by its restoring spring 49, to begin to drive the gear wheel 44 through the cam 46 in the clockwise direction. Accordingly, the gear wheel 44 is engaged with the drive gear 43 rotating with the capstan 42 to rotate the gear wheel 44 in a clockwise direction (Fig. 1). With this movement, the mode change-over pin 35 of the mode change-over lever 34 is moved backward to the postion shown at B′ from the position shown at A′ on line D (Figs. 5 and 7).

With further rotation of the gear wheel 44, the swing lever 47 is further rotated in a clockwise direction about its support pin 48 (Fig. 1) by the cam 46 against the action of its restoring spring 49, and the mode change-over lever 34 is now moved leftward as viewed in Fig. 7. Since the pin 35 of the mode change-over lever 34 is guided within the oblong opening 56 formed in the interconnecting lever 53, the mode change-over lever 34 moves so that the mode change-over pin 35 is moved substantially in a linear path to

the position shown at C′ from the position shown at B′ on the line D (Figs. 5 and 7). The projection 28*a* of the recording/reproducing slide 28 is moved leftward (as viewed in Fig. 5) by the mode change-over pin 35, to change the tape drive system into the reproducing mode. At that time, an actuator 78*a* of a micro-switch 78 mounted on the slide 28 is depressed by the mode change-over pin 35. The micro-switch 78 is placed in an "on" condition. Accordingly, the electric circuit for the tape recorder is changed over from the reproducing mode into the record mode responsive to the micro-switch 78.

When the swing lever 47 is rotated in the clockwise direction (Fig. 1), an actuator 77*a* of a micro-switch 77 is depressed by a switch operating portion 47*a* formed on the swing lever 47. The micro-switch 77 turns to its "on" position to de-energize the solenoid 39. With de-energization of the solenoid 39, the interconnecting lever 53, the transmission lever 57 and the lock-release lever 69 are restored to their original at rest positions by the springs 64 and 71, respectively. Thus, the energizing time for the solenoid 39 is very short and the electric power consumed is minimized.

When the gear wheel 44 has been rotated through a predetermined angle, and thereby the recording/reproducing slide 28 has been moved to the position shown at C′ on line D (Fig. 5) by the mode change-over pin 35, the lock-release projection 65*b* of the lock lever 65 is engaged with the lock pin 68 (Fig. 8B) and the swing lever 47 is again placed in a locked position. The mode change-over pin 35 is stopped at the position shown at C′. Thus, the recording/reproducing slide 28 is locked at its operative position by the mode change-over pin 35 and the mode change-over lever 34. At this juncture the gear wheel 44 has been rotated almost one complete revolution and it is disengaged from the drive gear 43 to stop further rotation. Thus, the change-over operation to place the recorder in the record mode is completed.

The tape recorder according to this embodiment is designed so as to be changeable through the stop mode into any one of the reproducing, record, fast-forward or rewind mode from any other of these modes.

For example, if the recorder is in the above-described record mode and the stop push-button 2 is depressed, the record push-button 5 is released from a locked position and the record push-button 5 is restored to its original position. With the record push-button 5 moving to its original position, the switch operating lever 12 also rotates back to its original position and the micro-switch 17 is turned off. With the micro-switch 17 in its "off" mode, the solenoid 39 is again energized and the transmission lever 57 is rotated in a counter-clockwise direction (Fig. 1). The pin 72 of the lock-release lever 69 pushes down on the lock release projection 65*c* of the lock lever 65. The lock lever 65 is thereby rotated slightly in a clockwise direction (Fig. 1) and the locking portion 65*b* of the lock lever 65 is separated from the lock pin 68. The swing lever 47 rotates slightly in a counter-clockwise direction (Fig. 1). With this movement the mode change-over pin 35 of the mode change-over lever 34 is moved along a substantially linear path back to the position shown at A′ from the position shown at C′ on line D (Fig. 5). With the slight counter-clockwise rotation of the swing lever 47, the lock portion 65*a* of the lock lever 65 is again engaged by the lock pin 68. Thus, the swing lever 47 is again locked at its initial position after a slight rotation movement. The cam 46 is moved by the swing lever 47 and the gear wheel 44 is rotated to its original angular position. The pin 76 fixed on the gear wheel 44 again contacts with the gear lock lever 73 and the gear wheel 44 is locked at its initial angular position.

