United States Patent

[11] **3,549,823**

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[54] **AUTOMATICALLY REVERSING TAPE TRANSPORT WITH COAXIAL REELS**
6 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **179/100.2;** 242/194, 274/4

[51] **Int. Cl.** G11b 15/44, G11b 21/12

[50] **Field of Search** 179/100.2MT, 100.2F, 100.2CA; 242/188, 202, 209, 210, 193, 194; 274/4D, 11A; 226/165, 167

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Primary Examiner—J. Russell Goudeau
Attorney—Kinney, Alexander, Sell, Steldt & Delahunt

ABSTRACT: A tape handling apparatus specifically designed for background music and having means for affording continuous uninterrupted play of the tape by affording an automatic reversing mechanism combined with movement of the magnetic head, a timing device permitting automatic interruption of music for predetermined intervals and mechanical means for fading out and in the recorded music at intervals of interruption.

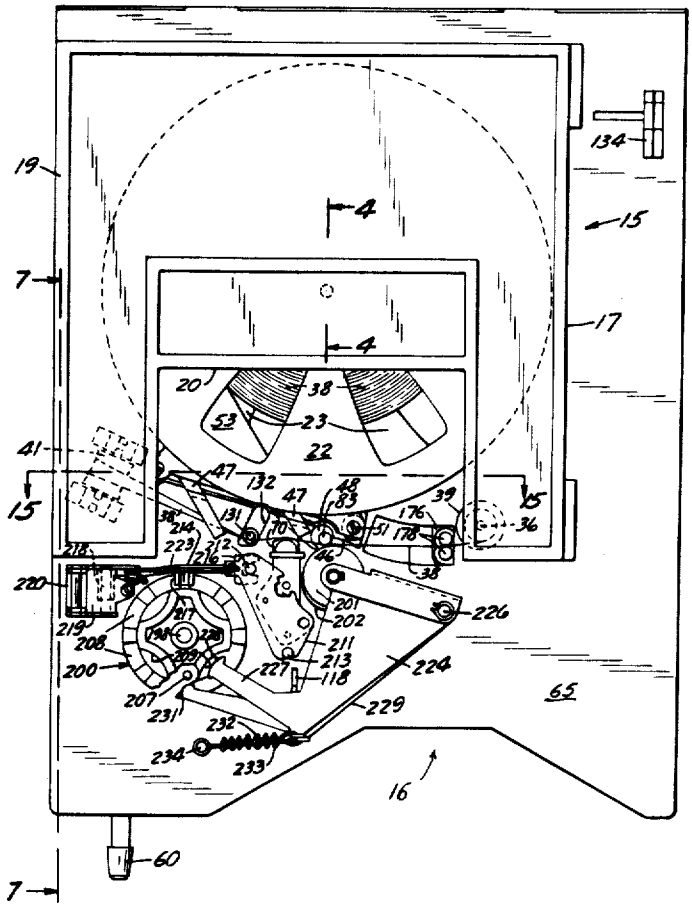
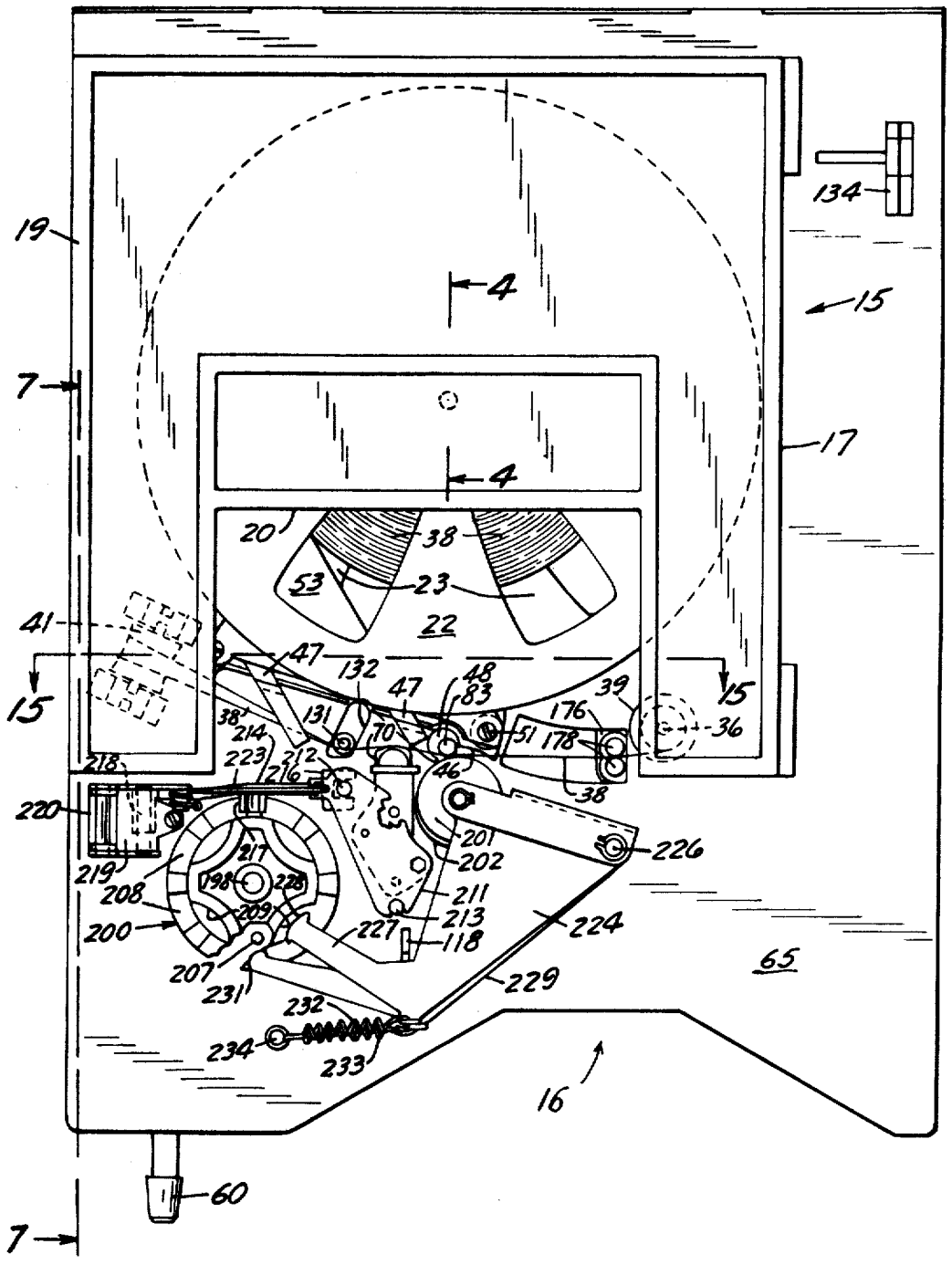


