

Oct. 27, 1959

H. C. CHAMBERLIN
SOUND REPRODUCING SYSTEM

2,910,298

Filed July 16, 1956

2 Sheets-Sheet 2

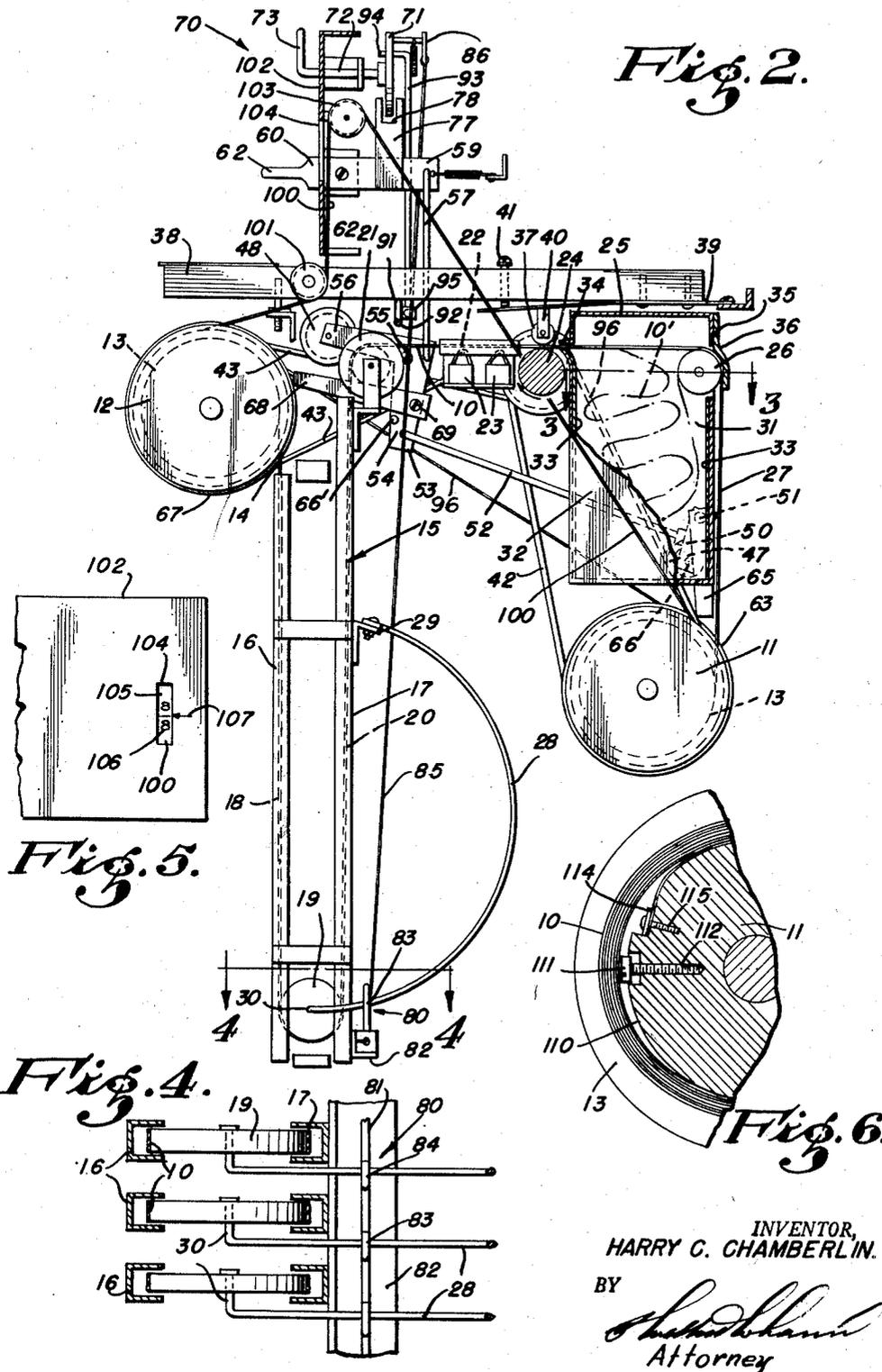


Fig. 2.

Fig. 5.

Fig. 4.

Fig. 6.