With the movement of the mode change-over pin 35 to the position shown at A′ on line D (Fig. 5), the recording/reproducing slide 28 is moved back to its original position. When the swing lever 47 is rotated back to its original position, the micro-switch 77 is turned off, thus de-energizing the solenoid 39. With the movement of the mode change-over pin 35 on the mode change-over lever 34 to the position shown at A′ on the line D, the micro-switch 78 is also turned off and the electric circuit is changed over into the reproducing mode. Thus, the change over operation for the stop mode is completed.

When the reproducing push-button 3 is depressed with the recorder in the stop mode, the mode selecting lever 13 is rotated to the position shown at *c*′ (Fig. 4). The stop lever 51 thus rotates until it abuts the surface 25 of the mode selecting lever 13 or to the angular position shown at *c*″ (Fig. 1). The mode change-over lever 34 connected through the interconnecting lever 53 with the stop lever 51 is correspondingly rotated in a clockwise direction about its support pin 50 and the mode change-over pin 35 on the mode change-over lever 34 moves to the position shown at A′ on line C (Fig. 5) in a substantially linear path. As a result of this movement, the recording/reproducing slide 28 is also moved to the left (as viewed in Fig. 5), and the tape recorder is changed over into the reproducing mode. Since the mode change-over pin 35 contacts the projection 28*a* on the recording/reproducing slide 28 and the slide 28 moves along the line or path shown at line C, there is no contact with the actuator 78*a* of the micro-switch 78 by the pin 35, and the micro-switch 78 is not turned on and the recorder remains in its electrical mode for reproducing.

When the fast-forward push-button 4 is depressed with the recorder in the stop mode, the mode selecting lever 13 is rotated to the position shown at *b'* (Fig. 4). The stop lever 51 thus rotates until it contacts the surface 26 of the mode selecting lever 13 and moves to the angular position shown at *b''* (Fig. 1). The mode change-over lever 34 connected through the interconnecting lever 53 with the stop lever 51 is correspondingly rotated in a clockwise direction about its support pin 50. The mode change-over pin 35 on the mode change-over lever 34 moves to the position shown at A' on the line B (Fig. 5) in a substantially linear path of movement. As a result of this movement, the fast-forward slide 29 is moved to the left (as viewed in Fig. 5) by the mode change-over pin 35 and the tape recorder is changed over into the fast-forward mode.

When the rewind push-button 1 is depressed with the recorder in the stop mode, the mode selecting lever 13 is rotated to its uppermost position shown at *a'* (Fig. 4). In this case, the stop lever 51 is not regulated by the mode selecting lever 13 and the stop lever 51 rotates to the angular position shown at *a''* (Fig. 1). The mode change-over lever 34 connected through the interconnecting lever 53 with the stop lever 51 is correspondingly rotated in a clockwise direction about its support pin 50. The mode change-over pin 35 moves to the position shown at A' along a substantially linear path of movement along the line shown at A (Fig. 5). As a result of this movement, the rewind slide 30 is moved to the left (as viewed in Fig. 5) by the mode change-over pin 35 and the tape recorder is changed over into the rewind mode.

Various modifications can of course be made. For example, in the above described embodiment, the strokes of the push-buttons 1, 3, 4 and 5 are equal to each other, but the lengths of the projections 7, 8, 9 and 10 thereof are different from each other in order that the substantive operative or actuating positions of the push-buttons 1, 3, 4 and 5 differ from each other. However, it is evident that the strokes of the push-buttons 1, 3, 4 and 5 may be made to differ from each other and that the lengths of the projections 7, 8, 9 and 10 may be equal to each other.

While the above described embodiment of the present invention has been described as being applicable to an audio tape recorder, it is understood that this invention is not limited to an audio tape recorder but that this invention may be applicable to any other recording and/or reproducing apparatus such as a video tap recorder.

Further, in the above described embodiment, the push-buttons 1 to 5 are so designed as to move back and forth in a linear path but they may be designed so as to rotate back and forth.

In addition, in the above described embodiment, the mode selecting lever 13, the mode change-over lever 34 and the pin 35 fixed thereon are used as a mode change-over means, and the rotational force of the capstan 42 is used as the drive mechanism which is actuated by the solenoid 39. However, any other suitable motor driven mechanism may be used instead of the above described construction to provide the motive forces necessary to effect the corresponding movements to effect mode change-over.