FIG. 1



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FIG. 2

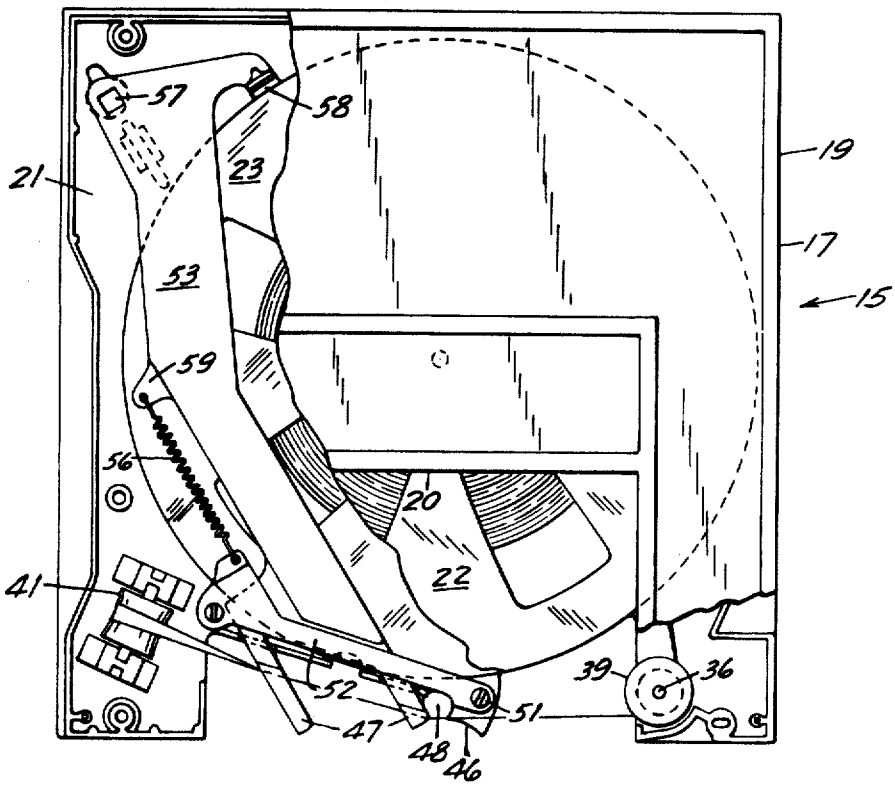


FIG. 3

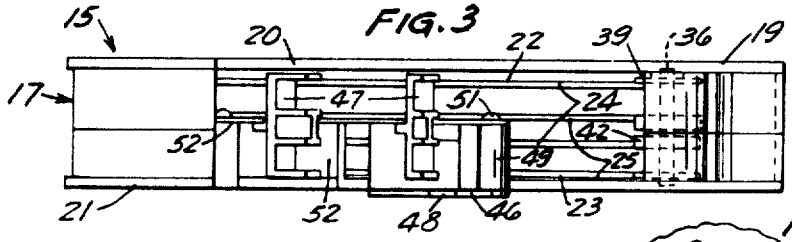


FIG. 4

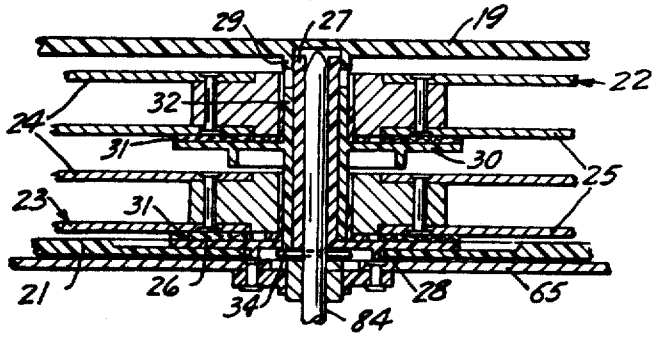
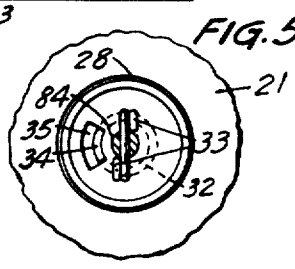
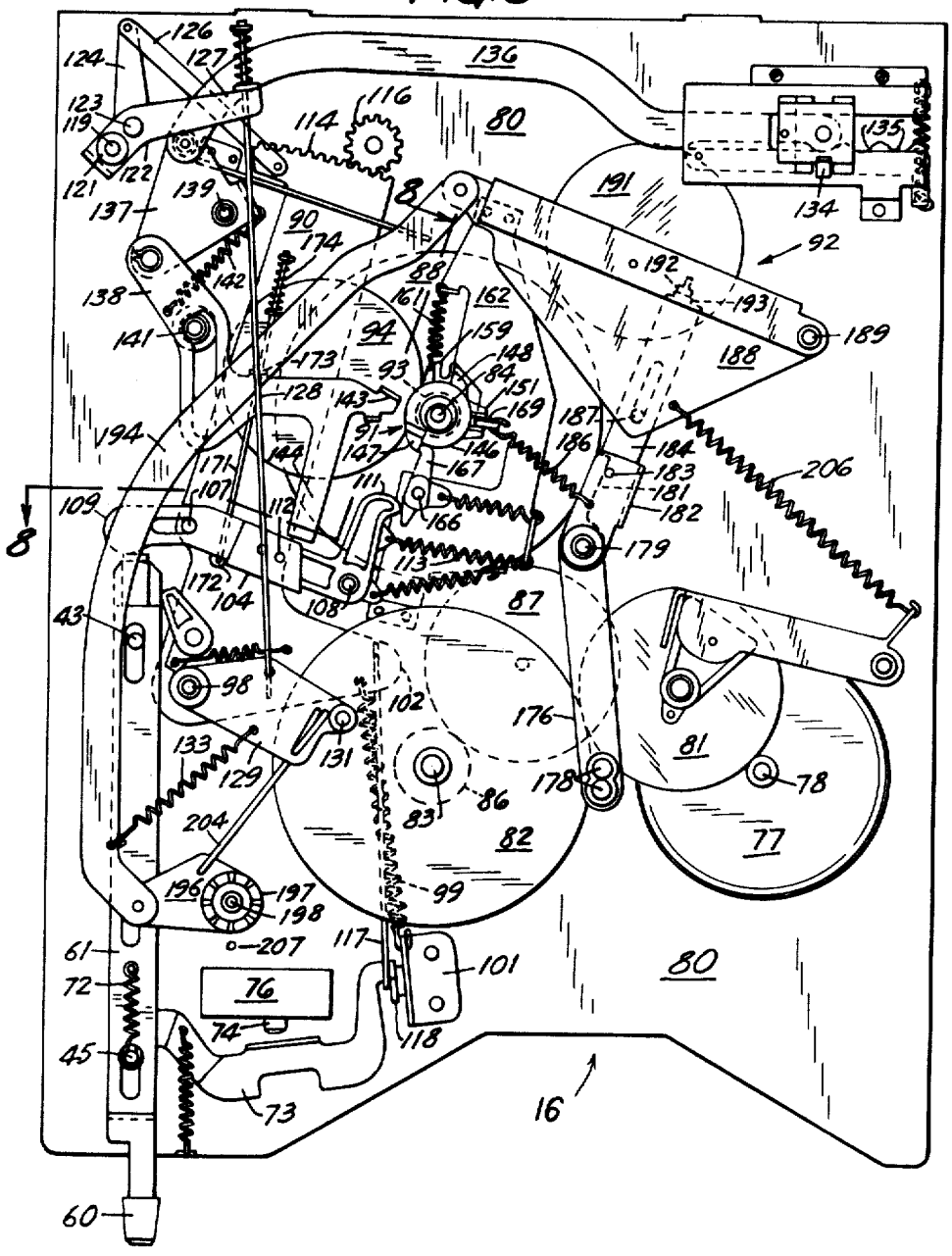


FIG. 5



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FIG. 6



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FIG. 7

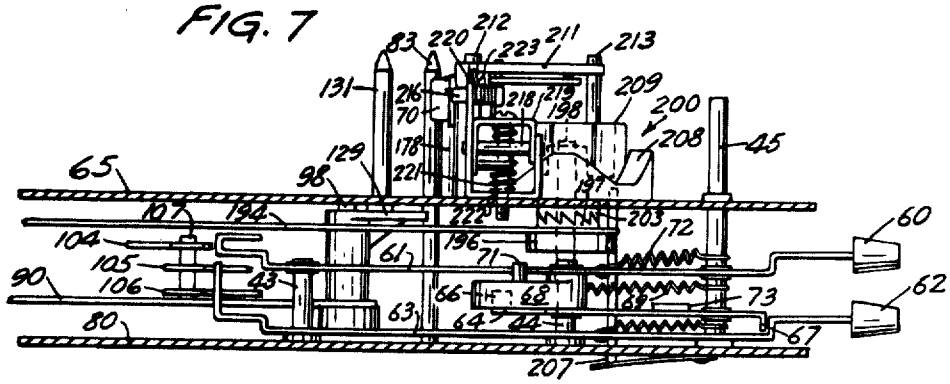


FIG. 15

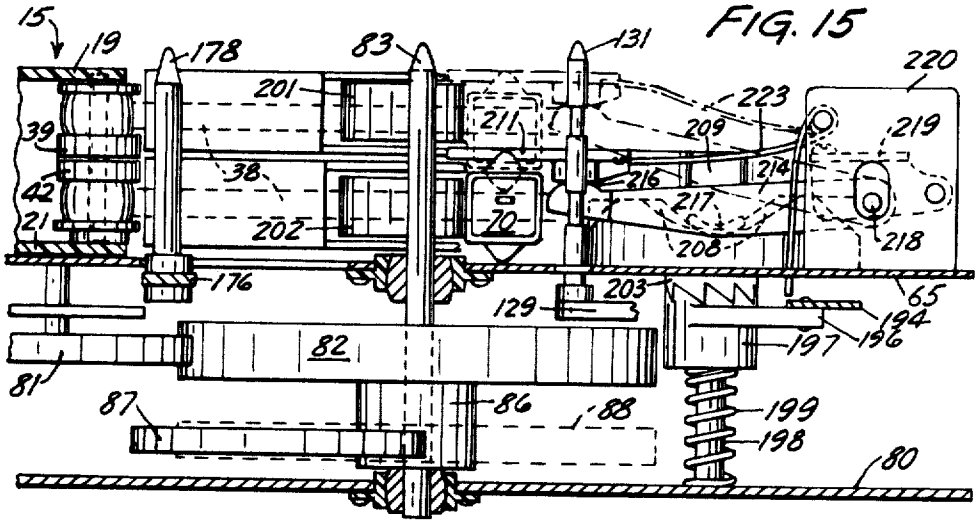
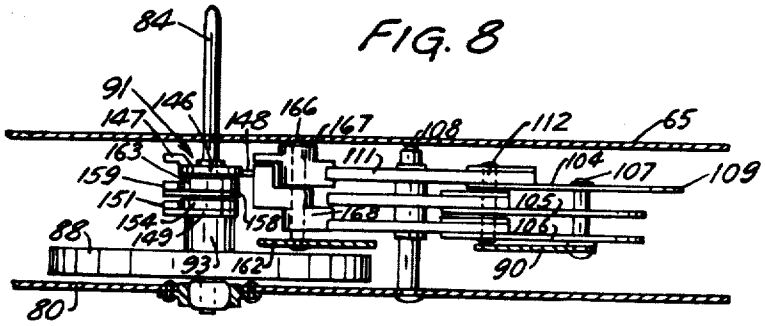
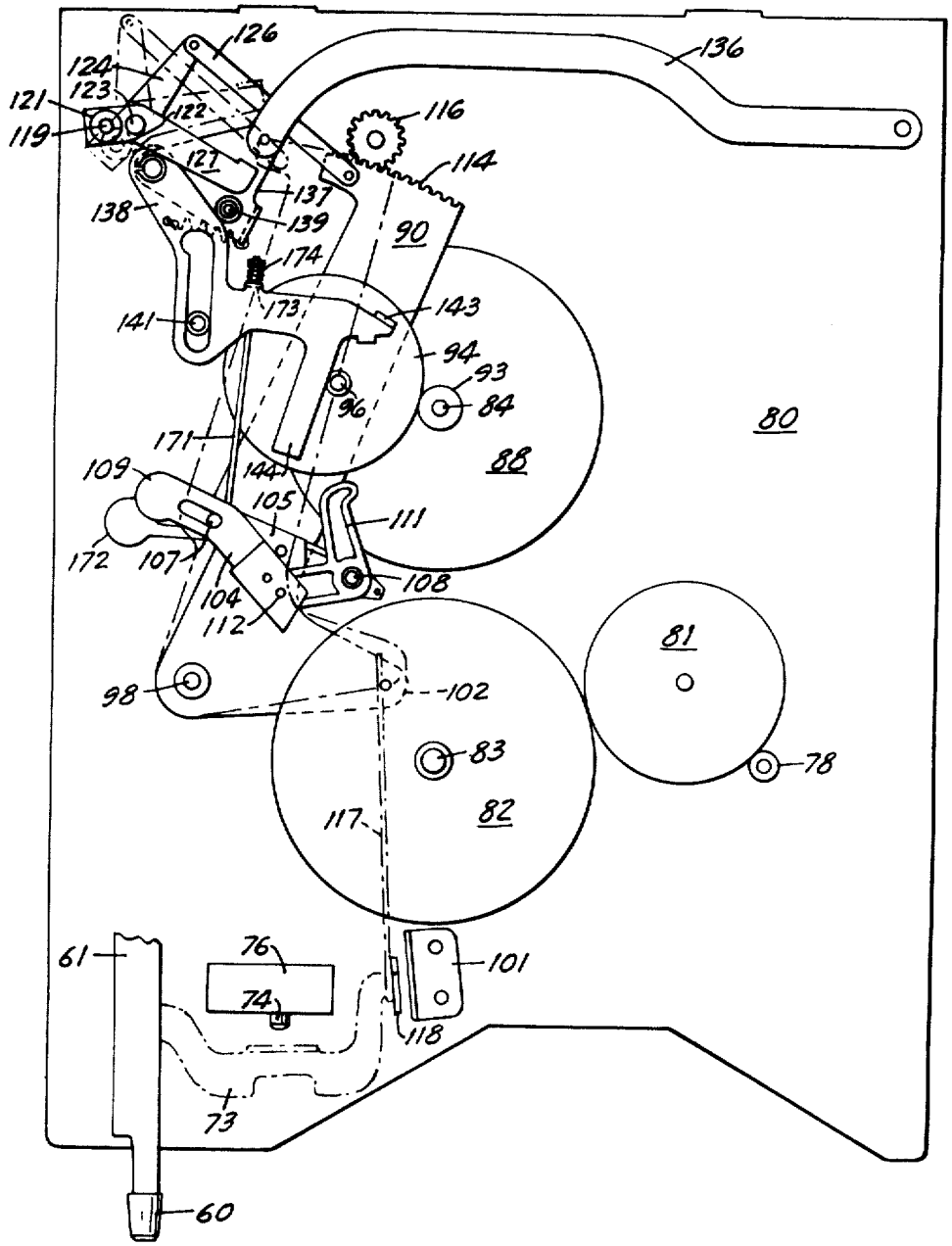