INVENTOR,
HARRY C. CHAMBERLIN.
BY
Shelton
Attorney

1

2

2,910,298

SOUND REPRODUCING SYSTEM

Harry C. Chamberlin, Upland, Calif.

Application July 16, 1956, Serial No. 598,005

19 Claims. (Cl. 274-4)

This invention relates to a sound reproducing device employing a plurality of sound record strips such as tapes arranged so that they can be moved with relation to sound pickup heads in response to the actuation of keys. The present invention embraces improvements in the device disclosed in my co-pending application, Serial No. 386,459 filed October 16, 1953, for Electronic Musical Instrument.

It is an object of the invention to provide in this sound reproducing device means for preventing operation of the drums on which the strips are wound during the time the keys are operative to effect movement of individual strips with relation to their respective pickup heads. This feature of the invention makes it impossible to inadvertently simultaneously operate the controls which are intended for independent operation at different times, and therefore it is impossible to disarrange, break or otherwise injure the sound record strip as the result of the application thereto of contrary forces or movements.

It is a further object of the invention to provide in this sound reproducing device means for effecting a substantially instantaneous return of the sound record strips to their initial starting position after they have been moved forwardly with relation to their respective pickup heads for the purpose of reproducing the sounds thereon. This includes receivers for the portions of the sound record strips which are moved forwardly from the pickup heads, such receivers holding the forwardly moved strip portion without application thereto of anything which will retard the rearward movement of the strips, thereby making it possible for the strip retracting means to return them instantaneously to starting positions. The strip receivers comprise flat containers in side-by-side relation, each having an inlet opening through which a sound record strip may enter and each having an interior space in which the received strip may accumulate in convolutions. The strip, upon being moved into the container folds back and forth therein, and being not engaged by any part involving mass, such as, for example, a roller, the strip may be quickly pulled out of the container for the reason that the only forces resisting its outward movement are the extremely small inertia due to its own small mass and the extremely small frictional resistances encountered as the result of contact of the strip with surfaces of stationary parts.

Further objects and advantages of the invention include locking means for holding the strip storage drums of the device, means for selectively rotating the drums so as to move sections of the strips from one drum to the other, means for preventing sound-reproducing movements of the strips when the drum rotating means is operative, and an interlock control which segregates the strip moving functions of the device so that one cannot interfere with the other; to provide a separate indicating tape having its ends wound upon the front and rear strip storage drums, this indicating tape having thereon markings corresponding to the sections of the sound record strips, the function of these markings, when brought into

conjunction with a stationary indicia on a visible portion of the device, to indicate which section of the strips are in sound-reproducing position in the device; to provide locking means for holding the strip retractors of the strip reservoirs which are disposed between the rear drum and the pickup heads, during the time the strips are being shifted from one of the drums to the other for the purpose of bringing a different sound record section of the strips into sound-reproducing position, whereby portions of the strips will be maintained under tension in their respective reservoirs and will not become tangled or adherent to the walls of the reservoirs due to static electricity; and to provide simple means for varying the effective diameters of the sections of the drums on which the strips are wound.

It is an object of the invention to provide a drive connection between the drums for correlated rotation of the drums so that the length of the playing tapes between the two drums will always remain the same, and therefore, the lower ends of the tape loops in the tape reservoirs will be maintained at a predetermined distance from the bottoms of the reservoirs as the sections of the tape are shifted back and forth from one drum to the other, to the end that the tapes will be always maintained under tension.

Further objects and advantages of the invention may be brought out in the following part of the specification wherein some small details have been recited for the purpose of providing a complete disclosure, without intending, however, to limit the scope of the invention which is defined by the accompanying claims.

Referring to the accompanying drawings which are for illustrative purposes only:

Fig. 1 is a schematic elevational view looking toward the rear face of the sound reproducing device embodying the invention;

Fig. 2 is a schematic sectional view taken as indicated by the line 2-2 of Fig. 1;

Fig. 3 is a fragmentary sectional view taken substantially as indicated by the line 3-3 of Fig. 2, showing one of the sound record strip receivers;

Fig. 4 is an enlarged fragmentary sectional view taken as indicated by the line 4-4 of Fig. 2, showing the strip retracting means associated with the sound record strip reservoirs;

Fig. 5 is a fragmentary sectional view showing a portion of the front upper panel of the device having therein an opening through which the indicator strip is visible; and

Fig. 6 is a fragmentary sectional view showing one of the strip storage drums and the means for varying the effective diameter thereof.

