

[54] **AUTOMATIC CASSETTE CHANGING AND  
PLAYING APPARATUS**

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[22] Filed: **Nov. 3, 1970**

[21] Appl. No.: **86,483**

[30] **Foreign Application Priority Data**

Nov. 5, 1969 Japan..... 44/88065  
Nov. 5, 1969 Japan..... 44/88066  
Nov. 5, 1969 Japan..... 44/88067

[52] U.S. Cl. .... 274/4 F, 214/6 BA

[51] Int. Cl. .... G11b 23/12

[58] Field of Search..... 274/4 F;  
352/6-8, 123; 353/15, 19; 179/100.2 Z;  
242/180, 181, 197-200

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*Assistant Examiner*—Dennis A. Dearing

*Attorney*—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

An automatic cassette changing and playing apparatus for automatically playing a plurality of cassettes one after another by automatically changing them after completion of playing. A predetermined cassette is taken out from a first cassette case in which cassettes yet to be played are housed and moved to a playing position for performance. After completion of performance, the cassette is moved from the playing position to a second cassette case. This cycle is repeated till all the cassettes in the first cassette case have been played.

**6 Claims, 29 Drawing Figures**

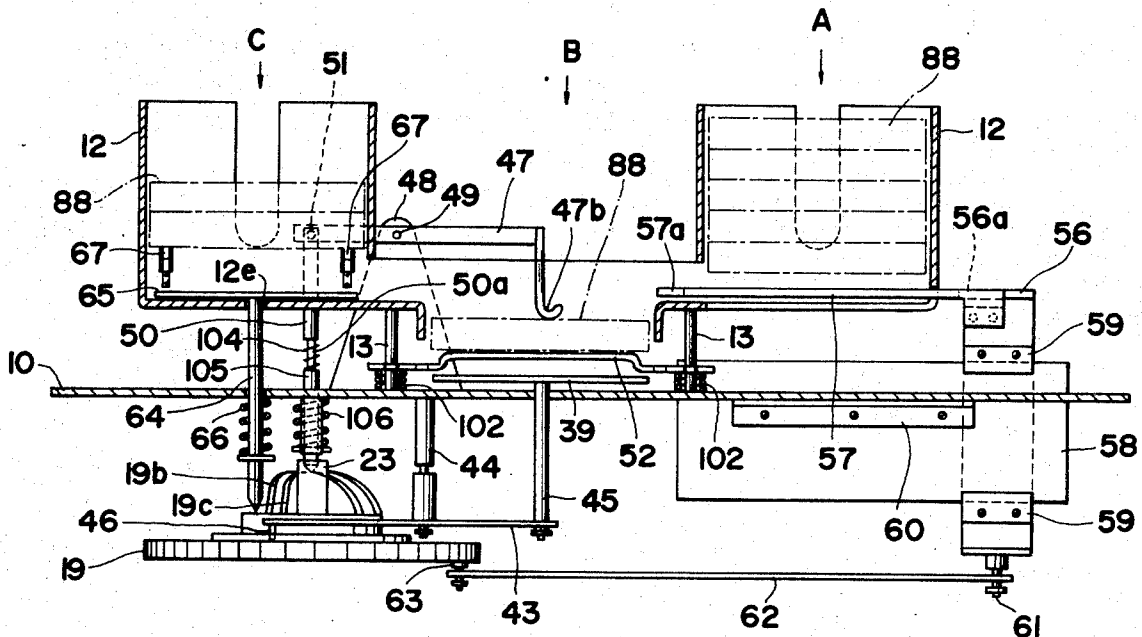


FIG. 1

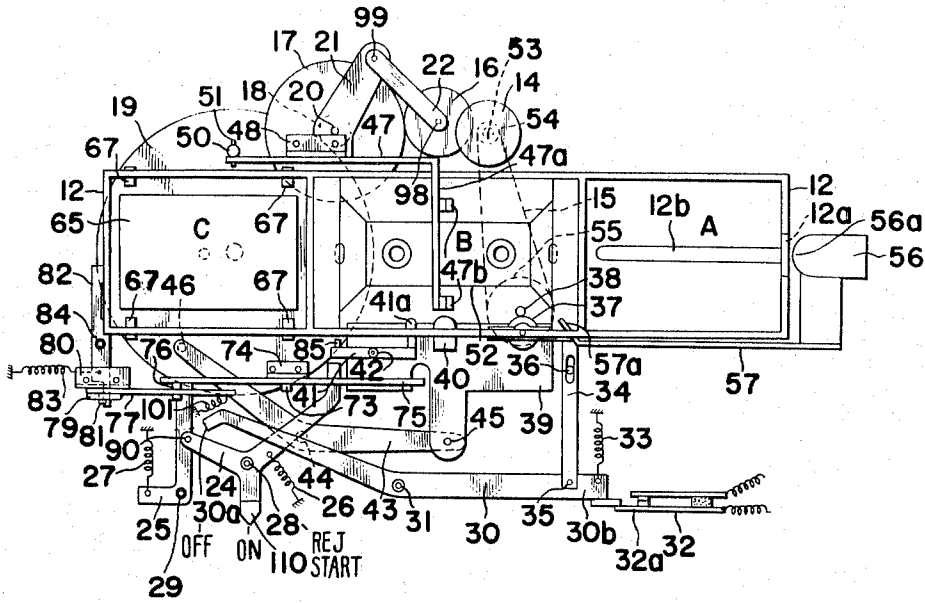
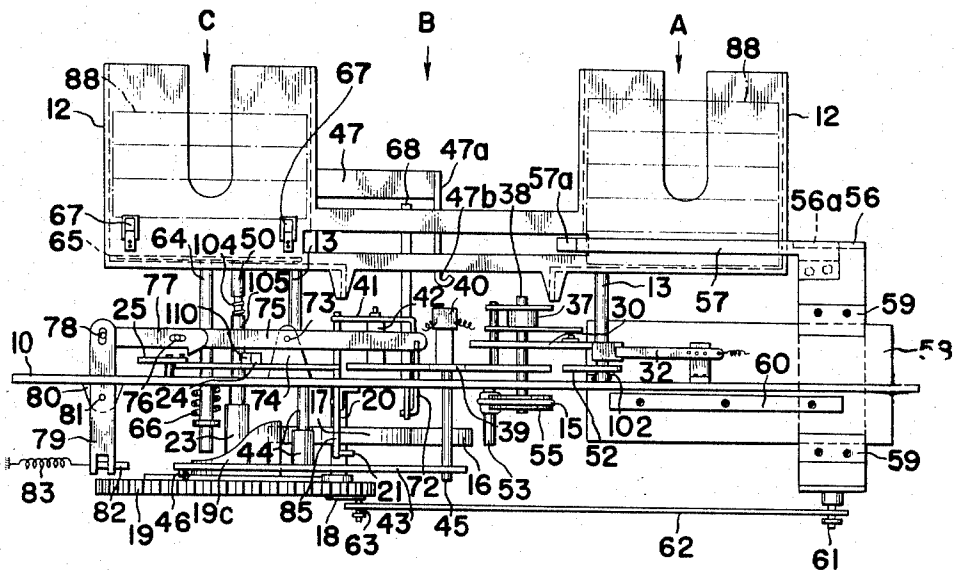