FIG. 8



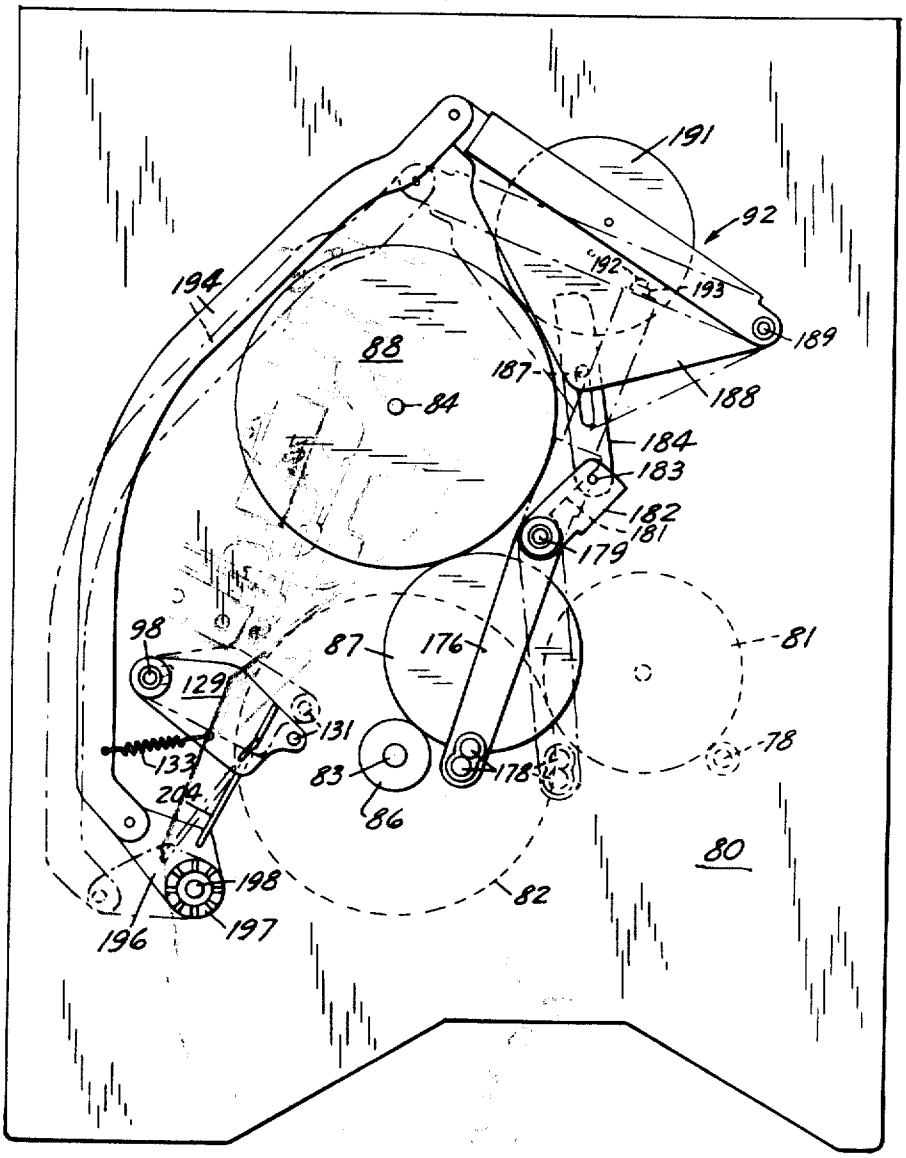
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FIG. 9



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FIG. 10



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FIG. 11

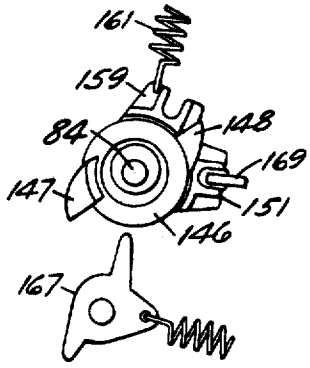


FIG. 12

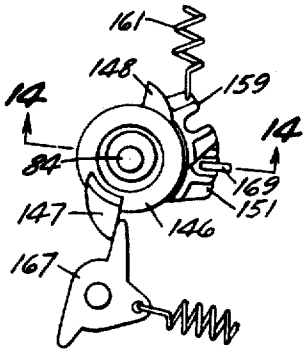


FIG. 13

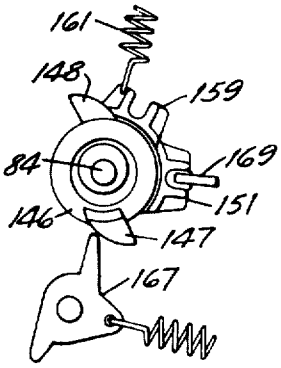


FIG. 14

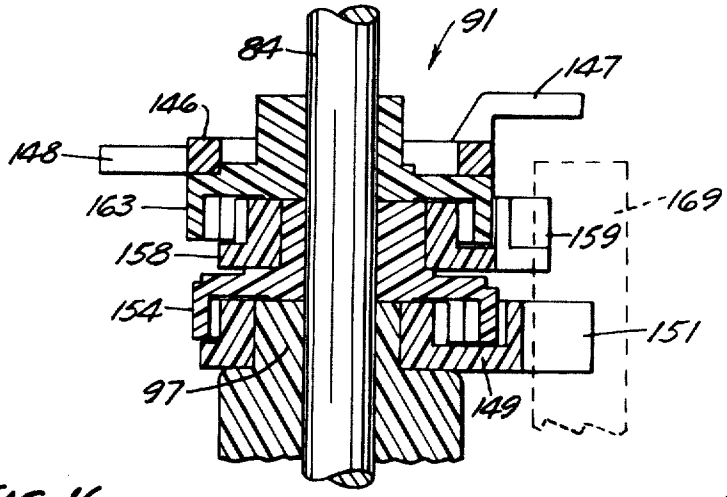
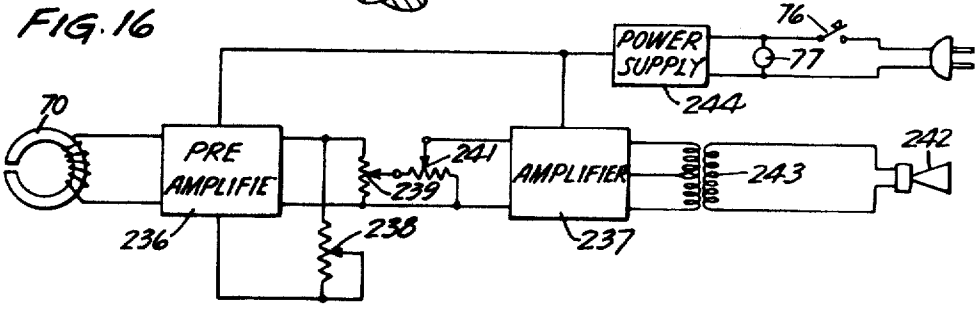


FIG. 16



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AUTOMATICALLY REVERSING TAPE TRANSPORT WITH COAXIAL REELS

This application is a division of application Ser. No. 489,534, filed Sept. 23, 1965.

This invention relates to a novel tape cartridge and apparatus for use therewith to afford continuous operation and which will continuously or at predetermined intervals reproduce signals imparted to the tape.

In the preferred embodiment disclosed herein the invention is utilized to provide an apparatus and cartridge adapted to furnish "background" music.