WHAT WE CLAIM IS:—

1. A mode change-over device for a recording and/or reproducing apparatus, the device comprising:
a plurality of push-buttons corresponding respectively to selected ones of a plurality of operative modes of said apparatus;
mode selecting means movable to a selected one of a plurality of positions in accordance with the selective actuation of one of said push-buttons;
mode change-over means selectively movable from a first rest position to one of a plurality of operative positions corresponding to movement of said mode selecting means to one of said plurality of positions;
a plurality of mode selecting levers: and
a drive mechanism including a motor-driven gear means and a second gear member which is engageable with said gear means and has a cam member fixed thereto, said cam member being operatively engageable with said mode change-over means;
said drive mechanism being selectively operable by solenoid means actuated in dependence on actuation of one of said push-buttons to rotate said cam means thereby to move said mode change-over means from one of said plurality of operative positions to one of a plurality of operated postions thereby to move selected ones of said mode selecting levers from a first inoperative position to a second operative position to effect mode change in said apparatus corresponding to the operative mode selected by the particular push-button which has been actuated.

2. A device according to claim 1 wherein said push-buttons include projections formed on each of said push-buttons and arranged to contact said mode selecting means upon selective actuation of said push-buttons, and wherein said projections are of different lengths whereby said mode selecting means is moved through a different path of movement upon selective actuation of each of said push-buttons.

3. A device according to claim 1 further comprising means to lock said mode change-pover means in an operative position when one of said push-buttons has been selectively actuated to place said apparatus in one of

said operative modes, and releasing means to return said mode change-over means to an inoperative position.

4. A device according to claim 1 wherein said mode change-over means comprises a pivotally mounted swing lever actuated by said drive mechanism to control a mode change-over lever pivotally mounted on said swing lever, and said mode change-over lever is operatively coupled to said plurality of mode selecting levers to effect corrsponding movement in a selected one of said mode selecting levers to effect a change in operative mode of said apparatus corresponding to the actuation of a selected one of said push-buttons.

5. A device according to claim 4 wherein a lock lever is pivotally mounted on said swing lever to lock said mode change-over device in the operative mode corresponding to the actuation of a selected one of said push-buttons.

6. A device according to claim 1 comprising switch means, an actuating lever for said switch means and said solenoid means which is controlled by said switch means and coupled to said mode change-over means, said actuating lever being movable from a first position to a second position responsive to actuation of one of said push-buttons thereby to energize said solenoid means through said switch means to move said mode selecting means to said selected one of a plurality of positions thereby to move said mode change-over means from said first rest position to one of said plurality of operative positions.

7. A device according to claim 1 wherein said mode change-over means comprises a mode change-over lever member and wherein spring means are connected between said mode change-over lever member and said mode selecting means to urge said mode change-over lever member to said first rest position.

8. A device according to claim 1 wherein said gear means is operatively connected with a rotatable capstan of said apparatus.

9. A device according to claim 8 wherein said second gear member includes a segment without gear teeth whereby when said segment is in juxtaposed relationship with said gear means said second gear member is not driven by said gear means.

10. A mode change-over device substantially as hereinbefore described with reference to the accompanying drawings.

11. A tape recording and/or reproducing apparatus including a mode change-over device according to any one of the preceding claims.

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1596560 COMPLETE SPECIFICATION
6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG.1