As shown in Figs. 1 and 2 the device has a plurality of record strips 10 arranged in side-by-side relation. In the form of the invention disclosed these strips 10 are tapes having magnetizable coatings thereon of the character employed in tape type magnetic recording devices. These tapes have thereon the records of the sounds to be reproduced, for example, the tones of musical instruments and or sounds derived from other sources such as the sounds of animals, birds and mechanical devices and including the sounds of the screeching of automobile tires sliding upon the road surface, the beat of drums or of raindrops upon a roof.

As shown in Figs. 1 and 2 the device has a front drum 11 and a rear drum 12 arranged in spaced, parallel relation. Each drum has a plurality of circumferential channels 13 forming spools on which the opposite ends of the strips 10 are fastened and wound. Each strip is divided into sections and each section may be brought into sound reproducing position in the device by suitable rotation of the drums 11 and 12 which are referred to as sound reproducing strip storage drums for the reason that they

contain thereon the sections of the strips which are not in sound reproducing position. From the rear spool 12 each strip extends downwardly as indicated at 14 into a strip reservoir 15 comprising spaced vertical channels 16 and 17. From the position 14 a portion 18 of the strip 10 extends downwardly within the channel 16 and then under a strip retracting roller 19 from whence a portion 20 of the strip 10 extends upwardly within the channel 17 to a spool 21 over which the strip 10 makes a 90° bend. The strip 10 has a horizontal portion 22 which extends from the pulley across a magnetic pickup head 23, across a rotating drive roller 24, through the upper portion of a strip receiver 25 to a pulley 26. The strip then bends down over the pulley 26 and has a portion 27 which extends along the rear face of the receiver 25 to the front strip storage drum 11. The drums 11 and 12 are locked against rotation and the film strip 10 is held taut between the drums 11 and 12 by the strip retracting roller 19 which is urged downwardly by a bow spring 28 having its upper end fixed to a horizontal bar 29 and having on its lower end a laterally bent axle portion 30 on which the retracting roller or pulley 19 is mounted.

Each film receiver 25 comprises a flat container having side walls 31 and 32 spaced apart a distance slightly greater than the width of the strip 10. For example, the spacing between the walls 31 and 32 may be about 1/32" wider than the strip 10. The front, top, bottom, opening or lips, and rear edge walls of the container are lined with strips 33 of felt or plush. The upper portion of the receiver 25 is formed so as to provide a strip inlet lip mouth or opening 34 which lies close to the top portion of the drive roller 24. The pulleys 26 are supported within the upper portions of the receivers 25 so as to project slightly through outlet openings 35 so that each strip portion 27 which extends downwardly from a pulley 26 will lie outside the rear face of a receiver 25. A portion of each strip 10, where it passes over a pulley 26 is frictionally engaged by a felt strip 36.

For each strip 10 there is a roller 37 adapted to deflect the strip 10 downwardly into engagement with the rotating roller 24 to effect frictional engagement of the strip and the roller with the result that the rotating roller 24 will move the strip rightwardly, pulling it from the reservoir 15 and feeding it through the inlet mouth 34 into the interior space of the receiver 25 wherein the tape will fold back and forth and accumulate in the container in convolutions as indicated by phantom lines 10' in Fig. 2. As the strip 10 is fed into the receiver 25 it will fold back and forth as indicated without sharp bends being formed therein. Friction of the felt strip 36 prevents the strip 10 from pushing out of receiver 25, but is not tight enough to prevent movement of the strip sections when drums are rotated. When the roller 37 is lifted so as to release the strip 10 from engagement with the roller 24, the strip will be substantially instantaneously pulled out of the receiver 25 and returned to the reservoir 15 by the strip retracting means formed by the pulley 19 and its bow spring. When the action of the roller 24 pulls the strip out of the reservoir 15, the loop of the strip 10 contained in the reservoir 15 will be shortened and the roller 19 will be lifted. The bow spring will continuously exert a force tending to move the roller 19 downwardly to the rear end of the reservoir 15 so that when the lifting of the roller 37 releases the strip 10 from engagement with the roller 24 a very quick return movement of the strip 10 will be accomplished because the portion of the strip 10 which lies within the receiver 25 will be substantially without restraint. The inertia of this small portion of the strip 10 is so small that it may be quickly set in motion and returned to the reservoir 15.