In devices where it is desired to reverse the sense of direction of tape, it is known in the art to utilize a tape path and tape drive whereby the tape passes across one side of a single direction continuously driven capstan, makes a 180° turn, returns across the same side of the capstan but is axially spaced with respect to the capstan from the first path across the capstan, and is driven by pressure rollers positioned on the same side of the capstan as the tape, alternately acting in association with the capstan on one tape path and then, when the tape direction is to be reversed, on the other tape path. Such a tape path and tape drive, disclosed in U.S. Pat. No. 3,122,294 issued to F. Laa, is utilized in the present invention which includes a novel cartridge, housing axially aligned tape supply and takeup reels, and a novel apparatus for use therewith to provide continuous or intermittent background music.

In any magnetic tape reproducing or recording device it is desirable to maintain the tape under even tension, regardless of the amount of tape on the supply reel, as it is drawn across the transducer head, and it is also desirable to exert even back tension, regardless of the amount of tape on the takeup reel, on the tape as it is wound upon the takeup reel. Uneven tension on the tape as it is drawn across the transducer head reduces high fidelity, and uneven tension on the tape as it is wound upon the takeup reel results in a nonuniform winding. Further, in devices where the direction of tape is to be reversed it is desirable to stop the movement or inertia of the tape instantaneously when the tape drive is interrupted.

The present invention provides novel and simple means to place a constant, uniform tension on the tape as it is drawn from the supply reel past a magnetic head and an equal tension in the tape as it is wound onto the takeup reel, which equal tension affords instantaneous stopping of the tape as the tape drive is interrupted. This is accomplished by a single reel driving spindle with independent slip clutches between the spindle and each reel.

Additionally, the apparatus is novel and distinct from previously known machines because it may be selectively adjusted to reproduce the signals and to mechanically interrupt the reproduction of said signals from the tape automatically for predetermined intervals of time so as to effectively provide intermittent background music.

An additional novel feature of the present invention is the provision of means for gradually decreasing the volume or fading out the reproduction upon the expiration of a predetermined interval of time and for gradually turning up the volume to a predetermined level or fading in the music after the expiration of a second predetermined interval of time when the signal is not being reproduced so as to avoid noticeable commencement and termination of the background music.

The novel cartridge utilized in supplying tape for use with the apparatus includes supply and takeup reels stacked in an axially aligned position with respect to each other and each reel has a clutch disc adhered thereto and each is associated with discs adapted to be driven from the apparatus. Thus when the cartridge is replaced the clutches are replaced.

Further, the novel cartridge has the tape positioned along a tape path extending across a cutaway portion on one edge of the cartridge and back across said cutaway portion to allow the tape to be readily changed without any threading of the tape through the apparatus by the operator.

The novel cartridge is also provided with novel brake means for the reels such that when the cartridge is not in an operative position on the apparatus the tape will remain wound on the reels during storage and handling.

The apparatus of the present invention further provides novel means for permitting continuous operation including an automatic reversing mechanism for the tape and means for adjusting the position of the head with respect to the direction of movement of the tape.

The above and further novel features and advantages of the present invention will become more apparent after reading the following detailed description which refers to the accompanying drawings wherein:

FIG. 1 is a plan view of the apparatus (except for the speakers and cabinet) with a cartridge shown in position on the apparatus;

FIG. 2 is a plan view of a cartridge, partially broken away to show parts located internally, constructed in accordance with the present invention;

FIG. 3 is a front elevational view of the cartridge of FIG. 2;

FIG. 4 is a fragmentary sectional view of the cartridge of FIG. 1 taken along the line 4–4;

FIG. 5 is a fragmentary bottom view of the central portion of the cartridge shown in FIG. 1 with the apparatus reel drive spindle shown in section;

FIG. 6 is a plan view of the apparatus of FIG. 1 with the cartridge, top plate and components above said top plate removed;

FIG. 7 is a partial side elevational view taken along the line 7–7 of FIG. 1;

FIG. 8 is a sectional view of the apparatus taken substantially along the line 8–8 of FIG. 6;

FIG. 9 is a fragmentary plan view similar to FIG. 6 illustrating certain parts in an alternative position for continuous operation;

FIG. 10 is a fragmentary plan view similar to FIG. 6 showing some of the parts in an alternative position;

FIGS. 11, 12, and 13 are detailed plan views of the timing mechanism showing a sequence of operation;

FIG. 14 is a sectional view taken generally along line 14–14 of FIG. 12;

FIG. 15 is a fragmentary elevation view of the tape and of the control cam for positioning the head and pressure rollers, taken generally along the line 15–15 of FIG. 1; and

FIG. 16 is a schematic circuit diagram.

Referring now to the drawing, there is illustrated a tape cartridge, generally designated 15, adapted for supplying a tape to and positioned by guide means and spindles on the top deck of a recording apparatus, generally designated 16.

The cartridge 15 comprises a boxlike container 17 made from molded polymeric material and comprising an upper shell 19 and a lower shell 21 adapted to be secured together by suitable threaded fasteners. The shells 19 and 21 enclose a pair of similar reels 22 and 23 rotatably supported in an axially aligned position generally centrally of said container 17. Each reel (see FIG. 4) contains an upper circular flange 24 and an axially spaced lower circular flange 25 joined by a hub having a center bore. The upper shell 19 has a rectangular opening in the side and has one edge wall cutaway and the lower shell 21 has an irregularly shaped side and edge wall to provide an opening or cutaway portion 20 in one edge of the cartridge 15 to expose the tape in the tape path to be hereinafter described. The drive and support shaft for the reels 22 and 23 is journaled centrally of the container 17. The shaft is formed by a first sleeve 27 having a lower clutch disc 26 formed integrally therewith. One end of the sleeve 27 is fitted in an opening 28 formed in the center of the sidewall of the lower shell 21. This end of sleeve 27 is provided with axially extending diametrically positioned tabs 33 (FIG. 5) affording means for a positive drive coupling with a reel driving spindle 84 on the apparatus 16. The opposite end of the sleeve 27 is journaled within a cuplike projection 29 extending downward from the center of the sidewall of the upper shell 19. An upper clutch

disc 30, formed integrally with a second sleeve 32, fits over sleeve 27, is concentric therewith, and is keyed or suitably connected to the lower clutch disc 26 and sleeve 27 by a projection 34 fitting in an opening 35 of the lower disc 26 to be rotated therewith. The sleeve 32 fits within the center bores of the reels 22 and 23 and the disc 30 is positioned between the two reels. Thus the reels 22 and 23 are resting on clutch discs 26 and 30 respectively and are rotatable relative to sleeve 32 and to each other. Adhesively secured on the outer surface of the lower flange 25 of each of the reels 22 and 23 and in opposed contacting relation to the clutch discs 26 and 30 are friction pads or discs 31 which are formed of a suitable material to cooperate with the material forming the clutch discs such that the torque transmitted to the reels is, or is substantially, directly proportional to the weight of the tape on said reels. Additionally, the slip clutches must afford a proper amount of tension in the tape to provide proper contact with the transducing head. Suitable material for the discs 31 and the clutch discs 26 and 30 are suede or felt and a polymeric material, e.g. acetal resin, respectively. Rotation of the sleeve 27 rotates the clutch discs 26 and 30 imparting driving torque to the reels 22 and 23 respectively, through the slip clutch discs 26, 30 and 31.

A length of tape 38 is wound on each of the reels 22 and 23 in the same direction, i.e. the tape, looking at FIG. 1, is wound clockwise around the inner hub of each reel toward the periphery. Means are provided to define a tape path from one reel along one edge of the container 17 across the cutaway portion 20 and back across said cutaway portion to the other reel. The tape path extends from the upper reel 22 around a first guide pulley 39, rotatably mounted on a support pin 36 positioned within the container 17 on one side of the cutaway portion and having an axis parallel to the axis of the reels 22 and 23, across the cutaway portion 20 of the container 17, between the upper tines of a tape guide assembly 47, (F. 2) and to a second guide pulley 41. Pulley 41 is journaled about an axis normal to the axis of the pulley 39 on the opposite side of the cutaway portion. The tape 38 in traversing the guide pulley 41 is turned 180° and returns from the lower side of the up pulley 41, between the lower tines of the tape guide s assembly 47, and across the cutaway portion of the container 17 to a third guide pulley 42, positioned below the first guide pulley 39 and rotatably mounted on the same support pin 36, and onto the lower reel 23.

The lower shell 21 has a projection 46, formed in the side defining an arcuate opening 48 to receive a capstan 83 of the apparatus 16 as will be hereinafter described. The projection 46 also forms a partial edge wall and a boss 49 which receives a screw fastener 51 supporting one end of a cross plate 52 which is positioned above the tape guide assembly 47.

The tape guide assembly 47 includes a connecting plate 53 which is positioned between the reels 22 and 23 and extends from the opening 20 in the cartridge 15 toward one rear corner of the cartridge. The plate 53 is bifurcated at one end to define spaced tape guides each having an upper and lower set of tines supporting the tape in the path across the opening 20. The opposite end of the connecting plate 53 is formed with an opening 57 which is adapted to align with a keyhole shaped opening in the side of the lower shell 21 which receives a cartridge positioning and locking pin 119 to be hereinafter described. The opposite end of the connecting plate 53 is also provided with an axially extending brake member 58 adapted for engaging the peripheral surfaces of the flanges of reels 22 and 23 and is held against the peripheral surfaces of said reels by means of a tension spring 56 joined at one end to the cross plate 52 and at the other end to an ear 59 formed on the side of the connecting plate 53. The brake member 58 is released from the reel flanges, after the cartridge 15 is placed on the apparatus 16 and the apparatus is placed in the "on" position, by movement of the locking pin 119 which draws the connecting plate 53 toward a corner of the container against the bias of the spring 56.