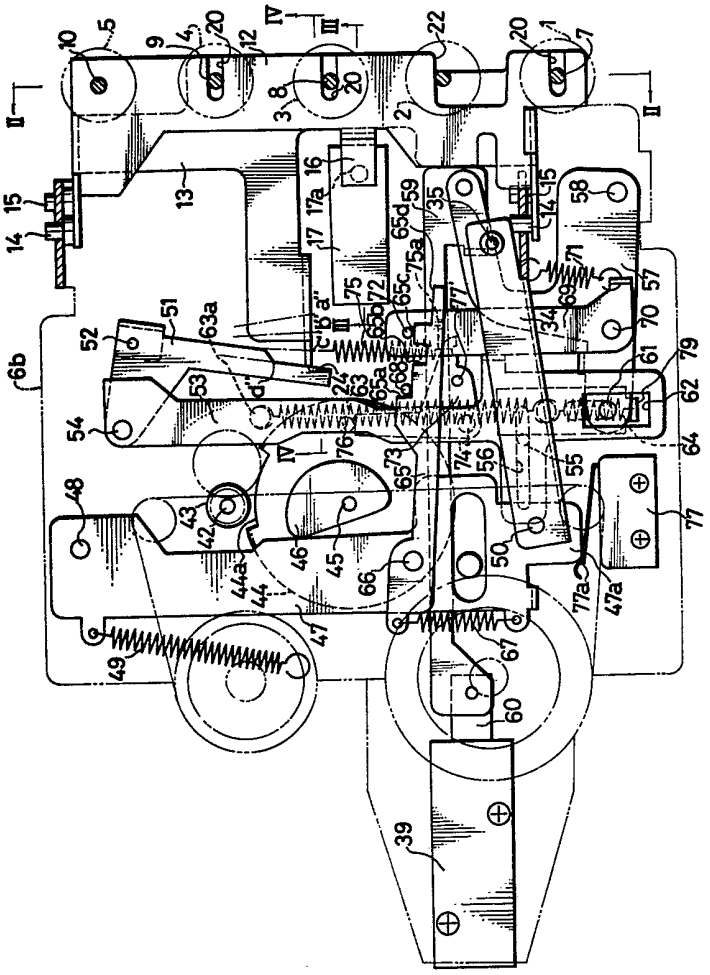


FIG. 2

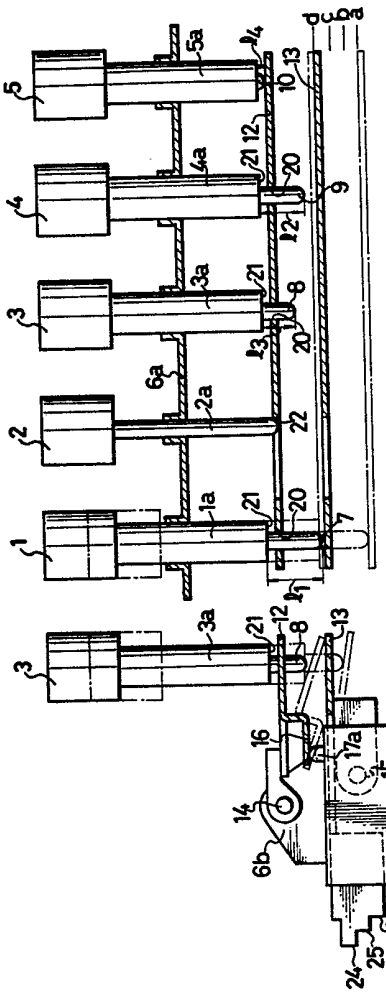


FIG. 3

FIG. 4

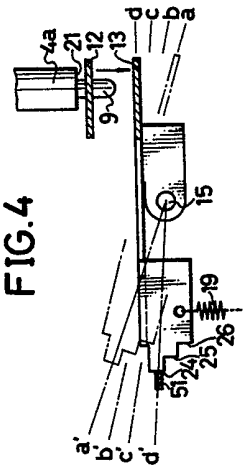


FIG.5

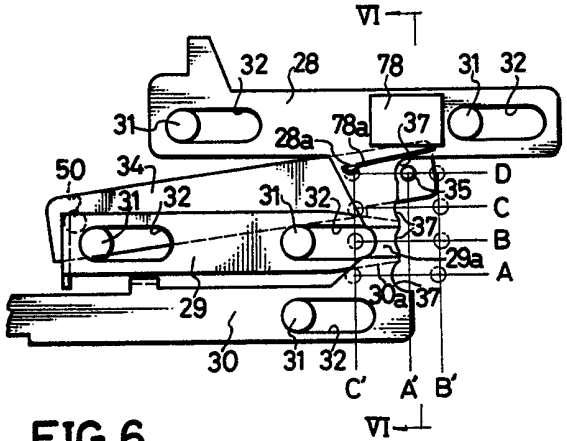

VI
32
28
78
31
32
31
78a
37
28a
50
34
D
35
31
32
31
32
C
37
B
29a
A
30a
37
29
30
31
32
C'
A'
B'
VI