FIG. 2



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FIG. 4

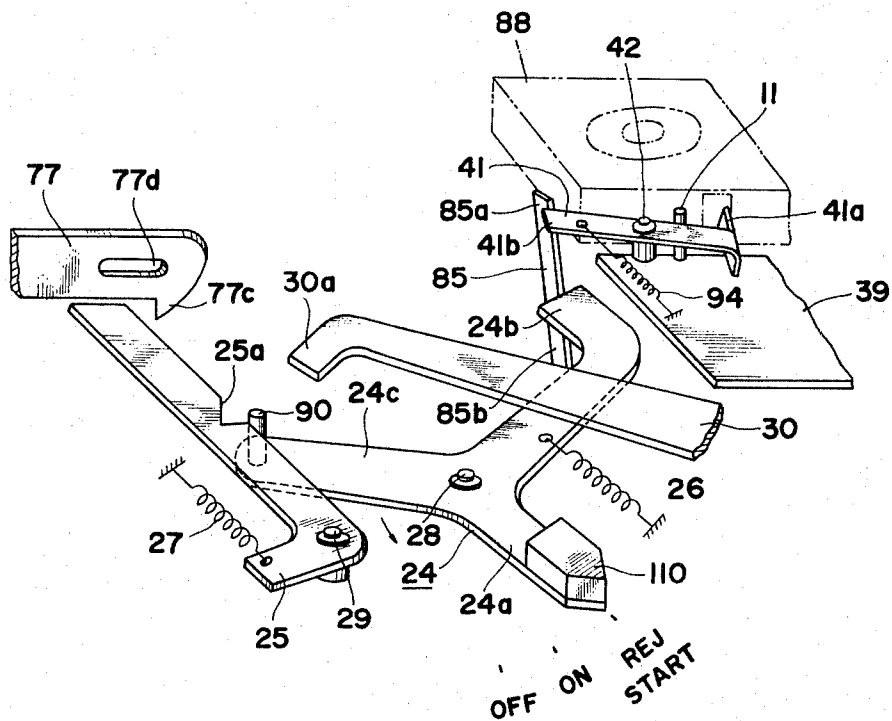


FIG. 12

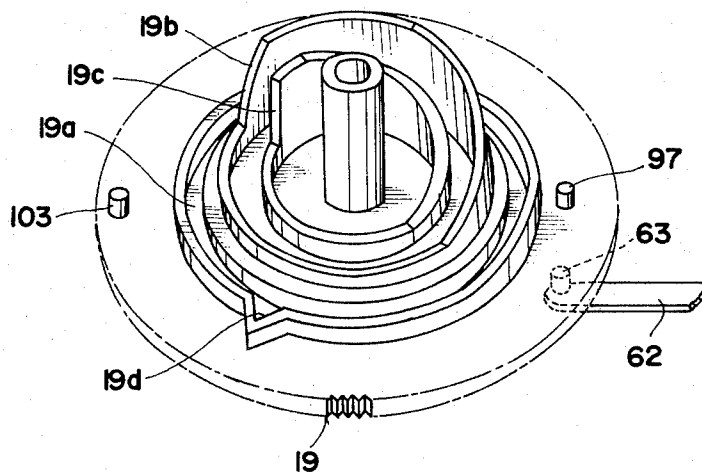






FIG. 7

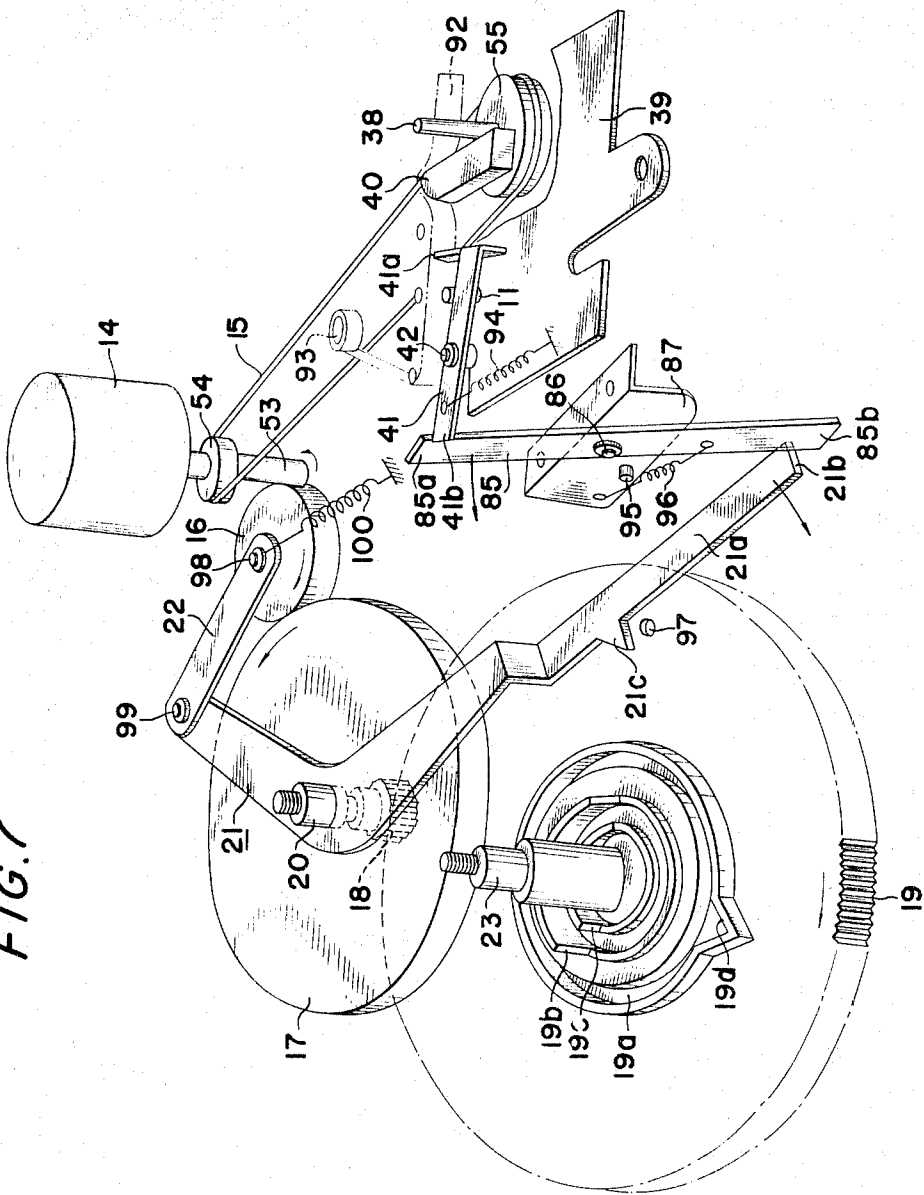


FIG. 8