Referring to FIG. 1 there is illustrated the reproducing apparatus 16 with the outer cabinet or casing removed and with the conventional speaker or speakers removed and not shown. The cartridge 15 is properly positioned on a top support deck 65 of the apparatus by means of cooperating guides and pins. With the cartridge 15 in position on the top support deck 65 the tape 38 is in position for movement past a pickup and/or record means such as a magnetic head 70. The apparatus 16 is provided with means for driving the tape at a uniform speed and with means for reversing the direction of movement of the tape upon the transporting of a predetermined length of tape, or substantially all the tape, from one of said reels to the other of said reels. Upon placing the apparatus in the "on" position the tape is moved past the magnetic head 70 and the conventional electrical circuitry is energized. As the apparatus is turned on the cartridge 15 is locked onto the top support deck 65 and the brake member 58 in the cartridge 15 is released from the reel flanges.

The apparatus is provided with only an "on" bottom 60, "off" button 62, a volume control knob, a tone control lever, and a timer selector control handle 134. The "on" button 60 affects the energization of the tape transport means to be hereinafter described and energizes the magnetic head 70 and speaker circuitry for reproducing the signals carried by the tape 38.

Referring how now to FIG. 7 the "on" bottom 60 is secured to an upper control bar 61 reciprocatably supported on three vertical pins 43, 44, and 45 extending upwardly from a lower support deck 80 which is vertically spaced from and parallel to the top support deck 65. The "off" bottom 62 is secured to one end of a second control bar 63 mounted on the same vertical pins 43, 44, 45 and positioned directly beneath the upper control bar 61. Interposed between the control bars is a switch actuating bar 64 having an upwardly bent projection 66 at its rearward end and a downwardly bent projection 67 at its forward end. The bar 64 is biased toward the front of the apparatus and is retained in a retracted position, to which it is moved by the lower control bar 63 which abuts projection 67, by means of a pivoted pawl 68 mounted on the middle vertical support pin 44. The pawl 68 is urged into engagement with the projection 66 on the end of said bar 64 by a spring 69. The pawl 68 has a cam follower pin 71 which cams the pawl 68 out of engagement with the projection 66 when the upper control bar 61 is pushed by button 60 against the bias of a tension spring 72 toward the rear or to the left as viewed in FIG. 7. When the pawl 68 is cammed out of engagement with the switch actuating bar 64, the bar 64 moves forwardly and a switch contact bar 73, extending transversely to and pivotally mounted on the switch actuating bar 64, releases a plunger 74 of a snap-action switch 76. Releasing the plunger 74 actuates the switch 76 to energize a motor 77, having a drive shaft 78, suitably supported on the lower support deck 80. Energization of the motor 77 will energize an idler wheel 81 which is si suitably mounted and spring biased into engagement with the drive shaft 78 and with the periphery of a capstan flywheel 82 which is rotatably mounted between the upper and lower support decks 65 and 80. A capstan 83 extends vertically above the upper support deck 65 and is received within the arcuate cutaway portion 48 of the cartridge 15 and is positioned on one side of the tape 38. The capstan 83 provides for movement of the tape along the tape path and is driven continuously in one direction when the apparatus 16 is in the "on" mode.

The reels 22 and 23 are driven from a continuously driven spindle 84 which is rotated in the same direction as the capstan 83 or counterclockwise. The capstan flywheel 82 is provided with an axially extending hub portion 86 of reduced diameter which serves to drive a second idler wheel 87 which is biased into engagement therewith and with a drive wheel 88. The drive wheel 88 is mounted on the reel driving spindle 84 which is suitably bearinged in the support decks 65 and 80. The end of the spindle 84 projecting above the top deck 65 is received within the sleeve 27 of the cartridge. The drive wheel

88 also affords motive power for a control arm 90, a timing mechanism 91 and a reversing mechanism 92. The power actuated control arm 90 receives power from a knurled hub 93, having a reduced diameter and formed concentrically above the drive wheel 88, through an eccentric circular cam 94 rotatably mounted on a stub shaft 96 secured to the control arm 90. The timing mechanism 91 is driven from an eccentric hub 97 formed axially above the hub 93. The reversing mechanism 92 is powered from the outer periphery of drive wheel 88.

The power actuated control arm 90 controls the means for fading on and off the volume of the signals reproduced, the means for retracting the pressure rollers, the cartridge lock and brake release, and the movable tape guide pin all to be hereinafter described. The control arm 90 is mounted on a post 98 for oscillation toward and away from the spindle 84 and is biased toward the spindle by a spring 99 connected between a bracket 101 on support deck 80 and a transversely extending arm 102 of the control arm 90. The control arm 90 is retained in two predetermined positions along its oscillation path by holding means. The apparatus in in a "volume off" position with the arm 90 in the position shown in FIG. 6 (which corresponds to the dot-dash line position in FIG. 9) and in the "volume on" position with arm 90 in the solid line position of FIG. 9. The holding means comprise three superimposed toggle linkages 104, 105, and 106, an upper, middle, and lower toggle respectively. The toggles are positioned between a pin 107 fixed on the control arm 90 and a post 108 positioned between the decks 65 and 80. The upper toggle 104 comprises a pivotable and slotted bar 109 formed with a cam lobe at one end and a channel-shaped opposite end portion which is pivotally connected to a crank arm link 111 pivoted intermediate its ends to the post 108. The pin 112 forming the knuckle and permitting the pivoting of the crank arm 111 with the bar 109 is normally drawn to an over center position between the post 108 and the pin 107 by means of a spring 113 connected to the crank arm 111. Toggle 104 in its straightened, over center arm 111 position holds the control arm 90 in a position along its oscillation path remote from the spindle 84. In this remote position the control arm 90 through a gear sector 114 at one end of the arm has turned an intermeshed peripherally geared control knob 116 to a position turning down a potentiometer, to be hereinafter described, which controls the volume of the reproduced signals and which is the means for fading the volume off and on.

The means for retracting the pressure rollers, when the apparatus 16 is placed in an "volume off" or silent mode, includes a wireform link 117 mounted between the transverse arm 102 and the lower portion of a vertical lever 118 which is pivoted intermediate its ends on a transverse pin fixed to the bracket 101 and has an upper end extending above the top support deck 65.

The cartridge 15 is locked to the apparatus 16 and the reel be brake member 58 is released by movement of a locking pin 119 having an enlarged belled out portion 121 fitting in the keyhole opening in the cartridge lower sidewall. The locking pin 119 is carried by one leg of an irregularly shaped double crank arm 122 (Y-shaped in plan) which is pivoted centrally on a fixed post 123. A second leg 124 of the arm 122 is joined by a bar 126 to the control arm 90. A third leg 127 of the crank arm 122 has an eyelet through which is fitted a wireform link 128 extending forwardly of the apparatus to a pivoted tape guide pin support member 129. The support 129 is pivoted on the post 98 and supports a tape guide pin 131 projecting upwardly through an arcuate slot 132 in the top deck 65. The tape guide pin support 129 is biased clockwise about the post 98 by a tension spring 133. A compression spring is positioned on that end of the link 128 which extends through the eyelet of leg 127 to yieldably retract the guide pin 131 against the bias of the spring 133.

In operation, as the upper control bar 61 engages the cam lobe on the bar 109 of the toggle 104, the pin 112 is moved to break the toggle permitting the control arm 90 to pivot clockwise as viewed in FIG. 6 under the force of spring 99 toward the spindle 84. As the arm 90 moves toward the spindle 84 the eccentric cam 94 engages the hub 93 and is rotated thereby to move the control arm 90 from the position shown in FIG. 6 to the position shown in solid lines in FIG. 9. As the control arm 90 is moved to its alternate position near the spindle further clockwise movement is prevented by either one or both of the similar toggle linkages 105 and 106 disposed below the upper toggle 104.

Movement of the power actuated control arm 90 to its alternate position (solid line position of FIG. 9) affords a movement of the tap tape guide pin 131 which moves the tape 38 from the path between the tines of the bifurcated to tape guide 47 of the cartridge 15 (as shown in FIG. 1) to a position where the tape 38 will be placed at one point along in engagement with the face of the magnetic head 70. This movement of the tape guide pin 131 is accomplished by the spring 133 as the guide pin support 129 is released by rotation of the double crank arm 122 upon movement of the bar 126. Rotation of the crank arm 122 also moves the cartridge locking pin 119 to the slot of the keyhole opening, locking the cartridge in place and releasing the brake member 58. Movement of crank arm 122 also releases the pressure roller retracting lever 118 and movement of the control arm 90 toward the spindle 84 rotates the fader control knob 116 through the gear sector 114 to gradually increase the volume of the signal output.

To manually stop signal reproduction and shut off the apparatus, the "off" bottom 62 and lower control bar 63 are moved rearwardly. The remote end of the control bar 63 has a flange to engage and break the toggles 105 and 106. The breaking of these toggles allows the control arm 90 to move the eccentric cam 94 into engagement with the hub 93 whereby the control arm 90 will be moved from its solid line position of FIG. 9 back toward the dot-dash line or remote position in which it is held by the then straightened toggle 104. As the control arm 90 moves to this position the signals are faded out, the tape guide pin 131 and pressure rollers are retracted, the cartridge is unlocked and the reel brakes are applied. Also, as the lower control bar 63 is moved rearwardly the switch actuating bar 64 is moved and locked in the rearward position by pawl 68, and as the lever 118 is rotated to retract the pressure rollers, the lower end thereof pivots the switch contact bar 73 to open the snap-action switch 76 finally deenergizing the motor 77.

Means are provided in apparatus 16 for adapting it to reproduce the signals on the tape continuously and means are provided for adjusting the machine so it will automatically interrupt signal reproduction for a predetermined length of time and then automatically recommence signal reproduction for a predetermined time interval. As the timing device recommences or interrupts signal reproduction gradual oscillation or rotation of the power control arm 90 from one position to the other slowly rotates the fader control knob 116 to fade out the music or fade the music back in.

The timing for apparatus 16 is controlled by selector control. The selector control bar 134 is slidable along a guide which may bear indicia, not shown, indicating positions for continuous operation, 15 minutes on and 15 minutes off, and 24 minutes on and 6 minutes off. This bar 134 is retained in place along the guide by a spring biased detent assembly 135.