The rollers 37 are adapted to be actuated by keys 38, similar to piano keys and corresponding in number to the number of sound record strips 10. Each key 38 has its rear end connected by a leaf spring 39 with a horizontal supporting member. As shown in Fig. 2 the forward end

of each leaf spring has thereon a bracket 40 which supports a roller 27. A screw 41 is provided in each key 38 for adjusting the leftward end of the spring 39 upwardly or downwardly thereby adjusting the position of the roller 27 in relation to the key 38 and to the driving roller 24.

For selectively driving the drums 11 and 12 so as to shift the tapes 10 for the purpose of bringing another section into sound reproducing position, loose belts 42 and 43 are provided which respectively extend over sheaves 44 on the drums 11 and 12 and sheaves 45 and 46 which are fixed on the driving roller 24 so as to rotate therewith. Idler pulleys 47 and 48 are arranged to be moved inwardly against the belts 42 and 43 so as to selectively tighten the same, thereby transmitting driving rotation from the sheave 45 to the drum 11 or from the sheave 46 to the drum 12.

The idler pulley 47 is supported on the lower end of the lever 50 which swings on a pin 51. The lever 50 is arranged to be swung back and forth by a link 52, the rear end of which is pivotally connected to the lever 50 and the front end (left end) is pivotally connected to the downwardly extending arm 53 of a bell crank lever 54 which swings on a pivot 55 and has a leftwardly extending arm 56 which supports the idler sheave 48 in a position above the belt 43. The bell crank lever 54 is connected by a link 57 with the end 59 of an operating lever 60 swingably supported by a pin 61. If the projecting handle portion 62 of the lever 60 is raised, so as to rotate the lever 60 in clockwise direction, the link 57 will be moved downwardly causing the bell crank lever 54 to be likewise rotated in clockwise direction, with the result that the idler sheave 48 will be lifted and the idler sheave 47 will be moved leftwardly so as to tighten the belt 42 as shown in Fig. 2. If the control lever 60 is rotated in counterclockwise direction the link 57 will transmit counterclockwise rotation to the bell crank lever 54 with the result that the sheave 48 will be moved downwardly so as to tighten the belt 43 and the sheave 47 will be moved rightwardly away from the belt 42. Accordingly, upward movement of the handle 62 will effect a tightening of the belt 42 so as to drive the drum 11 in clockwise direction, winding the strips 10 thereon and effecting an unwinding of the strips 10 from the drum 12. Similarly, depression of the handle 62 will cause the sheave 48 to move downwardly and tighten the belt 43 which, owing to the fact that it is crossed, will rotate the drum 12 in counterclockwise direction, winding the strips 10 thereon and unwinding the strips 10 from the drum 11.

The drum 11 is provided with releasable locking means which normally prevents counterclockwise rotation of the drum 11. This locking means consists of a rubber surface layer 63 on the drum 11 and a detent pawl 65 swingable upon the pin 51 and being adapted to rest in engagement with the band 63 in such position that its engagement with the band 63 will prevent counterclockwise rotation of the drum 11. However, when the link 52 shifts the lever 50 rightwardly from the position which it is shown in Fig. 2, a pin 66 which projects from the lever 50 will engage the pawl 65 and swing the same rightwardly out of its position of engagement with the rubber surface layer 63. This removal of the pawl 65 from engagement with the rubber layer 63 occurs in conjunction with the movement of the idler sheave 48 downwardly so as to effect counterclockwise rotation of the drum 12. Therefore, the pawl 65 will not prevent the unwinding of the strip 10 from the drum 11 when the lever 62 is forced downwardly. A rubber ring or layer 67 is mounted on the drum 12 and a pawl 68 is supported on the arm 53 of the bell crank lever 54 by a pin 69 and in such position that it will normally engage the rubber layer 67 and prevent clockwise rotation of the drum 12. However, when the upward movement of the handle 62 effects clockwise rotation of the bell crank lever 54 and likewise leftward movement of the

idler sheave 47 so as to tighten the belt 42, the pawl 68 will be swung upwardly out of its position of engagement with the rubber layer 67 by pin 66, so that the pawl will not prevent clockwise rotation of the drum 12 during the time the drum 11 is driven in clockwise direction by the belt 42. When lever 60 is in neutral or playing position both pawls 68 and 65 are engaged to prevent movement of drums 11 and 12 and hold the strips 10 taut. Also, the drums 11 and 12 are provided with brake means 67' arranged to prevent inadvertent rotation thereof. The brake means 67' are shown as friction shoes supported in engagement with the ends of the drums 11 and 12 by adjustable leaf springs 78'.