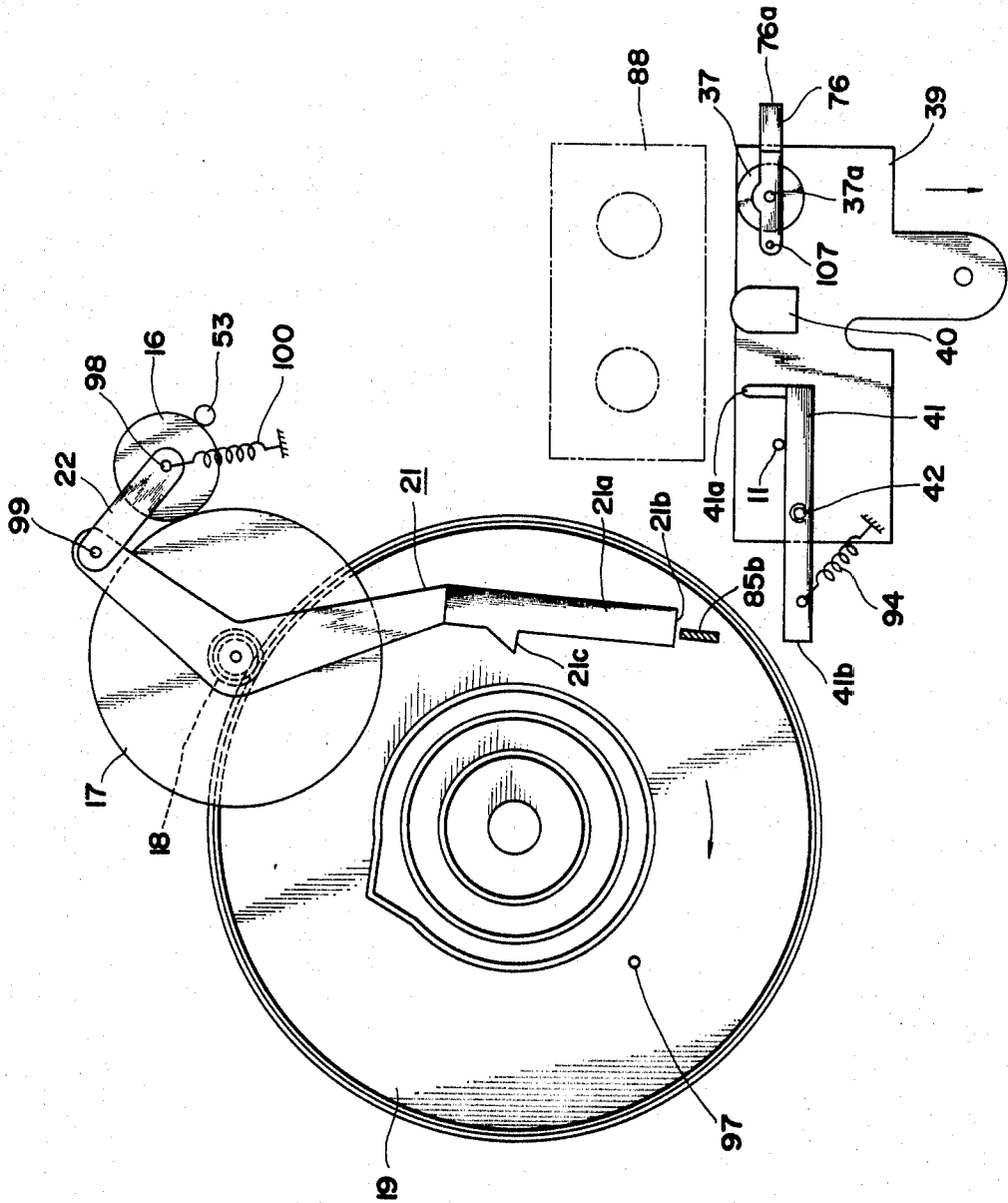


FIG. 9

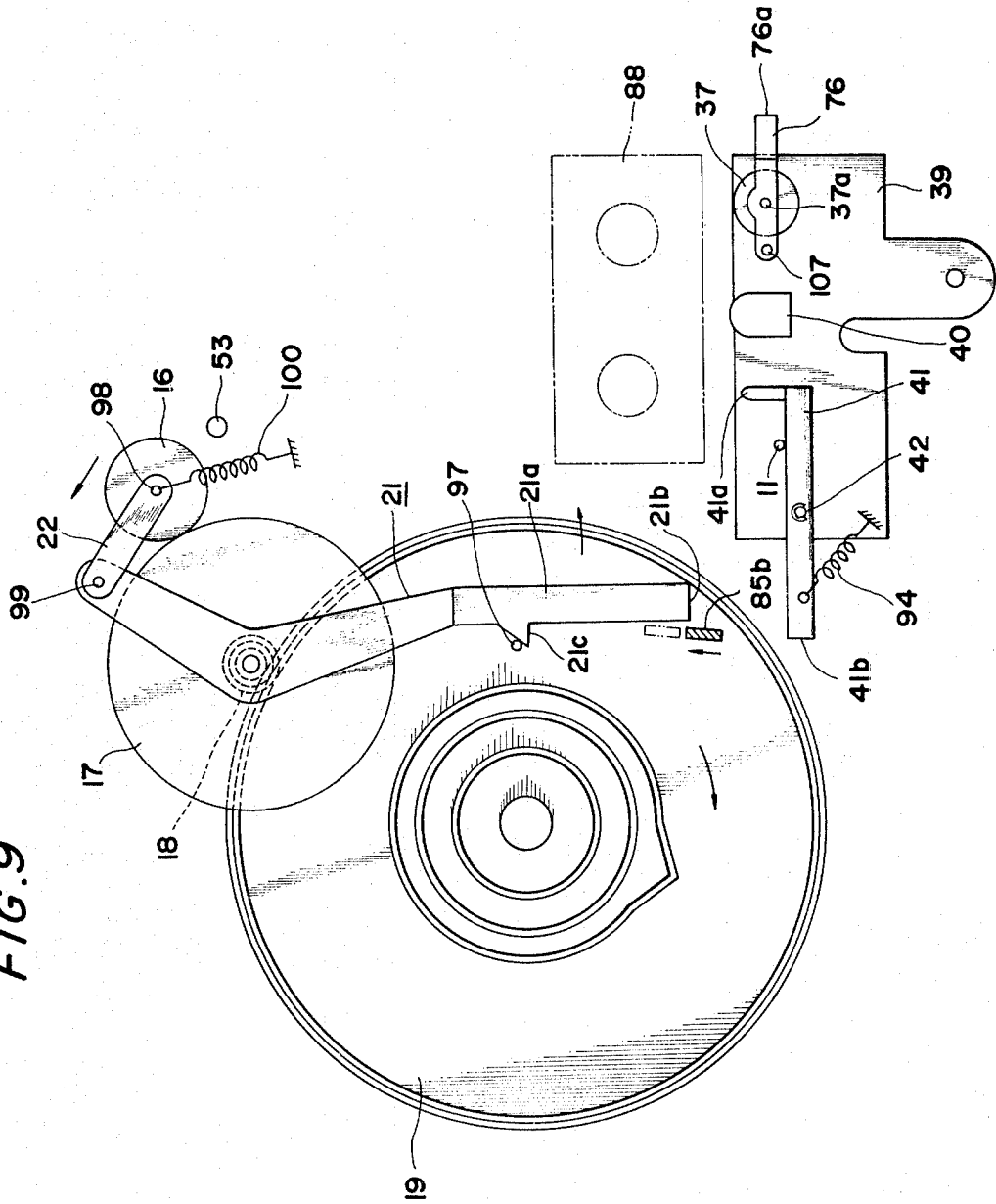


FIG. 10

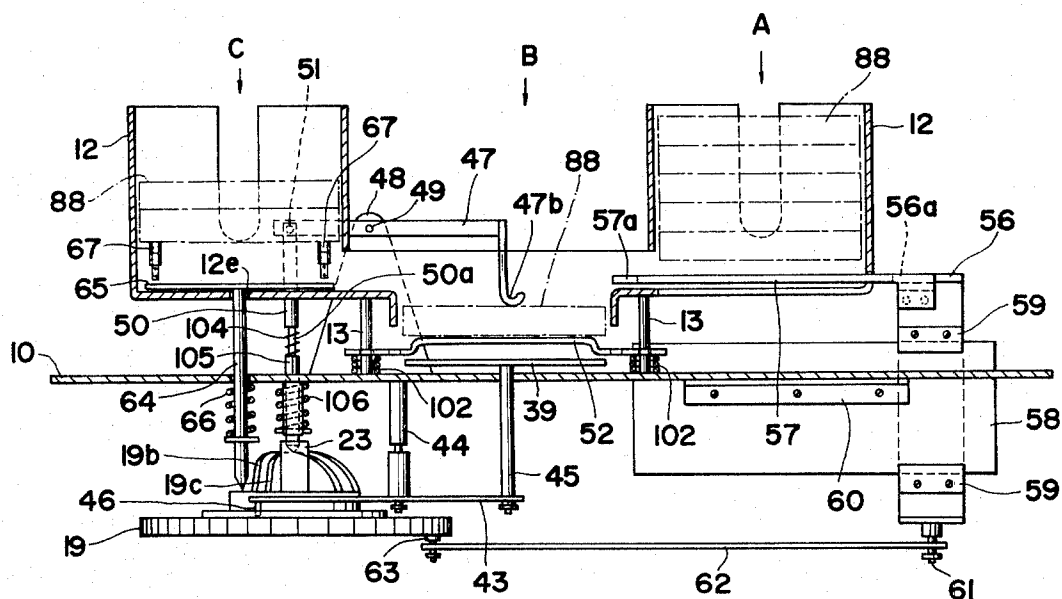


FIG. 14

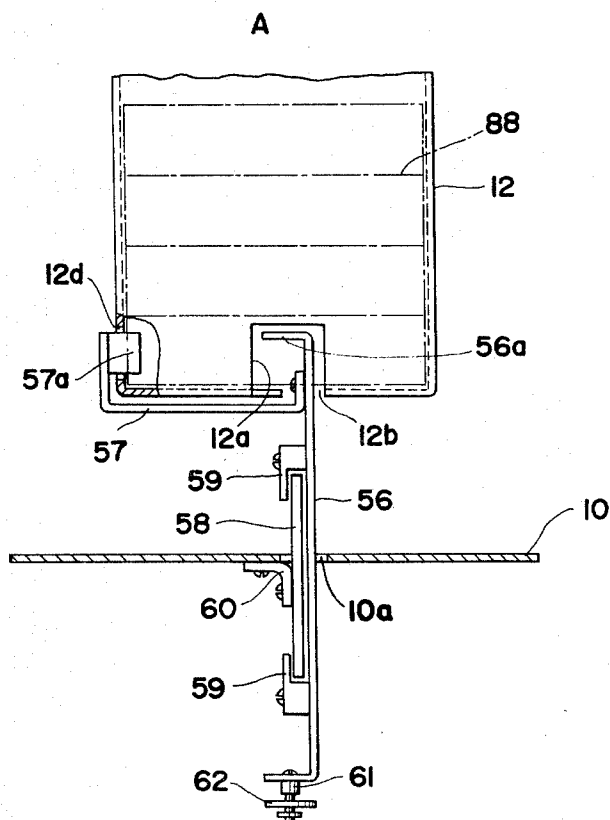
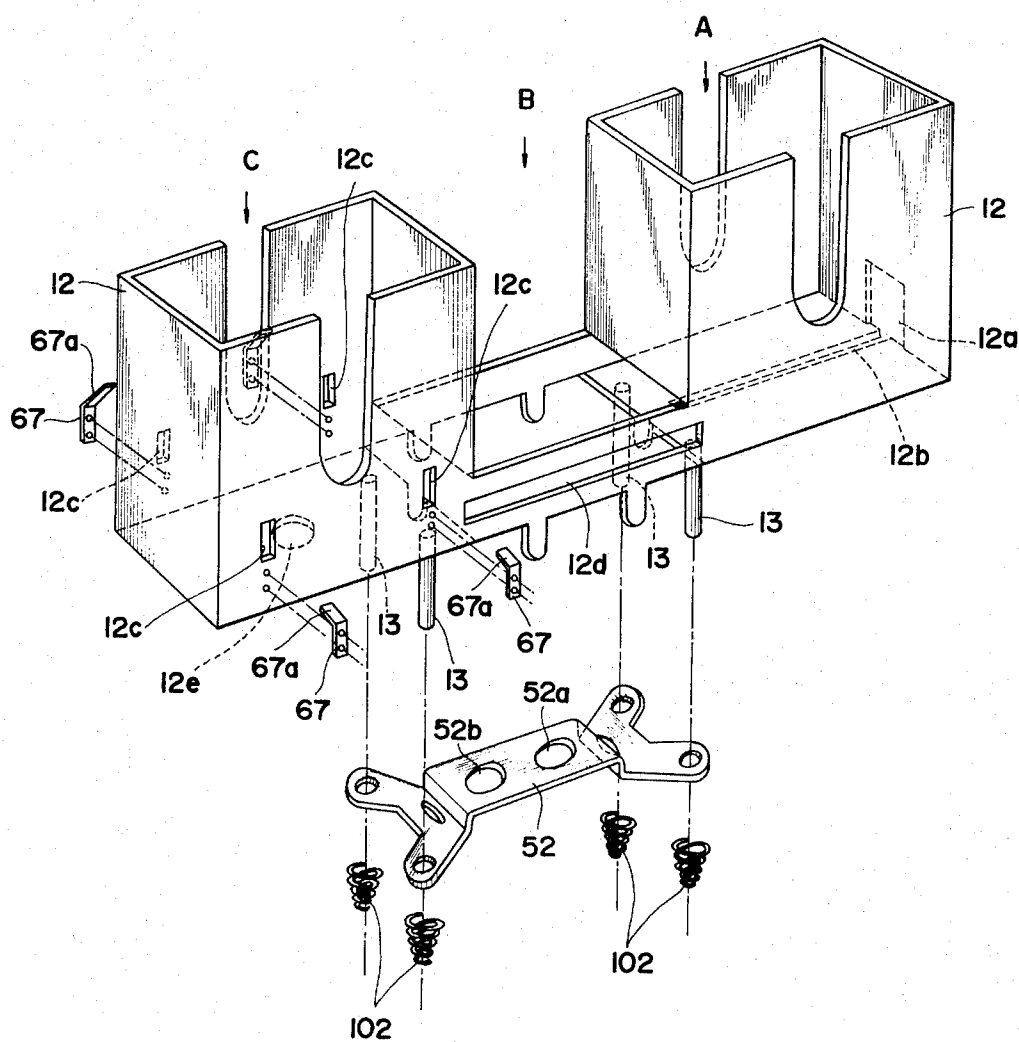