In FIG. 6 the selector control bar 134 is shown in the position affording intermittent signal reproduction, i.e. 24 minutes on and then off for 6 minutes, on 24 and off 6, etc. Upon movement of the selector control bar 134 to this position, a pivoted U-shaped lever arm 136, pivotally connected to a trial triangularly-shaped motion transmitting plate 137, adjusts the position of a variable position control lever 138. The plate 137 is pivoted on a post 139 and the control lever 138 is slidably supported on a post 141 supported on the lower support deck 80. A spring 142 interconnects the variable position control lever 138 and the motion transmitting plate 137 to suitably position the control lever 138 with respect to the post 141 on which it is slidably supported. In the position as illustrated in

FIG. 6 the control lever 138 has one upwardly bent end portion 143 disposed closely adjacent the reel drive spindle 84 and has an elongate arm 144 extending toward and in the plane of the upper toggle 104 which arm is adapted to engage the toggle 104 to move the pin 112 thereof over center allowing movement of the control arm 90, through rotation of the eccentric cam 94, from the off position to the on position. Movement of the control lever 138 to break the toggle 104 is effected by the timing mechanism 91 which includes an actuator 146 rotatably mounted on the reel drive spindle 84 and rotated by means of epicyclic gearing at a predetermined uniform rate. The actuator 146 has a pair of radially extending lobes in axially spaced positions and designated as an upper lobe 147 and lower lobe 148 (see also FIGS. 11—14).

The eccentric hub 97 of the drive wheel 88 drives the epicyclic gearing the timing mechanism 91. The epicyclic gearing comprises a lower driving gear 149, a middle internal gear 154, an upper driving gear 158, and an upper internal gear 163, all of which are fitted together and rotatably mounted on the spindle 84.

The lower driving gear 149 has a circular plate portion with a bifurcated side projection 151 fitting about a projection 169 to prevent rotation of the gear, and a hub with peripheral gear teeth which hub and plate have a center bore, within which the eccentric hub 97 rotates thereby causing the lower driving gear to perform revolution about the spindle 84. The middle internal gear 154 has a circular plate portion with a depending flange, the inner surface of which has gear teeth concentric about a center bore within which the spindle 84 may rotate and which gear teeth are engageable with the teeth of the lower driving gear 149 as the latter revolves, and a hub portion which is eccentric with respect to the center bore. The upper driving gear 158 is shaped and operates like the lower driving gear 149 except that within the center bore is positioned the eccentric hub portion of the middle internal gear rather than the eccentric hub 97 of the drive wheel, and, additionally, a bifurcated projection 159 of the upper gear 158 is secured by means of a spring 161 to a fixed support plate 162 mounted on the lower support deck 80 thereby tending to maintain the gear against rotation rather than being secured against rotation by projection 169 as is the lower driving gear 149. The upper internal gear 163 is shaped like the middle internal gear 154 and, in cooperation with the upper driving gear, operates the same way. Mounted concentrically on top of the upper internal gear 163 is the actuator 146.

The timing mechanism 91 provides a 900 to 1 speed reduction from the eccentric hub 97 of the drive wheel 88 to the actuator 146. Each driving gear has 29 teeth and each internal gear has 30 teeth. As aforenoted the eccentric hub 97 of the reel drive wheel 88 is an eccentric circular cam which drives the nonrotatable lower driving gear 149 in a revolution, causing the driving gear 149 to walk around the middle internal gear rotating it once for every 30 revolutions of the driving gear which is driven by the eccentric hub 97. The second eccentric circular hub portion on top of the middle internal gear 154 drives the second or upper driving gear 158 in a manner similar to the drive for the lower driving gear which upper driving gear in turn drives another or upper internal gear 163 with the same result. Again there is a 30 to 1 reduction or an overall gear reduction of 900 to 1. The actuator 146 thus makes one revolution for every 900 revolutions of the reel drive spindle 84 or of the drive wheel 88.

A post 166, positioned approximately midway between the post 108 supporting the toggle linkages 104, 105, and 106, and the reel drive spindle 84 and supported by the lower support plate and extending toward the upper support plate, carries two tripper mechanisms 167 and 168 for striking the upper and lower toggle linkages 104 and 106 respectively. These tripper mechanisms 167 and 168 are formed with three arms. One arm of each tripper is positioned to be struck by a lobe of the timer actuator 146, a second arm strikes a crank arm of either the upper or lower toggle linkage, and a third arm extends laterally of the other two and is formed to receive an end of a tension spring which is positioned between the support plate 162 and the third arm of each tripper mechanism to hold the tripper in a predetermined operative position.

With the selection control bar 134 in the position shown in FIG. 6 it functions to turn the volume on after 6 minutes of off time. This means that after the volume and tape transport mechanism are turned off and rendered inoperative, respectively by the lower lobe 148 striking the lower tripper 168 to break the lower toggle 106 the upper toggle 104 is straightened holding control arm in its remote position. Then as the upper lobe 147 strikes the projection 143 of the control lever 138 it breaks the upper toggle 104 to again place the apparatus in the on (signal reproducing) position. When the selection control bar 134 is in the position for 15 minute cycles, i.e. "on" 15 minutes and "off" 15 minutes, the control lever 138 has no operative function. When the selection control bar 134 is set for continuous play the control lever 138 holds the middle toggle 105 in a locked over center position through linkage means including a wireform link 171 fixed at one end to bar 172 of the toggle 105 by means of an ear placed adjacent the knuckle of the toggle 105 and which link has its other end extending through an opening in an ear 173 formed on the control lever 138. The end of the link 171 extending through the opening in ear 173 has a compression spring 174 retained thereon to resiliently bias the toggle 105 to the locked over center position holding the control arm 90 in its position near the reel drive spindle 84. The link 171 holding the middle toggle 105 in the locked position disables the timing mechanism 91 so the apparatus will continue in the "on" mode even though the lower actuator lobe 148 continues to rotate and strike the lower tripper 168 repeatedly breaking the lower toggle.

Referring now to FIGS. 11, 12 and 13, the function of the spring 161, which is connected to the bifurcated side projection 159 of the upper driving gear 158, is to move the slowly rotating actuator lobes 147 and 148 past their dwell points or actuating positions after they operate the control lever 138 or one of the trippers 167 or 168. This permits manual override of the mechanical movements of the apparatus. Thus, as illustrated in FIG. 12, as upper lobe 147 engages a tripper 167 continued rotation of the spindle 84 causes the upper driving gear 158 and thereby side projection 159 to rotate in a clockwise direction against the bias of the spring 161 toward the projection 169. This means that the upper internal gear 163 to which is secured the actuator 146 is bearing against the tripper 167 but instead of rotating the force is used to store energy in spring 161 by rotation of the upper driving gear 158. After the bifurcated side projection 159 of the upper driving gear 158 strikes the projection 169 continued rotation of the spindle 84 will rotate the actuator 146 and moves the tripper 167. Once actuating lobe 147 on the actuator 146 moves the tripper 167 enough to move the toggle linkage from its over center position, the tension of spring 161 completes the breaking of the toggle, returns the upper driving gear 158 to its normal position, and moves the lobe 147 past the tripper 167, as illustrated in FIG. 13. The actuator lobes are thereby carried substantially past the actuating position at which the tripper will break the toggle. Therefore, if the operator of the apparatus desires to turn the apparatus "on " after it has been automatically turned "off " by the timing mechanism the lobe on the actuator will be out of the way such that the toggle and the tripper may immediately be returned to a straightened over center position to hold the apparatus "on " or "off " without interference by the actuator lobes.

As aforedescribed this mechanism is provided with means for reversing the direction of travel of the tape along the tape path after a predetermined amount of tape has been withdrawn from a given reel. Upon such reversal it is necessary to reposition the head 70 such that it will be in position adjacent a different track on the tape in the new direction of tape travel. This reversing mechanism consists of a tape sensing arm 176 and power assisted reversing drive mechanism. The

reverse sensing after a given length of tape is unwound from one reel is achieved by means of a piece of material or clip placed on the tape to increase its transverse thickness at a point substantially at each end of the tape, and this may be in the form of a trailer formed of thicker material and spliced to the end of the tape. During movement of the tape **38**, the clip is moved around the guide roller **39** or **42** and is drawn across one end of the tape sensing arm **176** of the reversing mechanism causing the end of arm **176** to be driven toward the capstan **83**. The sensing arm **176** has, at the end across which the tape is drawn, two upstanding pins **178** spaced apart a distance less than the width of the clip and between which the tape **38** is drawn. The sensing arm **176** extends beneath the upper support plate **65** (FIG. **6** and **10**) to a vertically extending post **179** upon which the arm **176** is pivoted intermediate its extreme ends. The arm **176** has an extended lever portion **181** shown in dotted lines in FIG. **6**. Also mounted on the post **179** above and below the arm **176** is a channel-shaped member **182**. The channel-shaped member **182** carries a vertically extending pivot pin **183** between the flanges adjacent the free end upon which is fixed a pivoted locking arm **184**. A tension spring **186** extends between the projection **169** and the channel-shaped member **182** to hold the pin **183** in engagement with the extended lever portion **181** of the sensing arm **176** which tends to hold the pins **178** of the sensing arm **176** in a position away from the capstan **83**. The locking arm **184** is slidably and pivotally mounted intermediate its ends on a stud **187** carried by a triangularly-shaped actuating plate **188** adjacent one corner thereof The plate **188** is pivoted about a second corner on an upstanding post **189** positioned between the upper and lower support decks. A rotatable eccentric cam **191** is mounted on the triangular actuating plate **188** and carries a stop pin **192** engageable with a downwardly bent flange **193** at one end of the lock arm **184**. This stop pin **192** on the cam **191** abuts the flange **193** to limit its rotary motion.