FIG.6

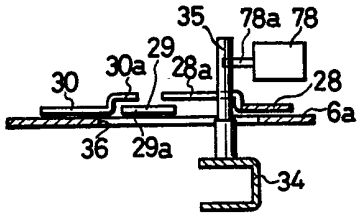
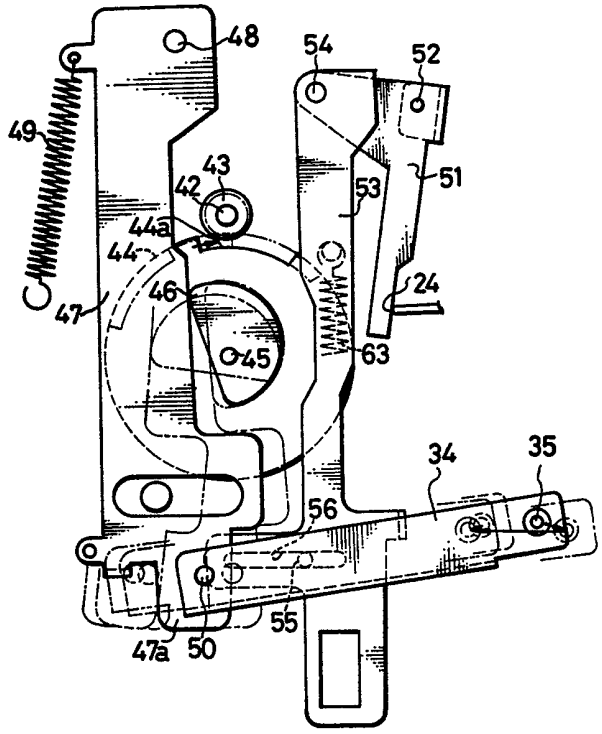

35
78a
78
29
30a
28a
30
28
6a
36
29a
34

FIG.7



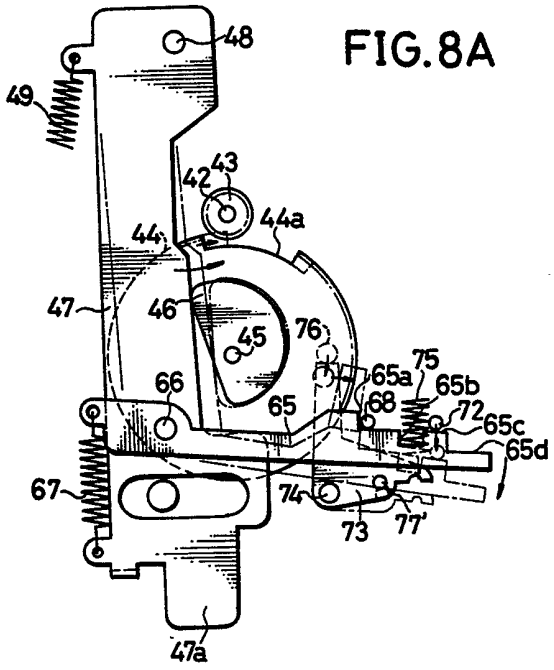

48
49
42
43
44a
44
47
46
45
76
75
65a
65b
66
65
68
72
65c
65d
67
74
73
77
47a

FIG.8A

1596560 COMPLETE SPECIFICATION
6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 6

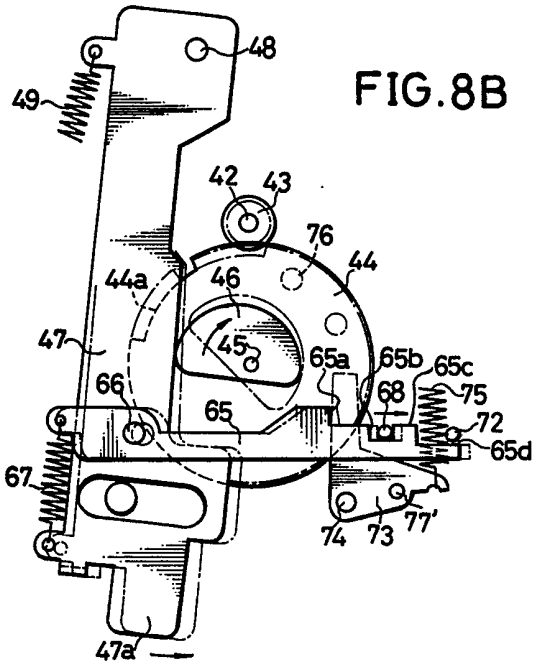


FIG.8B