FIG. 11



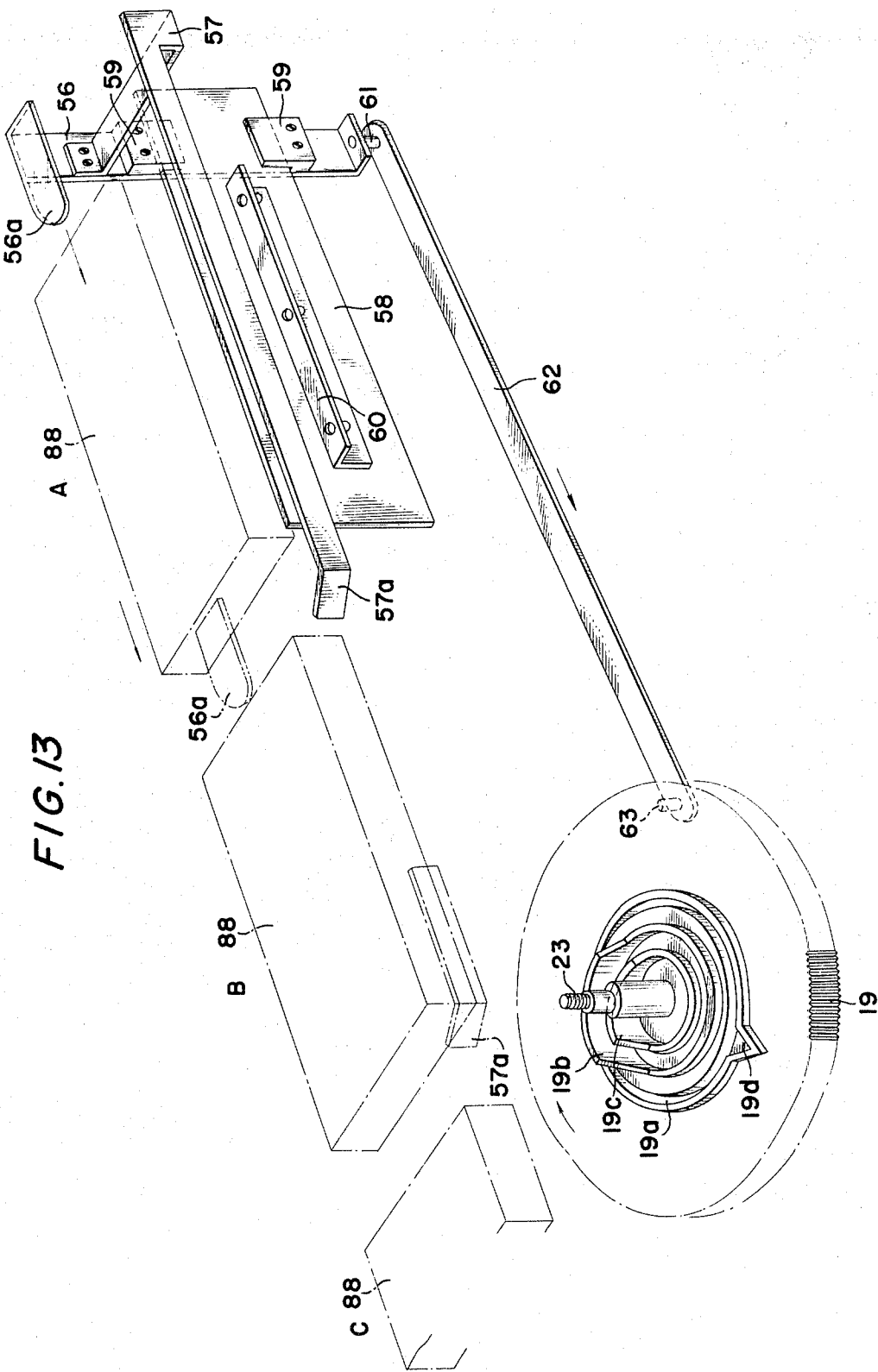


FIG. 15

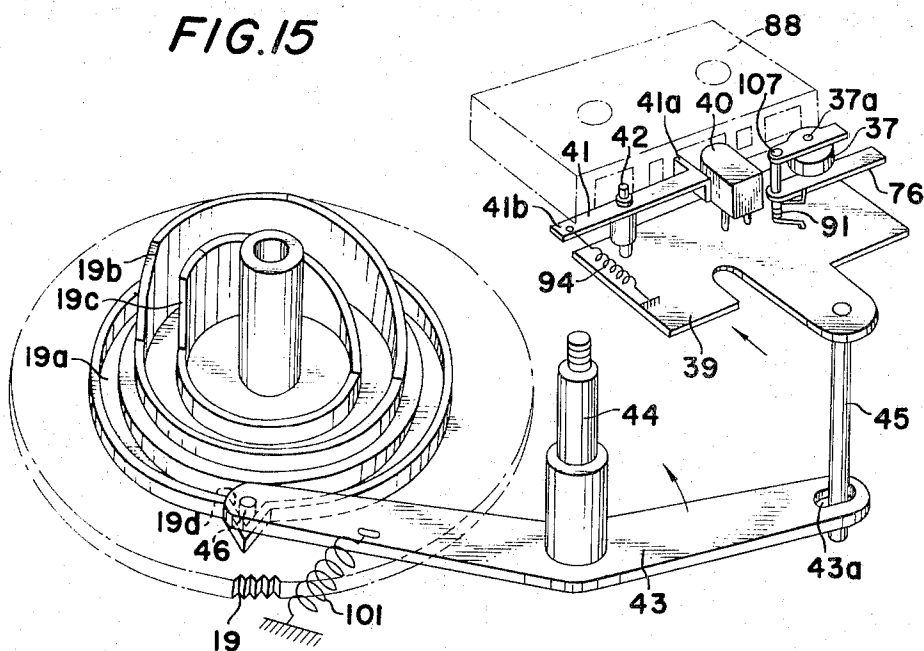


FIG. 16

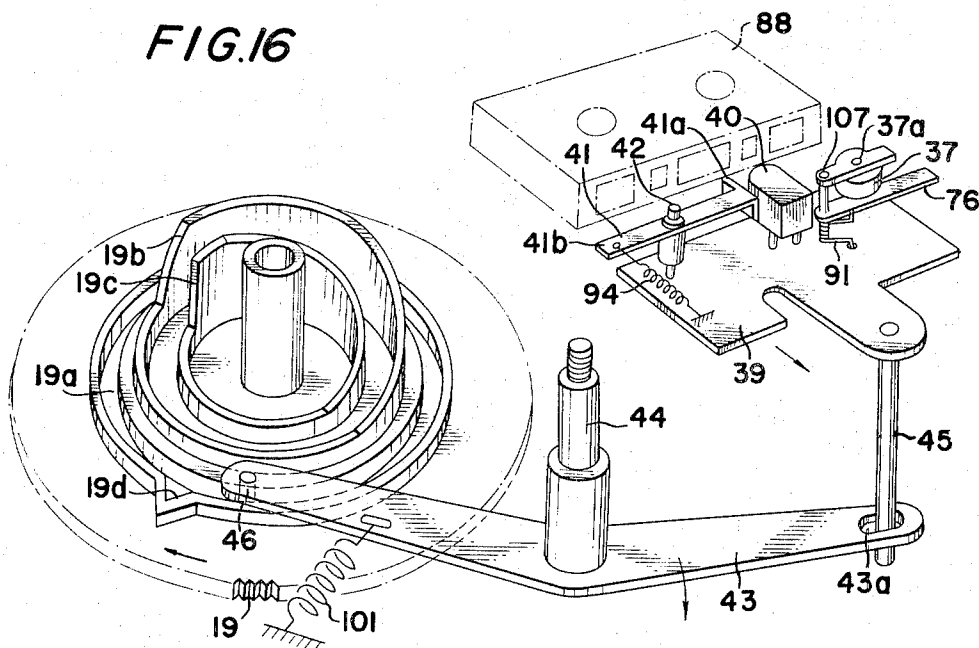


FIG. 17A

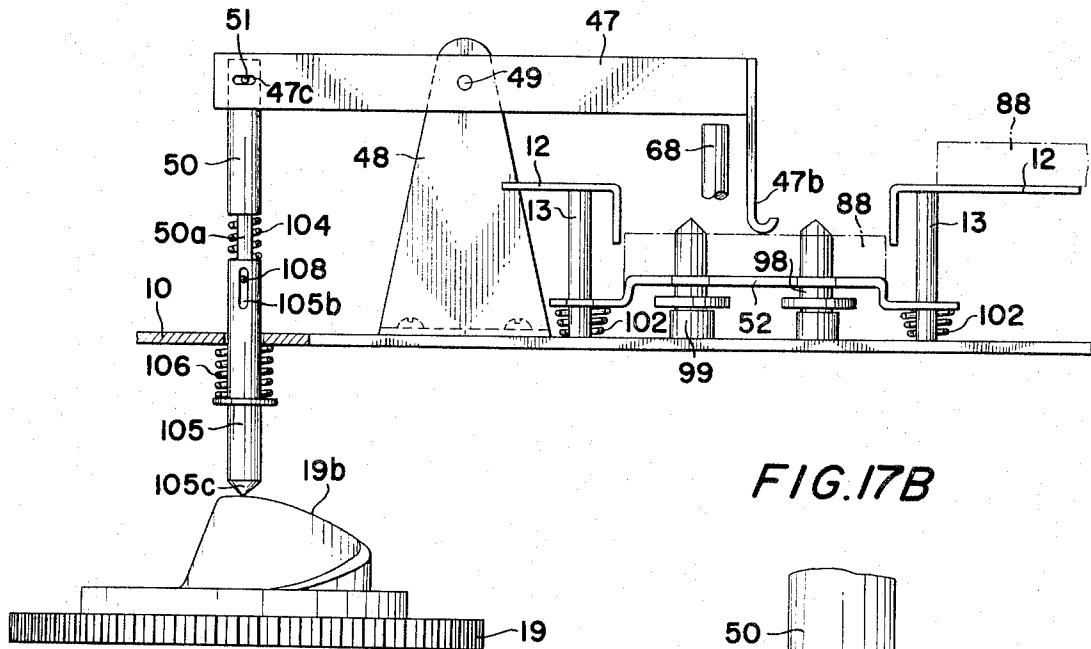


FIG. 17B

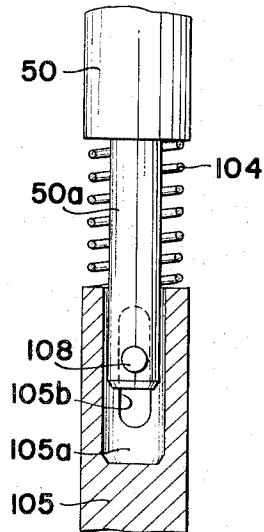


FIG. 22

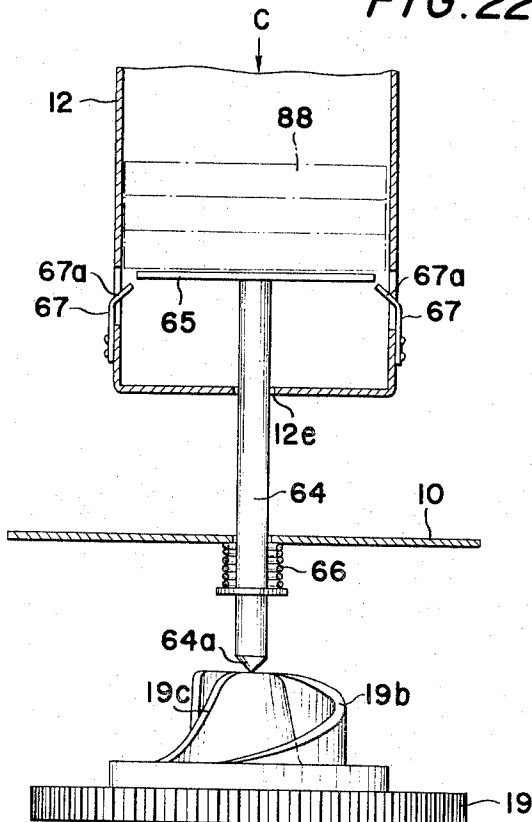


FIG. 18

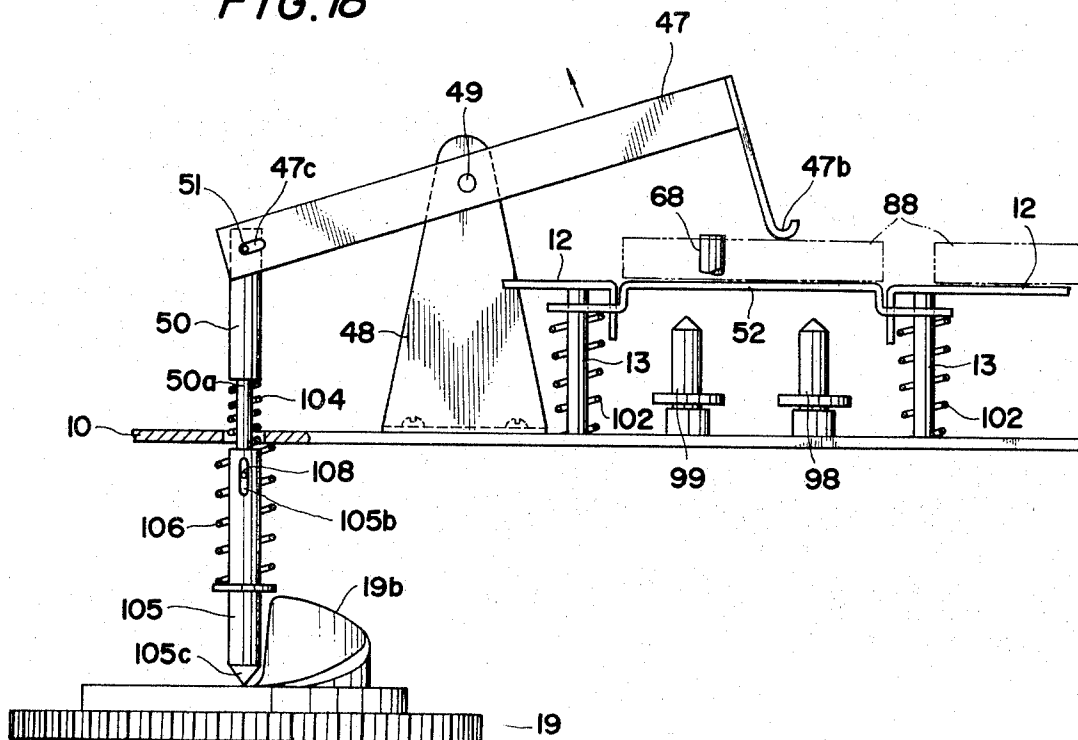


FIG. 19

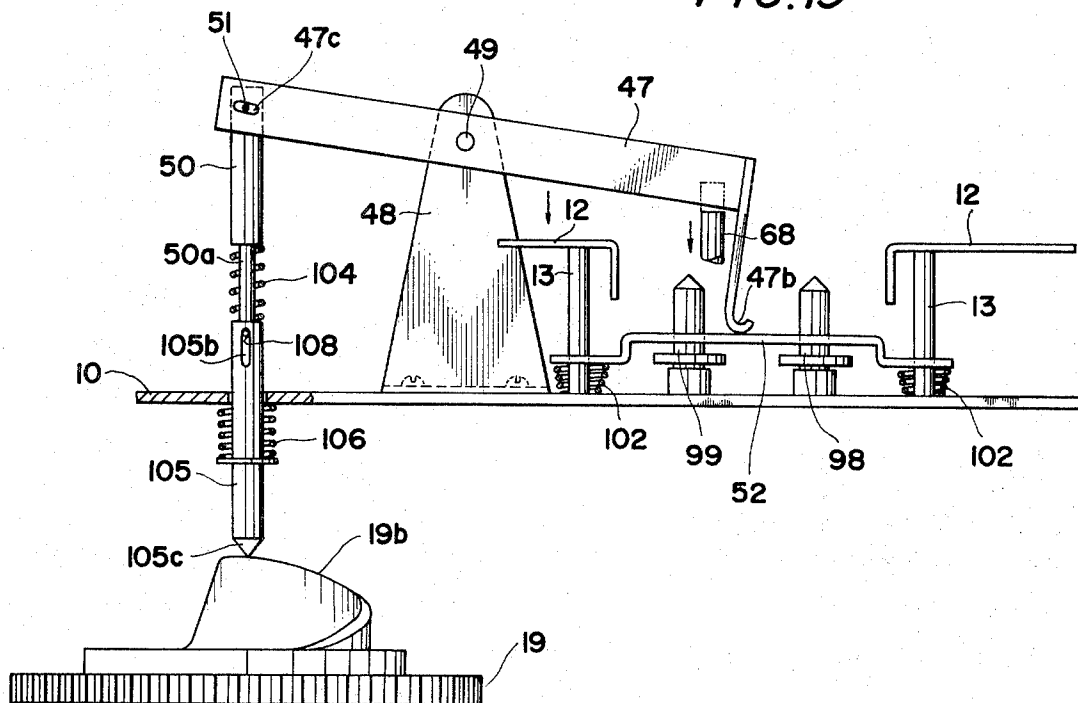


FIG. 20

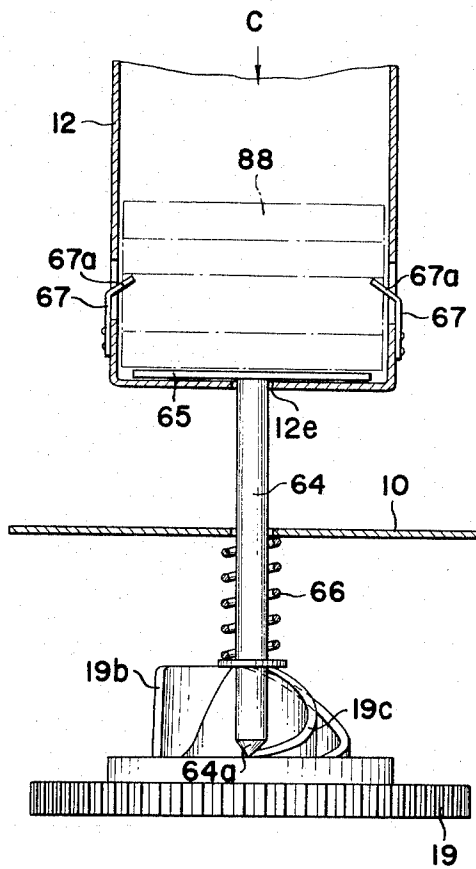


FIG. 21

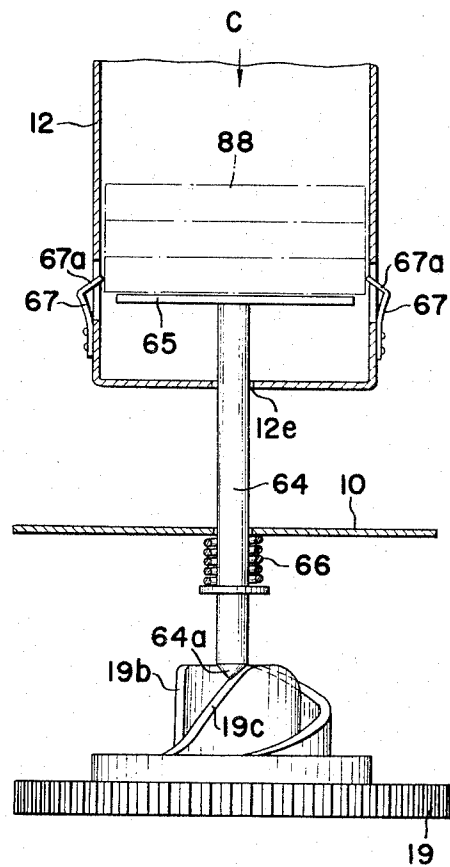




FIG. 24

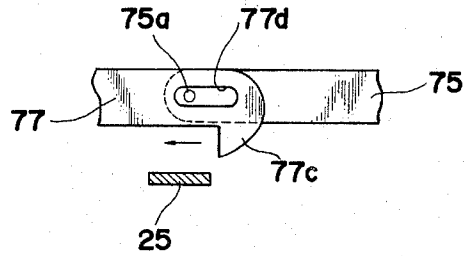


FIG. 25

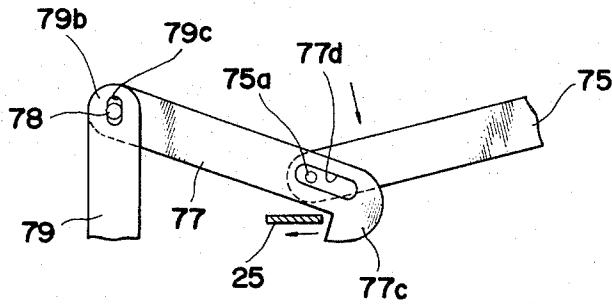


FIG. 26

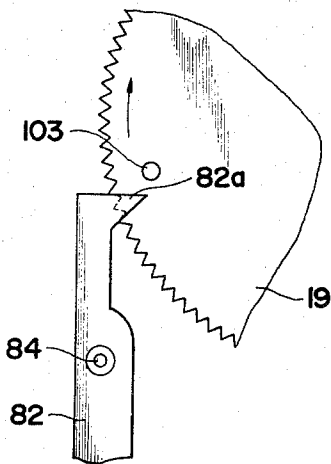


FIG. 27

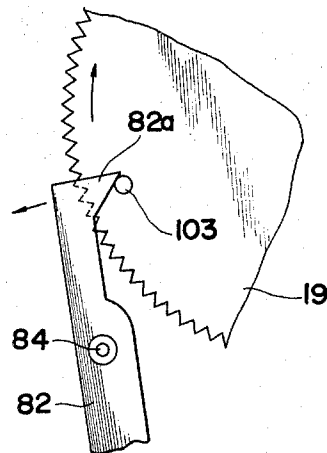
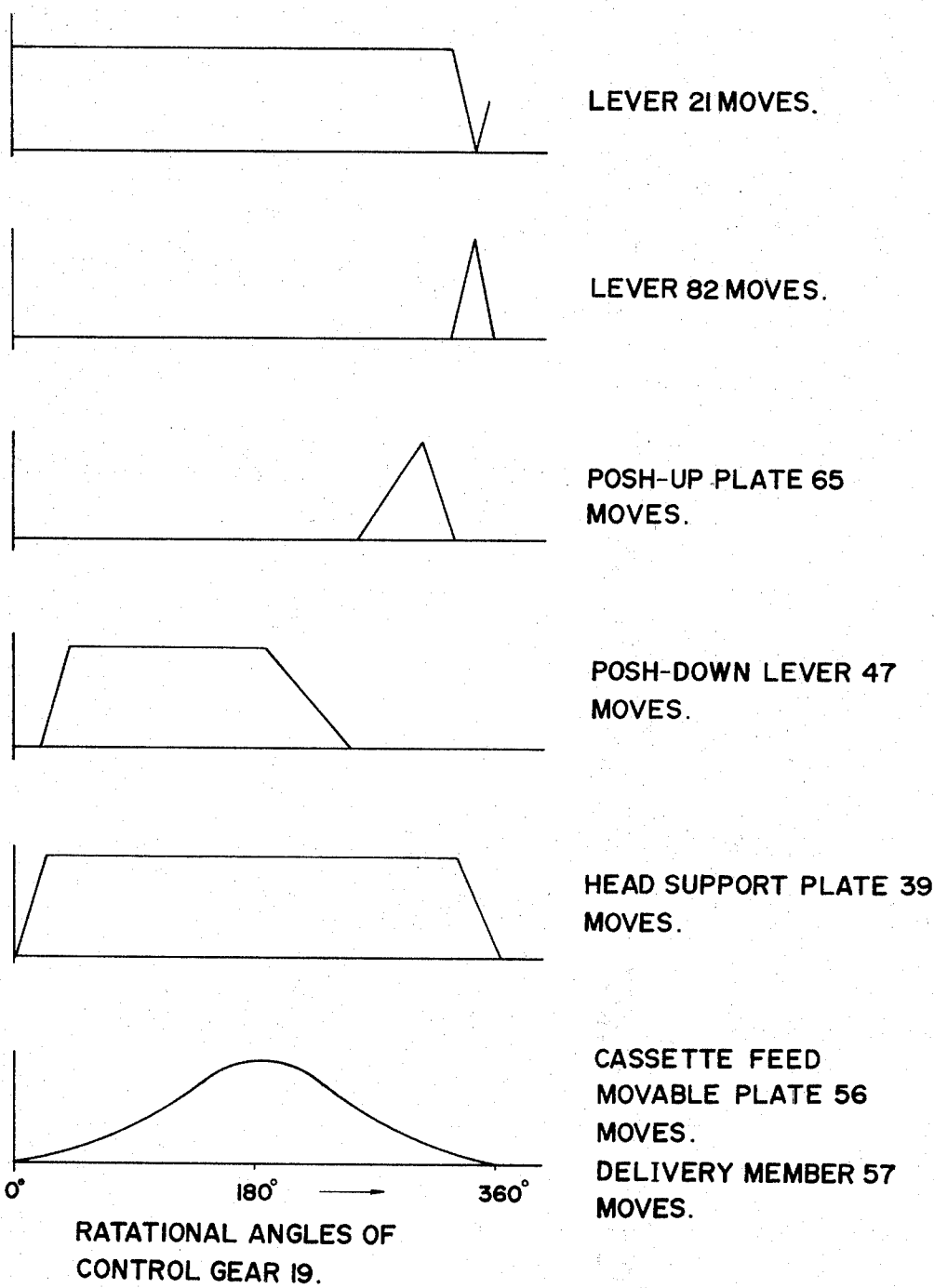


FIG. 28



## AUTOMATIC CASSETTE CHANGING AND PLAYING APPARATUS

This invention relates to automatic cassette changing and playing apparatus. More particularly, the invention is concerned with an apparatus for automatically changing and playing a plurality of cassettes successively each of which contain therein a magnetically recorded tape or movie film.

In one apparatus known in the art of automatic playing of cassettes, a plurality of cassettes are piled in a stack in a cassette case and the lowermost cassette is first played. After completion of playing, the lowermost cassette is moved downwardly and removed from the apparatus, and the cassette now in the lowermost position is then played and moved downwardly after completion of playing. This process is repeated until all the cassettes in the case are played.