The third corner of the triangularly-shaped actuating plate **188** is pivotally and operatively connected by means of an irregularly-shaped elongate link **194** to a one-way ratchet clutch having a lower clutch member **197** (FIG. **6**) which is rotatably mounted on a post **198** positioned between the upper and lower support decks. The lower clutch member **197** has a radial arm **196** to which link **194** is attached for transmitting the movement of the actuating plate **188** to the lower clutch member **197**. The lower clutch member **197** is biased by a compression spring **199** toward the upper support deck **65** (FIG. **15**). A dual control cam **200** which positions the magnetic head **70** and controls the placement of the pressure rollers **201** and **202** has a downwardly extending hub portion **203** forming the driven member of the ratchet clutch and the teeth of which cooperate with the teeth on the member **197**. Thus movement of the actuating plate **188** under the direction of the cam **191** controls the direction of tape movement and the position of the magnetic head.

The reversing mechanism also controls the tape guide pin **131** by a wire form link **204** extending between the radial arm **196** and the guide pin support plate **129**. This link **204** affords retraction of the guide pin **131** from the alternate tape path upon rotation of the radial arm **196** permitting the tape to be withdrawn from the magnetic head when the pressure rollers are retracted and before the head is moved.

In operation the reversing mechanism moves from the dot and dash line positions of FIG. **10** to the solid line positions and then back again. Thus as the tape is transported to a position where the clip at either end of the tape **38** is drawn against the pins **178**, further movement actuates the reversing mechanism **92** to (almost immediately) retract one pressure roller, move the guide pin **131**, shift the head **70**, return the guide pin, and allow the other pressure roller to move toward the capstan **83** to drive the tape along the path in the opposite direction. This is afforded by the clip pivoting the tape sensing arm **176** clockwise on the post **179** and pivoting the locking arm **184** counterclockwise around stud **187** to break the toggle linkage formed by arm **184** and the channel-shaped member **182**. When this toggle is broken the plate **188** is allowed to pivot about the post **189** under the force of a tension spring **206** placing the cam **191** in engagement with the drive wheel **88**. Simultaneously, the flange **193** is moved away from the stop pin **192** permitting rotation of the cam **191**. As the cam **191** begins to rotate, plate **188** causes link **194** to pull the radial clutch arm **196** from the dot-dash line position to the solid line position as shown in FIG. **10**. Movement of the radial arm **196** drives the dual cam **200** through an increment of 45° to retract a pressure roller from the capstan and move the guide pin and support plate **129**. Continued rotation of the cam **191** returns the radial arm to the start position and rotation of the cam **191** is stopped by the stop pin **192** and plate **188** is repositioned upon the straightening of the toggle, formed by arm **184** and member **182**, under force of the spring **186**.

An upwardly biased pin **207** is engageable with detents on the bottom of the dual cam **200** and maintains the cam in each incremental position so the lower clutch member **197** may be reversed to the reset position and the cam will be held in its new position. The dual cam **200** provides, through suitable linkage, a predetermined number of positions for the magnetic head **70** (depending on the number of tracks on the tape) and two predetermined positions for each pressure roller **201** and **202**. In the illustrated embodiment the axially undulating cam surface **208** has eight circumferentially spaced surfaces providing four different positions for the magnetic head, opposing cam surfaces offering the same head position. The radially undulating cam surface **209** has eight surfaces providing two different positions for each of the pressure rollers, opposing surfaces likewise offering the same position for the pressure rollers.

The cam surface **208** cooperates with a cam follower assembly which affects the vertical shifting movement of the magnetic head **70**. The magnetic head **70** is mounted on a plate **211** guided for translatory movement up and down on a pair of guide posts **212** and **213** (FIG. **1**). The cam follower assembly includes a lever **214** having a bifurcated end portion **216** fitting about the post **212** and below the plate assembly **211**. Intermediate the ends of the lever **214** is a cam follower **217**. The other end of the lever **214** is pivotally mounted about a pin **218**. The pin **218** is supported by an adjustable support frame **219**, which is pivotally attached to a bracket **220** fixed to the upper support deck **65**. The frame **219** supports the pin **218** and permits adjustment thereof and permits adjustment thereof and of the cam follower assembly by means of a screw, extending through the frame **219** and a compression spring **221**, threadably received in a threaded opening of the bracket **222**. The bracket **220** also supports a torsion spring **223** which has one end thereof bearing against the magnetic head support plate **211** to maintain the same in engagement with the bifurcated end portion **216** of the cam follower assembly lever **214**.

The radially undulating cam surface **209** of dual cam **200** affords movement of the pressure rollers **201** and **202** as defined above. The upper pressure roller is mounted on a support arm **224** which is pivotally mounted on a pin **226** extending above the upper support deck **65**. A projection **227** carrying a cam follower **228** extends from the arm **224**. The follower **228** is engageable with the radial surface **209** of the dual cam for selectively positioning the upper pressure roller **201**. A similar arm **229** supports the lower pressure roller **202** on the pin **226** and has a cam follower **231**. Tension springs **232** and **233** are connected between each of the pressure roller support arms **201** and **202** respectively and a support post **234**. The springs **232** and **233** serve to bias the pressure rollers **201** and **202** toward the capstan **83** and the cam followers **228** and **231** toward the cam surface **209**. The cam surface **209** allows only one pressure roller at a time to engage the capstan under the force of its associated spring. Therefore in a given position the dual cam **200** positions the magnetic head **70** in opposed relation to one of the tracks on the face of the tape along the lower portion of the tape path and places the lower pressure roller **202** in engagement with the tape and capstan. In another posi-

tion the dual cam **200** places the head adjacent the tape in the upper portion of the tape path and the upper pressure roller **201** in engagement with the capstan. The pressure rollers **201** and **202** and the head **70** are positioned so the capstan **83** always pulls the tape across the head **70**.

The aforementioned link **118** for retracting both of the pressure rollers simultaneously, engages the pressure roller support arms **224** and **229**, as illustrated in FIG. **1**, between the cam follower projections and the main plate or arm portions thereof. This link **118** can thus retract both pressure rollers from the capstan and both cam followers from the cam surface **209**.

Referring again to FIG. **6** the switch plate **73** which actuates the switch **76**, energizing the drive motor **77**, is movable by the lower end of the retracting link **118** as it retracts the pressure roller support arms. Movement of the switch plate **73** allows the lower slide bar **63** to be moved to initiate movement of the apparatus to the off position but it will not be entirely shutoff until a cycle is completed. The cycle comprises merely moving the lower slide bar **63** if the motor is on but not the tape transport mechanism, but if the tape transport and signal reproduction is "on" or operating and producing audible sound the cycle includes breaking the lower and/or middle toggle to move the control arm **90** to the position shown in FIG. **6** from the position shown in FIG. **9** and initially fading out the signals. Also, the cartridge guide and locking pin **119** is returned to the position shown in FIG. **6**, the tape guide pin **131** is returned, and the upper toggle linkage **104** is straightened to lock the control are arm **90** in its "off" position. Finally, as the arm **90** moves into the off position the link **117**, connecting the control arm **90** with the pressure roller retracting lever **118** moves the switch plate to depress the plunger on the switch and deenergize the apparatus.

It will be noted that the novel construction of this apparatus eliminates the need of a pressure pad to press the magnetic tape into intimate contact with the face of the magnetic head or the need for other back tensioning means along the path of the tape between the supply reel and the head. The construction of the two reels a stacked one above the other and driven through similar clutches formed by the clutch discs and felt pads on the reels affords a uniform tension in the tape throughout the tape path. This uniformity in tape tension in all positions of the tape relative to the two reels, i.e. wound substantially on one reel or the other or partially wound on one or the other, is accomplished because the amount of torque transmitted through the slip clutches is a function of the weight of the tape on a reel and tension in the tape is a function of torque divided by the moment arm, i.e. the distance between axis of rotation and the periphery of the wound tape. Due to the uniformity of this tension, any time that the operative pressure roller is retracted from the tape and capstan, tape movement and reel rotation stops instantly eliminating the need for reel brakes, except as provided for cartridge handling.

FIG. **16** illustrates an electrical schematic diagram of the circuitry for use in the background music system including conventional transistorized amplifying circuitry. The magnetic head **70** reproduces the recorded signal from the magnetic tape in the form of a low voltage signal. A preamplifier **236** receives and preamplifies the low voltage signal to a preamplified voltage level sufficient for input into an amplifier **237** through a tone control potentiometer **238**, a volume control potentiometer **239**, and a fader control potentiometer **241**. The volume control potentiometer **239** is manually adjusted to the desired level and fading during "on" and "off" is afforded by the fader control potentiometer **241** which is connected in series with the volume control **239** and is operative throughout the full range by the fader control gear **116** rotated by sector gear **114**. Amplifier **237** amplifies the received voltage input to drive a speaker **242** through a power transformer **243**. A power supply **244**, including an off-on switch **76**, is connected to a source of alternating current voltage and supplies the electrical power to preamplifier **236**, amplifier **237**, and the drive motor **77**. Thus it is readily seen that the switch **76** energizes the motor **77** and amplifier circuitry when closed. Energization of the motor **77** drives the capstan **83** and reel driving spindle **84**. The manual volume control potentiometer **239** and fader control potentiometer **241** adjust the audio output.

The terms forward and rear are used herein for purposes of description but the apparatus and the cartridge, as explained, operate only when the support decks are disposed horizontally and the tape cartridge, as explained, operate only when the support decks are s disposed horizontally and the tape cartridge is positioned so the reels rest upon the cooperating driving discs.

Although the above description relates to a single preferred embodiment of the present invention it is to be understood that certain modifications may be made therein without departing from the spirit or scope of this invention, e.g. the magnetic head could be positioned in opposed relation to the tape guide pulley—to lessen the degree of movement thereof, or the head could be substituted for the pulley—and the tape could be wound so the coated surface would pass around the face of the head.