This apparatus has disadvantages. The cassette being played cannot be observed under direct vision. Difficulty is experienced in taking out a cassette because it is moved downwardly after being played.

A general object of this invention is to provide a novel automatic cassette changing and playing apparatus which obviates the aforementioned disadvantages of the prior art apparatus.

A main object of the invention is to provide an apparatus which permits to automatically change and play a plurality of cassettes one after another.

Another object of the invention is to provide an automatic cassette changing and playing apparatus which permits to readily observe a cassette under direct vision while it is being played.

Another object of the invention is to provide an automatic cassette changing and playing apparatus in which a cassette taken out of a number of cassettes stored in a predetermined position is played in a playing position and moved to a predetermined position after completion of playing. The apparatus is effective to automatically detect the completion of playing of one cassette and perform a next operation.

Another object of the invention is to provide an automatic cassette changing and playing apparatus which comprises means for taking out a cassette from a first cassette case in which cassettes yet to be played are housed and moving it to a predetermined playing position, and means for moving a cassette from the playing position into a second cassette case after completion of playing of the cassette in the playing position.

Another object of the invention is to provide an automatic cassette changing and playing apparatus in which cassettes are successively piled in a stack in superposed relation in a cassette case after completion of playing.

Still another object of the invention is to provide an automatic cassette changing and playing apparatus which comprises means for automatically detecting the position of the trailing end of a magnetic tape in the cassette by sensing an increase in the tension of the tape when playing reaches an end.

A further object of the invention is to provide an automatic cassette changing and playing apparatus which is rendered inoperative when all the cassettes housed in a cassette case have been played.

Additional objects as well as features and advantages of this invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view of a first embodiment of the automatic cassette changing and playing apparatus according to this invention;

FIG. 2 is a front view of the apparatus of FIG. 1;

FIGS. 3 to 5 are perspective views, on an enlarged scale, of a mechanism for starting and stopping essential portions of the apparatus of FIG. 1;

FIGS. 6 and 7 are perspective views, on an enlarged scale, of a mechanism for starting and stopping the control gear section;

FIGS. 8 and 9 are plan views of the means shown in FIGS. 6 and 7 respectively;

FIG. 10 is a front view of the cassette conveyor means;

FIG. 11 is a perspective view of the cassette case;

FIG. 12 is a perspective view of the control gear;

FIG. 13 is a perspective view of the cassette horizontal conveyor means;

FIG. 14 is a side view of the means shown in FIG. 13;

FIGS. 15 and 16 are perspective views of the means for actuating the head support plate;

FIGS. 17 to 19 are front views of the cassette push-down means;

FIGS. 20 to 22 are side views of the cassette push-up means;

FIG. 23 is perspective view of the automatic stop means;

FIGS. 24 to 27 are views in explanation, on an enlarged scale, of the essential portions of the means shown in FIG. 23; and

FIG. 28 graphically shows the operation of various members in relation to the rotational angles of the control gear.

The present invention will be explained with reference to an embodiment which uses cassettes containing magnet tapes available in the market.

In FIGS. 1 and 2 which are a plan view and a front view respectively of the apparatus in its entirety, a cassette case 12 is mounted on a chassis base 10 by four support posts 13, 13.

The cassette case 12 comprises a housing for containing cassettes yet to be played (A), a playing station (B) and a housing for containing cassettes already played (C). The two housings (A) and (C) are of box-shape and have a bottom for placing thereon cassettes yet to be played and cassettes already played respectively. Formed in a side wall and a bottom wall of the housing (A) are an opening 12a and a slit 12b respectively which act as a path of travel of a cassette feed movable plate 56 subsequently to be described.

Mounted on the outer surfaces of the front and rear walls of the housing for containing cassettes already played (C) are four claws 67, 67 each of which is formed of a plate spring and includes an obliquely upwardly directed forward end portion 67a extending through a window 12c into the interior of the housing (C). The claws 67, 67 are each fixed to the front and rear walls in a position such that the forward end portion 67a is disposed at a level slightly higher than that of a cassette as measured from the bottom of the housing (C).

Provided in the playing section (B) is a movable plate 52 which can move up and down as guided by support posts 13, 13. Openings 52a and 52b are formed in the movable plate 52 for cassette reel driving spindles to extend therethrough. The movable plate 52 is normally urged upwardly by the biasing forces of springs 102,

102 mounted between the chassis base 10 and movable plate 52 into a position in which it is flush with the upper surfaces of the bottoms of the two housings (A) and (C) (See FIG. 18).

A motor 14 is provided on the underside of the chassis base 10 (see FIGS. 1, 6 and 7). A belt 15 is trained about a pulley 54 secured to a shaft 53 of the motor 14 and a pulley 55 secured to a shaft of a capstan 38. The shaft of the capstan 38 is rotatably supported by the chassis base 10 and its upper end extends upwardly above the upper surface of the chassis base 10.

Rotatably supported by a shaft 23 secured to the underside of the chassis base 10 is a control gear 19 which is maintained in meshing engagement with a pinion 18 supported by a shaft 20 secured to a portion of the chassis base 10. Formed coaxially and integrally with the pinion 18 is a friction wheel 17 which is driven by the motor 14 through an idler 16. The idler 16 is rotatably supported at 98 by an arm 22 at its forward end. The arm 22 is pivotally supported at its base 99 by one end of a lever 21. A spring 100 is mounted between the forward end of the arm 22 and chassis base 10 so as to thereby bring the idler 16 into pressing engagement with the shaft 53 of the motor 14 and the friction wheel 17. The lever 21 is pivotally supported by the shaft 20 and has an arm 21a which extends above the control gear 19 and traverses the same. The arm 21a is formed with a projection 21c midway between its opposite ends. A first pin 97 is attached to the upper surface of the control gear 19 so that the projection 21c is pushed and moved by the first pin 97 as the gear 19 rotates.

A shaft 86 is attached to a bracket 87 secured to the chassis base 10, and a lever 85 pivotally supported by the shaft 86 pivotally moves in a vertical plane. The lever 85 is urged to move by the biasing force of a spring 96 and its movement is inhibited by a stopper 95.

When the lever 85 is in its operative position, a lower end 85b thereof is disposed in the path of pivotal movement of a forward end 21b of the arm 21a of the lever 21, thereby preventing further pivotal movement of the lever 21 in a clockwise direction beyond its position shown in FIG. 6.

A head support plate 39 adapted to move in sliding motion on the upper surface of the chassis base 10 is moved by guide means (not shown) in the directions of the arrows shown in FIGS. 15 and 16. The aforementioned movements of the head support plate 39 are effected by a cam 19a provided in the control gear 19 through a lever 43 pivotally supported by a shaft 44 secured to the chassis base 10.

Formed in one end portion of a lever 43 is a slot 43a which receives therein a shaft 45 attached to a portion of the support plate 39 and directed downwardly. The lever 43 is urged by the biasing force of a spring 101 for pivotal movement in an anticlockwise direction so as to thereby cause a pin 46 attached to the other end portion of the lever 43 to drop into a recess 19d formed in the cam 19a. A magnetic head 40 is secured to the head support plate 39, and a pinch roller 37 for advancing a magnetic tape and a sensing lever 41 are provided on the head support plate 39. The pinch roller 37 is rotatably supported through a shaft 37a by a □-shaped arm 76 which is pivotally supported by a shaft 107 on the head support plate 39 and urged to move pivotally in an anticlockwise direction by a spring 91.

The sensing lever 41 is pivotally supported by a shaft 42 on the head support plate 39 and urged to pivotally

move in an anticlockwise direction by a spring 94. The sensing lever 41 is positioned by being engaged by a pin 11 secured to the head support plate 39. A projecting member 41a is provided at a right end of the sensing lever 41 and disposed normal to the longitudinal axis of the lever 41 whose left end is positioned against an upper end 85a of the lever 85.

The numeral 24 refers to an operation lever which is Y-shaped as shown in FIG. 1 and FIGS. 3 to 5 and pivotally supported at its central portion by a shaft 28 on the upper surface of the chassis base 10. The operation lever 24 comprises a first arm 24a on which a knob 110 is provided. The lever 24 also comprises a second arm 24b which is positioned against the lever 85 and a third arm 24c having a pin 90 attached to its end portion which is engaged in a recess 25a formed in a clamp lever 25. The clamp lever 25 is urged to pivotally move in a clockwise direction about a shaft 29 by the biasing force of a spring 27. With the pin 90 at the end of the third arm 24c of the operation lever 24 being received in the recess 25a in the clamp lever 25, the operation lever 24 is prevented from pivotally moving in a clockwise direction beyond the position shown in FIG. 3 by being urged by the biasing force of a spring 26. A lever 30 pivotally supported by a shaft 31 urged to move pivotally in an anticlockwise direction by a spring 33 has one end portion 30a which is positioned against the pin 90. The lever 30 has the other end portion 30b which is positioned against a movable contact 32a of a normally closed power source switch 32 for turning on and off the power source for the motor 14.

A sliding member 34 pivotally connected by a shaft 35 to the other end portion 30b of the lever 30 is guided by a pin 36 attached to the upper surface of the chassis base 10 for sliding movement as the lever 30 moves in pivotal motion. Attached to a forward end of the sliding member 34 is a pin 89 which is adapted to engage a forward end 76a of the □-shaped arm 76.

A guide plate 58 is attached to the chassis base 10 by an angle 60 and disposed vertically to extend through an opening 10a formed in the chassis base 10 (See FIGS. 2, 10, 13 and 14). A pair of embracing members 59, 59 secured to one side surface of a cassette feed movable plate 56 at its upper and lower portions respectively embraces the guide plate 58 at its upper and lower edges for permitting the movable plate 56 to move in sliding motion along the guide plate 58.

Attached to the lower end of the movable plate 56 is a shaft 61 to which is provided a rod 62 at one end thereof which is pivotally supported at the other end thereof by a shaft 63 attached to the underside of the control gear 19. The upper end portion of the movable plate 56 extends through the slit 12b formed in the bottom of the housing (A) for containing cassettes yet to be played. The upper end portion of the movable plate 56 is bent in one direction to form a projecting feed portion 56a. Secured to one side surface of the movable plate 56 is a delivery member 57 which extends transversely therefrom and is bent to extend along the front surface of the housing (A) and reach the right end of the playing station (B). The delivery member 57 has a forward end portion 57a which extends through a slit 12d formed in a front wall of the playing station (B) and projects inwardly into the playing station (B).

A push-down lever 47 is pivotally supported by a shaft 49 attached to a bracket 48 provided on the upper surface of the chassis base 10 as shown in FIGS. 10 and

17A. The lever 47 is bent at right angles at its right end portion (See FIG. 1) to provide a bent portion 47a which extends above the central portion of the playing station (B). The bent portion 47a has two push-down portions 47b, 47b extending downwardly therefrom. Formed in a left end portion of the push-down lever 47 is a slot 47c through which extends a pin 51 for pivotally supporting a rod 50.

As shown in FIG. 17B, the rod 50 has a reduced diameter lower end portion 50a which is received in an axial bore 105a formed in an upper end portion of a rod 105. Formed in the side wall of the bore 105a is a vertically arranged slot 105b which receives therein a pin 108 secured to the lower end portion 50a of the rod 50. By this arrangement, the rods 50 and 105 are connected to each other for sliding motion toward and away from each other for a distance corresponding to the vertical length of the slot 105b. A compression spring 104 is mounted between the two rods 50 and 105 for normally bringing the rods 50 and 105 into extended positions.

The rod 105 extends downwardly through an opening formed in the chassis base 10 and includes a lower end portion 105c which engages a cam 19b provided in the control gear 19. The rod 105 is supported for axial movement and urged to move downwardly by the biasing force of a compression spring 106.

An opening 12e is formed in the bottom of the housing (C) for containing cassettes yet to be played. A rod 64 extending through an opening formed in the chassis base 10 and the opening 12e is supported for vertical movements upwardly and downwardly (See FIG. 10 and FIGS. 20 to 22). A push-up plate 65 is attached to an upper end of the rod 64 which is urged by a compression spring 66 to press at its lower end 64a against a cam 19c provided in the control gear 19.

Provided in the path of pivotal movement of the push-down lever 47 is a rod 68 (See FIG. 23) which is supported for movement upwardly and downwardly and extends downwardly through an opening formed in the chassis base 10. The rod is urged to move upwardly by the biasing force of a spring 109. A lever 69 pivotally supported through a shaft 71 by a bracket 70 secured to the underside of the chassis base 10 is pivotally connected at one end to a lower end of the rod 68 through a shaft 35. The lever 69 is pivotally connected at the other end thereof to one end of a lever 75 through a rod 72. The lever 75 is pivotally supported through a shaft 73 by a bracket 74 secured to the upper surface of the chassis base 10. A pin 75a is attached to an end of the lever 75 opposite to the end thereof at which the lever is pivotally connected to the rod 72.

A second pin 103 attached to the upper surface of the control gear 19 is adapted to engage one end portion 82a of a lever 82 which is pivotally supported by a shaft 84 and urged to pivotally move in a clockwise direction by a spring 83. A lever 79 engaging at one end portion 79a thereof the other end portion 82b of the lever 82 is pivotally supported through a shaft 81 by a bracket 80 secured to the underside of the chassis base 10. The lever 79 is formed at the other end portion 79b thereof with a slot 79c which receives therein a pin 78 attached to one end portion 77a of a pawl member 77. A pawl 77c is provided at the other end portion 77b of the pawl member 77 which is formed therein with a slot 77d for receiving therein a pin 75a attached to the lever 75. Disposed below the pawl 77c is the clamp lever 25

(See FIGS. 3 to 5 and 23 to 25) which is adapted to be engaged by the pawl 77c when the lever 75 has been pivotally moved in a clockwise direction as shown in FIG. 25.

The mechanism constructed as aforementioned operates as follows:

Cassettes 88 to be played are placed in the housing (A) for containing cassettes yet to be played and arranged in superposed relation in the order of playing. The knob 110 on the first arm 24a of the operation lever 24 is then turned to a position designated START as shown in FIG. 4. This results in the pin 90 being released from engagement with the one end 30a of the lever 30 and allows the lever 30, which has up to then been pushed and moved pivotally as shown in FIG. 5 by the pin 90 attached to the third arm 24c of the operation lever, to be moved pivotally in an anticlockwise direction by the biasing force of the spring 33. Thus, the lever 30 is released from engagement with the movable contact 32a of the power source switch 32, and the switch 32 is closed for starting the motor 14.

On the other hand, the second arm 24b of the operation lever 24 pushes the upper end 85a of the lever 85 and moves the same pivotally in the direction of the arrow shown in FIG. 7. This allows the lever 21, which has up to then been prevented from moving pivotally by the lower end 85b of the lever 85 as shown in FIG. 6 to move in pivotal motion. As a result, the lever 21 moves pivotally in the direction of the arrow in FIG. 7, thereby permitting the idler 16 to be pressed against the shaft 53 of the motor 14 and the friction wheel 17 by the biasing force of the spring 100.

If the hand is released from the knob 110, then the operation lever 24 tends to return to an OFF position by being moved pivotally by the biasing force of the spring 26. However, since the recess 25a formed in the clamp lever 25 receives the pin 90 therein, the knob 110 remains in an ON position. With the operation lever 24 in this position, the pin 90 is kept away from the one end 30a of the lever 30, so that the lever 30 is prevented from opening the power source switch 32.

The second arm 24b of the operation lever 24 is also released from engagement with the lever 85. As shown in FIGS. 7 and 8, the lever 85 abuts against the end portion 21b of the lever 21 and is prevented thereby from further pivotal movement.

The idler 16, which is pressed against the shaft 53 of the motor 14 and the friction wheel 17, transmits the rotation of motor 14 to the control gear 19 through the friction wheel 17 and pinion 18, thereby causing the control gear 19 to rotate in a clockwise direction. As a result, rod 62 is pulled to the left in FIG. 13, causing the cassette feed movable plate 56 to move leftwardly. The projecting feed portion 56a of the cassette feed movable plate 56 is brought into engagement with and pushes the lowermost cassette, at its right side surface, of the cassettes 88 disposed in superposed relation in the housing (A), so that the cassette moves leftwardly in sliding motion into the playing station (B).

When the control gear 19 has rotated through over 180°, the rod 62 is driven to move in a direction opposite to the direction in which it has moved as aforementioned or to the right, thereby causing the movable plate 56 to move to the right too and restored to its original position (solid line position in FIG. 13). The cassettes 88 yet to be played which are disposed one over another rest on the projecting feed portion 56a till

the cassette feed movable member 56 is restored to its original position. When the latter is restored to its original position, the cassettes 88 moves downwardly by their own weight till the lowermost cassette comes into contact with the bottom of the housing (A).

When the control gear 19 has rotated through over 180°, the cam 19b pushes upwardly the lower end 105c of the rod 105 and causes the push-down lever 47 to move pivotally as shown in FIG. 17, with a result that the two push-down portions 47b, 47b press against the upper surface of the cassette 88 resting on the movable plate 52 and push the plate 52 downwardly, so that the cassette 88 on the plate 52 moves downwardly too. Reel spindles 98 and 99 project upwardly from the upper surface of the chassis base 10 in the playing station (B) and extend through openings 52a, 52a formed in the movable plate 52 to be fitted in openings in the reels of the cassette 88 in the playing station (B). The capstan 38 (See FIG. 3) which also extends upwardly from the upper surface of the chassis base 10 extends through the cassette 88 in a predetermined position.

The first pin 97 abuts against the projection 21c of the lever 21 and causes the latter to move pivotally in an anticlockwise direction as shown in FIG. 9 before the control gear 19 makes one complete revolution. With the lever 21 moving pivotally as aforementioned, the lever 85, which has up to then been prevented from pivotally moving by the end portion 21b of the lever 21, is moved pivotally by the biasing force of the spring 96, so that its lower end portion 85b moves to a position in which it is disposed on one side of the lever 21. Thus, the movement of lever 21 is inhibited by the lever 85 after the pin 97 passes through the position of projection 21c, so that the lever 21 stays in the position shown in FIG. 9.

With the lever 21 pivotally moving to this position, the idler 16 connected to it is released from engagement with the motor shaft 53, thereby disconnecting the control gear 19 from its drive source.

Immediately before this state is brought about, the recess 19d formed in the cam 19a draws near the pin 46 attached to the lever 43 (See FIG. 15), so that the control gear 19 slightly moves even after disconnected from its drive source, because it operates as a reverse cam by virtue of the biasing force of the spring 101 to move the lever 43, so that the control gear 19 stops rotating when the pin 46 is received completely in the recess 19d.

With the pin 46 being engaged in the recess 19d, the lever 43, which has up to then been moved pivotally in a clockwise direction by the cam 19a, begins to move pivotally in an anticlockwise direction. As a result, the head support plate 39 moves toward the cassette 88 in the playing station (B) as shown in FIG. 15, thereby bringing the head 40 and pinch roller 37 into engagement with a magnetic tape 92 in the cassette 88 and starting the playing of the cassette 88.

The magnetic tape 92 in the cassette 88 is pushed by the projecting member 41a of the sensing lever 41 and its path of movement is slightly curved as shown in FIG. 6. Since the trailing end of the magnetic tape 92 is firmly secured to a reel 93, the tensioning of the tape increases as the playing of the cassette is terminated. Thus, the projecting member 41a is pushed back by the tensioned tape and causes the sensing lever 41 to move pivotally in a clockwise direction against the biasing force of the spring 94. The sensing lever 41 pushes at

its left end portion 41b an upper end portion 85a of the lever 85 and causes the lever 85 to move in pivotal motion. This performs the same action as the operation of the lever 85 by the second arm 24b of the operation lever 24 to push the lower end 85b of the lever 85 when the knob 110 is turbed to the START position as aforementioned. Thus, the control gear 19 begins rotating.

The operations of various elements relative to the rotational angles of the control gear 19 are as shown in FIG. 28. With the reopening of the rotation of control gear 19, the pin 46 attached to the lever 43 is released from engagement in the recess 19d of the cam 19a and permits the lever 43 to move pivotally in a clockwise direction, causing the head support plate 39 to move away from the cassette 88.

The rod 105 then slides downwardly from the crest of cam 19b as shown in FIG. 18 and moves the push-down lever 47 pivotally in an anticlockwise direction. As a result, the cassette 88 and movable plate 52, which have up to then been moved to a lower position by the push-down portions 47b, 47b, are moved to an upper position by the biasing force of the spring 102.

The delivery member 57 moving leftwardly with the cassette feed movable plate 56 pushes at its forward end portion 57a the right side surface of the cassette 88 moving upwardly as aforementioned (See FIG. 13). As a result, the cassette 88 resting in the playing station (B) is transferred to the housing (C) for containing cassettes already played.

Upon completion of the transfer of the played cassette 88 to the housing (C), the rod 64 is pushed upwardly by the cam 19c (See FIGS. 20 to 22), with a result that the cassette 88 is pushed and moved upwardly by the push-up plate 65 attached to the upper end of the rod 64. At this time, the cassette 88 moves through this position by expanding the claws 67, 67 by the front and rear surfaces of the cassette. As the lower end 64a of the rod 64 has moved over the crest of the cam 19c and begins to move downwardly, the push-up plate 65 also moves downwardly. However, the cassettes 88 are prevented from moving downwardly by the forward ends of the claws 67, 67 projecting inwardly as shown in FIG. 22.

In this way, the cassette 88 that has been played is added from below to the cassettes in the housing (C) for containing cassettes already played while being pushed upwardly from below.

Simultaneously as the cassette 88 resting in the playing station (B) is delivered to the housing (C), a next cassette 88 in the housing (A) for containing cassettes yet to be played is delivered to the playing station (B) and played in the same manner as stated previously. When the final cassette has been played and the control gear 19 has started rotating to deliver the final cassette to the housing (C) so that all the cassettes in the housing (A) have been exhausted, no cassette 88 is found in the playing station (B).