I claim:

1. A tape transporting mechanism comprising:

means for receiving a cartridge having a reel of tape and means defining a tape path along which the tape may be moved to wind and unwind tape on said reel;

a spindle affording a drive connection with said reel within said cartridge for rotation of said reel in a tape winding direction;

capstan means located relative to said cartridge receiving means to be positioned on one side of said tape path;

means movable to place said tape in driving engagement with said capstan means;

signal receiving means positioned along said tape path to pick up signals from said tape;

amplifying means for amplifying said signals; and

mechanical timing means driven from said capstan means for gradually decreasing the volume of said amplifying means from a first level to a second level and for interrupting the movement of a said tape by retracting said movable means from said capstan means after a predetermined time interval and for starting tape movement by advancing said movable means and for gradually increasing the volume of said amplifying means from said second level to said first level after a predetermined second time interval, said mechanical timing means including a two position control mechanism comprising an elongate control arm pivotally supported at one end on an axis parallel to said spindle, an eccentric circular cam rotatably affixed intermediate the ends of said control arm on an axis parallel to said spindle, means biasing said control arm toward said spindle to bring the periphery of the eccentric circular cam into contact with the rotating spindle, thereby causing the control arm to swing from a first predetermined position to a second predetermined position, holding means for releasably retaining the control arm at said first and second predetermined positions, actuating means for releasing the holding means thereby permitting

control arm to move from said first position to said second position and from said second position back to said first position, and linking means for connecting said control arm to said amplifying means and to said movable means and responsive to the movement of said control arm from one of said predetermined positions to the other of said predetermined positions.

2. In a recording or reproducing machine having a tape transport mechanism and a spindle which rotates continuously in one direction, a two position control mechanism for controlling the operation of said tape transport mechanism comprising:

an elongate control arm pivotally supported at one end on a pivot axis parallel to the axis of said spindle;

a circular cam rotatably and eccentrically mounted on said control arm intermediate the ends of said control arm and adjacent said spindle for engaging said spindle to pivot said control arm toward and away from a said spindle;

means biasing a said control arm toward said spindle to bring the periphery of the eccentric cam into driving engagement with the rotating spindle thereby causing the control arm to pivot about said pivot axis parallel to the axis of said spindle;

a vertical pin rigidly affixed to the control arm intermediate said eccentric cam and said pivot axis;

a first toggle joint assembly having a locked over center position and a collapsed position, said assembly having a first bar pivotally and slidably supported on said vertical pin and a second bar pivotally connected to said first bar to form a joint and being supported at a fixed point approximately in line with the path of the vertical pin and on the side toward which the control arm is biased, said first bar having an elongate slot through which the vertical pin extends, means biasing said joint to its locked over center position and said toggle joint being adapted so that when in locked over center position the control arm is at a position near its outermost pivoted position from said spindle with the slot engaging the vertical pin blocking movement of the arm towards said spindle and when the joint is broken permitting pivotal movement toward said spindle;

a second toggle joint assembly having a locked over center position and a collapsed position having a first bar pivotally supported on said vertical pin and a second bar pivotally connected to said first bar to form a joint and supported at a fixed point approximately in line with the path of the vertical pin and on the side toward which the control arm is biased, said first bar of said second toggle having an elongate slot through which the vertical pin extends, means biasing said joint to its extended over center position and said second toggle joint assembly being adapted so that when in extended over center position the control arm is at a position near its innermost point of pivotal movement toward the spindle with the slot engaging the vertical pin blocking further movement of the arm towards said spindle, and when the second toggle assembly is broken permitting movement of the arm nearer said spindle so said eccentric cam can drive said arm toward its outermost pivotal position;

a first slide control reciprocatably supported so as to slide back and forth in a direction substantially perpendicular to the first bar of the first toggle joint assembly when extended, and positioned and biased so as to engage and collapse the first bar of the first toggle joint assembly when actuated and to return to its unactuated position;

a second slide control reciprocatably supported so as to slide back and forth in a direction substantially perpendicular to the first bar of the second toggle joint assembly when extended, and positioned and biased so as to engage and collapse the first bar of the second toggle joint assembly when actuated and to return to its unactuated position; and

linkage means connected between said control arm and said tape transport mechanism.

3. In a machine for reproducing signals imparted to a length of tape supplied to the machine by a cartridge housing the tape on a pair of axially aligned reels and having means defining an exposed tape path leading across one edge of the cartridge and returning across the same edge but in a vertically spaced position, the combination comprising:

a capstan positioned on one side of the tape path;

driving means for driving said capstan continuously about its axis;

a pair of pressure rollers mounted on the other side of the tape path for selective movement toward and away from the capstan for driving the tape in opposite directions;

a magnetic head movably mounted adjacent to and positioned on the same side of tape path as the pressure rollers;

a spindle driven continuously in one direction affording a drive connection with the reels within a said cartridge for rotation of said reels in a tape winding direction;

amplifying means for amplifying the signals imparted to the tape; means responsive to the movement of a predetermined length of tape for retracting one of said pressure rollers, for moving said magnetic head, and for advancing the other of said pressure rollers to reverse the direction of movement of the tape;

a pressure roller retractor pivotally mounted for holding both of the pressure rollers away from the capstan;

a tape guide pin positioned near the magnetic head and having an axis parallel to the capstan and movable across the tape path for removing the tape from and positioning the tape against the magnetic head;

a two position control mechanism comprising an elongate control arm pivotally supported at one end on an axis parallel to said spindle, an eccentric circular cam rotatably affixed intermediate the ends of said control arm on an axis parallel to said spindle, means biasing said control arm toward said spindle to bring the periphery of the eccentric circular cam into contact with the rotating spindle, thereby causing the control arm to swing from a first predetermined position to a second predetermined position, holding means for releaseably retaining the control arm at said first and second predetermined positions, actuating means for releasing the holding means thereby permitting the control arm to move from said first position to said second position and from said second position back to said first position; and

linking means connected to and responsive to the movement of said control arm from one of said predetermined positions to the other for controlling the volume of the amplifying means, the position of the pressure roller retractor, and the position of the tape guide pin.

4. In a machine for reproducing signals imparted to a length of tape supplied to the machine by a cartridge housing the tape on a pair of axially aligned reels and having means defining an exposed tape path leading across one edge of the cartridge and returning across the same edge but in a vertically spaced position, the combination comprising:

a capstan positioned on one side of the tape path;

driving means for driving said capstan continuously about its axis;

a pair of pressure rollers mounted on the other side of the tape path for movement toward and away from the capstan for driving the tape in opposite directions;

a magnetic head movably mounted adjacent and positioned on the same side of said tape path as the pressure rollers;

a spindle driven continuously in one direction affording a drive connection with the reels within a said cartridge for rotation of said reels in a tape winding direction;

amplifying means for amplifying the signals imparted to the tape; and

mechanical timing means driven from said capstan means for decreasing the volume of said amplifying means and for interrupting the movement of said tape by retracting said pressure rollers from said capstan after a first predetermined time interval and for starting tape movement by advancing one of said pressure rollers and for turning up the volume of said amplifying means after a predetermined second time interval, said timing means comprising:

an actuating cam formed with actuating lobes and continuously driven from said capstan about an axis,

control means including a two position control arm and means responsive to the movement of said control arm between its said two positions for decreasing and increasing the volume of said amplifying means and for retracting and advancing said pressure rollers,

linking means extending into the path of said actuating cam lobes about said cam axis and responsive to advancing of said cam lobes about said cam axis for moving said control arm between its said two positions, and

means for biasing said actuating cam to move said cam lobes to a position beyond an actuating position after actuating said link means to permit manual actuation of the machine without interference from said timing means.

5. In a reproducing apparatus for background music, the combination comprising:

a pair of reels;

a single driven shaft independently supporting said pair of reels in axially aligned relationship;

clutch means positioned between said shaft and each of said reels for imparting rotary motion to said reels;

means driving said driven shaft in one direction of rotation;

means defining a tape path from one of said reels to the other of said reels;

a magnetic head head movably mounted relative to said tape path;

capstan means positioned along said tape path to drive said tape;

a pair of pressure rollers mounted for movement toward and away from said capstan means to drive said tape in opposite directions along said path; and

control means responsive to the movement of a predetermined length of tape for retracting one of said pressure rollers, for moving said magnetic head, and for advancing the other of said pressure rollers to reverse the direction of the tape, said control means comprising an arm, a pair of pins supported at one end of said arm, said pins being spaced to permit a tape to pass therebetween and to be engaged by a greater transverse thickness provided by material attached to the tape at spaced locations, pivot means for supporting said arm to position said pins one on each side of said tape path and to afford pivotal movement of said arm and movement of said pins along said tape path, and cam means energized upon pivotal movement of said arm for retracting one of said pressure rollers, for moving said magnetic head, and for advancing the other of said pressure rollers.

6. An apparatus according to claim 5 wherein said cam means includes an eccentric power cam mounted for engagement with said driven shaft, dual cam means for moving said pressure rollers and said magnetic head, and link means for advancing said dual cam means in response to rotation of said eccentric power cam.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,549,823 Dated December 22, 1970

Inventor(s) Sheldon Lee Pastor

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specification

Column 3, line 42, delete "up", and after "guide" delete -- s --;
Column 4, lines 20, 27, and 31 change "bottom" to -- button --;
line 55, after "is" delete -- si --;
Column 5, line 39, delete "arm 111";
line 56, before "brake" delete -- be --;
Column 6, line 11, after "affords" delete -- a --;
line 12, delete "tap";
line 13, after "bifurcated" delete -- to --;
line 15, after "along" insert -- its path --;
line 29, change "bottom" to -- button --;
Column 7, line 27, after "perform" insert -- a --;
Column 10, lines 46 and 47, delete "permits adjustment thereof and";
Column 11, line 30, after "control" delete -- are --;
line 40, after "reels" delete -- a --;
Column 12, line 10, delete the entire line;
line 11, delete "support decks are disposed horizontally".

In the Claims

Column 12, line 61, after "permitting" insert -- the --;
Column 13, line 5, after "biasing" delete -- a --.

Signed and sealed this 14th day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patent