With no cassette 88 in the playing station (B), the control gear 19 continues its rotation, and the push-down lever 47 moves pivotally in a clockwise direction as aforementioned. Accordingly, the push-down portions 47b, 47b are directly brought into contact with the movable plate 52 as shown in FIG. 19. If the cassette 88 were resting on the movable plate 52 as shown in FIG. 17, the upward movement of the rod 105 would be absorbed by the movement of the rod 105 and rod 50 toward each other after the downward movement of

the movable plate 52 is checked by the chassis base 10, so that the upward movement of the rod 105 would not be transmitted to the push-down lever 47. With no cassette 88 resting on the movable plate 52 as shown in FIG. 19, however, the push-down lever 47 moves pivotally a distance greater by an amount corresponding to the thickness of the cassette 88. As a result, the rod 68 is pushed and moved downwardly by the push-down lever 47 from the dash-and-dot line position to the solid line position in FIG. 19.

With the rod 68 being moved downwardly, the lever 69 pivotally connected to its lower end (See FIG. 23) moves pivotally in the direction of the arrow and causes the lever 75 to move pivotally in an anticlockwise direction. This causes the pawl member 77 to move pivotally in a clockwise direction about the pin 78 as shown in FIG. 25, thereby moving the pawl 77c to move toward the clamp lever 25. Immediately before a complete revolution of the control gear 19 is completed, the pin 103 attached to the control gear 19 causes the lever 82 to move pivotally in an anticlockwise direction as shown in FIG. 27. As a result, the lever 79 is pivotally moved and pulls the pawl member 77 leftwardly. The leftward movement of the pawl member 77 brings the pawl 77c into engagement with the clamp lever 25. The pawl 77c pulls the clamp lever 25 leftwardly, thereby causing the same to move pivotally in an anticlockwise direction.

The operation lever 24, which has been held in the ON position by the clamp lever 25 as shown in FIG. 3, is released from engagement therewith as the pin 90 is released from engagement in the recess 25a formed in the clamp lever 25, and the operation lever 24 is moved pivotally in a clockwise direction by the biasing force of the spring 26. This brings the knob 110 to an OFF position shown in FIG. 5. As a result, the lever 30 is pushed by the pin 90 and moves pivotally in a clockwise direction, thereby pushing and spreading apart the movable contact 32a of the power source switch 32. At the same time, the sliding member 34 is pulled in the direction of the arrow, and the pin 89 attached to one end thereof pulls the forward end of the □-shaped arm 76 toward it, thereby moving the pinch roller 37 away from the capstan 38 for preventing permanent deformation of the pinch roller. In this way, the playing of all the cassettes 88 is completed and all the parts of the apparatus are restored to the state before starting playing of the cassettes, with the apparatus being rendered inoperative.

The lever 82 moves pivotally each time the control gear 19 makes one complete revolution, so that the pawl member 77 moves leftwardly even when there are cassettes 88 yet to be played. When this is the case, however, pivotal movement of the lever 75 does not take place because the rod 68 is not pushed and moved downwardly, so that the pawl 77c moves through a path above the clamp lever 25 and does not cause it to move pivotally. Accordingly, the knob 110 on the operation lever 24 remains in its position shown in FIG. 3 and the apparatus remains operative.

When the control gear 19 stops after making one complete revolution, the pin 103 has passed by the position of the forward end 82a of the lever 82 and is disposed in the position shown in FIG. 26, so that the lever 82 is restored to its original position by the biasing force of the spring 83 and causes the pawl member 77 to move rightwardly. Accordingly, the clamp lever 25

is released from engagement with the pawl 77c, thereby leaving the lever 25 free to perform a clamping operation when the operation lever 24 is operated again.

If it is desired to change a cassette being played for another cassette during performance, one has only to turn the knob from the ON position to a REJECT position (which is the same as the START position). This causes the lever 85 to move pivotally, so that the element concerned functions as if the playing were completed. Thus, the playing of the cassette is interrupted and the next cassette can be played.

When it is desired to render the apparatus inoperative when there are some cassettes yet to be played, one has only to turn the knob 110 on the operation lever 24 to the OFF position shown in FIG. 5. The lever 90 pushes and causes the lever 30 to move pivotally, thereby pushing and spreading apart the movable contact 32a of the power source switch 32 and rendering the motor 14 inoperative. At the same time, the □-shaped arm 76 is pulled by the pin 89 on the sliding member 34 and moves pivotally to move the pinch roller 37 away from the magnetic tape 92.

When it is desired to start playing again, one has only to turn the knob 110 on the ON position. This causes the cassette, whose performance has been interrupted, to start playing again. If the knob 110 is turned to the START position, then the cassette whose performance has been interrupted is moved to the housing (C) for containing cassettes already played and the next following cassette is moved to the playing station (B) for performance.

In the embodiment shown and described herein, the movable plate 52 adapted to move up and down while maintained horizontally has been described as a support plate supported for movement upwardly and downwardly. It is to be understood, however, that this invention is not limited to the specific form of the embodiment described, and that the support plate may be of any suitable form so long as it does not interfere with the transverse movement of a cassette when it is in an upper position and it is capable of bringing a cassette into engagement with the playback device when it is in a lower position. Alternatively, the support plate may be of the type which angularly moves about a horizontal axis for supporting a cassette in an inclined position. Accordingly, the wording "movable upwardly and downwardly" in the claims should be construed to cover all the modifications of the support plate falling within the scope of the following claims.

Although the drawings and description relate to one embodiment of this invention, it should be understood that there is no intention to limit the invention to the disclosed construction and instead it is intended that the invention should extend to all alternative embodiments and constructions falling within the scope of the following claims.

What is claimed is:

1. An automatic cassette changing and playing apparatus comprising a first cassette case for housing therein a plurality of cassettes yet to be played piled in a vertical stack of horizontally disposed cassettes, first moving means for taking one cassette after another from the bottom of said stack of cassettes yet to be played housed in said first cassette case and laterally moving the same to a predetermined playing position, a support member movable upwardly and downwardly for supporting the cassettes after they are taken out of

said first case and moved laterally into said playing position by said first moving means, a pressing member adapted to press from above against said cassette supported by said support member, pressing means for causing said pressing member to press downwardly against said cassette, means for resiliently connecting said pressing member with said pressing means, said pressing means operating said pressing member through said resilient connecting means, means for successively playing the cassettes attached by said pressing member thereto, a second cassette case for housing therein a plurality of the cassettes after they have been played by said playing means, means for detecting the completion of playing of a cassette by said playing means, means for releasing said pressing member from engagement with the cassette in said playing position after completion of playing of the cassette has been detected by said detection means, second moving means operative in conjunction with said first moving means for laterally moving the played cassette from said playing position to said second cassette case at substantially the same time that said first moving means operates to move an as yet unplayed cassette laterally to said playing position, stopper means for rendering the apparatus inoperative, and means for operating said stopper means when there is no cassette on said support member and when said pressing member is moved below the height a cassette otherwise mounted on said support member would occupy.

2. The automatic cassette changing and playing apparatus as defined in claim 1 further comprising lever means for controlling the apparatus and taking three positions, said lever means starting the apparatus in the first position of said three positions, means for moving said lever means after the apparatus has been started to the second position of the three positions in which said lever means keep the apparatus playing, means for moving said lever means to the third position of the three positions in which said lever means operate said operating mechanism when there is no cassette on said support member, and means for designating the position of said lever means.

3. The automatic cassette changing and playing apparatus as defined in claim 1 wherein said first moving means comprises a feed member adapted to engage the lowermost cassette in the stack of cassettes piled in said first cassette case and deliver the same to said support member and a delivery member adapted to engage the cassette supported by said support member and forward the same to said second cassette case; said detection means comprises a magnetic tape tension increase sensing member maintained in contact with a magnetic tape secured at its trailing end to the reel in the cassette and pivotally movable as the tension of the magnetic tape is increased when playing of the tape is completed, and means for actuating said first moving means by the pivotal movement of said sensing member; and said second cassette case has a push-up member for pushing and moving upwardly a cassette that has been moved thereto, and projecting support means for resiliently supporting a cassette pushed and moved upwardly by said push-up member.

4. The automatic cassette changing and playing apparatus as defined in claim 3 in which said first cassette case and said second cassette case are on opposite sides of said support member, and said playing means have a magnetic head, a tape advance member, and means

for bringing said head and said tape advance member into engagement with the magnetic tape in said cassette in the playing position in which said cassette is pressed downwardly by said pressing means.

5. The automatic cassette changing and playing apparatus as defined in claim 3 in which said means for actuating said first moving means comprises a rotary control member for actuating the automatic changing mechanism, a motor driving said rotary control member, a clutch mechanism through which said motor drives said control member, a spring for biasing said clutch mechanism, and locking means for disengaging said clutch mechanism against the biasing force of said spring, said locking means being released from its locking position by the tape tension increase sensing member when said sensing member is actuated by an increase in the tension of the magnetic tape with which said sensing member is maintained in engagement at the termination of playing of the tape.

6. An automatic cassette changing and playing apparatus, comprising:

a first case for housing a plurality of horizontally disposed, vertically stacked cassettes containing magnetic tape on which reproducible signals are recorded;

a playing region distinct from said first case in which a selected cassette from said first case may be mounted;

reproducing means for reproducing said signals on the tape in said selected cassette;

a cassette support member resiliently mounted for vertical movement in said playing region;

first moving means for moving the lowermost of said vertically stacked cassettes laterally out of said first case and onto said support member in said playing region;

drive means disposed in said playing region below said support member for driving the tape in said selected cassette operatively past said reproducing means;

a pressing member having a principal component of motion in the vertical direction in said playing region, said pressing member contacting said selected cassette to urge it downwardly against the biasing action of the resiliently mounted cassette support member and into operative engagement with said drive means and reproducing means;

pressing means resiliently connected to said pressing member for moving said pressing member downwardly into contact with said selected cassette;

a second case for housing, in a horizontally disposed, vertically stacked arrangement, cassettes which have been ejected from said playing region;

a vertically movable member disposed in said second case;

first detecting means engaging the tape in said selected cassette and responsive to tension thereon for detecting the completion of play of the tape in said selected cassette;

means for releasing said pressing member from engagement with said selected cassette upon the detection of completion of play by said first detecting means;

second moving means operative in conjunction with said first moving means for laterally moving the first selected cassette out of said playing region and onto the vertically movable member in said second

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case at substantially the same time that said first moving member is operative to move a second selected cassette from said first case into said playing region;  
 means for moving said vertically movable member in 5  
 said second case upwardly to raise said first selected cassette within said second case;  
 means for supporting said first selected cassette in  
 said raised position to permit the entry of subsequently completed cassettes into said second case 10  
 below said first selected cassette;

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second detecting means for detecting excess vertical movement of said pressing member below the height a cassette otherwise mounted on said cassette support member would occupy when no cassette is disposed on said cassette support member in said playing region; and  
 means for stopping the operation of said apparatus in response to the detection of the excess vertical movement of said pressing member by said further detecting means.

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