The invention provides an interlocking control 70 which prevents sound-reproducing movement of the strips 10 when the drums 11 and 12 are being selectively driven, and which prevents driving of the drums 11 and 12 during the time the strips 10 are being moved for sound-reproducing purposes. This interlocking control 70 consists of a disc 71 fixed on a horizontal shaft 72 provided with a handle 73 at its forward end whereby the disc 71 may be rotated back and forth between "playing" position and "strip section selecting position," in which latter position the disc 71 is shown in Figs. 1 and 2. As shown in Fig. 1 the disc 71 has thereon a pin or lug 74 arranged to engage a stop 75 when the disc 71 is in its strip section selecting position. At this time a notch 76 in the lower part of the disc 71 is aligned with a plate 77 which is fixed on the lever 60 in upwardly projecting position and has at its upper end a slot or notch 78 which is aligned with the disc 71 when the lever 60 is in central or neutral position. When the notch 76 of the disc 71 is in the position of which it is shown in Fig. 1, the upper end of the plate 77 may swing back and forth through the notch 76, enabling a swinging of the lever 60 so as to effect a driving of either of the drums 11 or 12. If the disc 71 is rotated in counterclockwise direction from the position in which it is shown in Fig. 1 so as to bring the pin 74 into engagement with a stop 79, the notch 76 will be moved rightwardly out of alignment with the upper end of the plate 77. In other words, the portion of the disc 71 lying to the left of the upper end of the plate 77 will move into the notch 78 of the plate, thereby preventing movement of the lever 60 and preventing driving of the drums 11 and 12 during the time the device is being operated for sound reproduction.

When the control 70 is adjusted into a position to permit driving of the drums 11 and 12, lock means 80 prevents the movement of the retracting rollers 19 out of their positions at the lower ends of the reservoirs 15. This lock means 80 comprises a horizontal bar 81 carried by a guide member 82 and having a plurality of upwardly projecting hooks 83 which, upon rightward movement of the bar 81 from the position in which it is shown in Fig. 1 will carry the upper laterally directed ends 84 into positions above the lower portions of the bow springs 28, so that the lower ends of bow springs 28 cannot be moved more than a short distance upwardly. These hook members 83 are brought into locking position when the disc 71 is moved into a position as shown in Fig. 1, to permit movement of the handle 62 for the purpose of effecting rotation of either of the drums 11 or 12, by a cable 85 having a connection 86 with the disc 71 and extending downwardly around the sheave 87 to a connection 88 with the rightward end of the bar 81, so that when the cable 85 is pulled upwardly as the result of rotation of the disc 71 into the position in which it is shown in Fig. 1 it will pull the bar 88 rightwardly and move the laterally extending upper ends 84 of the hook members into their positions above the lower portions of the springs 28. A tension spring 89, connected to the leftward end of the bar 81 pulls the bar 81 and the hook members 83 leftwardly into non-locking positions when counterclockwise rotation of the disc 71 from the position in which it is shown in Fig. 1 lowers the

connection 86 and permits downward movement of the cable 85. Accordingly, the locking means for the strip retracting rollers 19 is released when the control 70 is adjusted for operation of the instrument for sound reproduction. The control 70 likewise prevents operation of the keys 38 when the disc is in the position thereof shown in Fig. 1. As shown in Figs. 1 and 2 a stop plate 91 is supported by a longitudinal shaft 92 below the keys. When this bar 91 is in upright position as shown in Fig. 2, the upper edge thereof engages the lower faces of the keys 38 so that they cannot be moved downwardly. When operation of the keys 38 is desired, the plate 91 will be rotated approximately 90° in clockwise direction from the position in which it is shown. This is accomplished by a link 93 having at its upper end a laterally bent portion 94 which engages an eccentric opening in the disc 71. The lower end of this link 93 engages a lever 95 which is connected to the rightward end of the bar 91 as shown in Fig. 1. When the disc 71 is in its position permitting adjustment of the drums 11 and 12, as shown in Figs. 1 and 2, the link 93 will hold the plate 91 in raised position, but when the disc 71 is rotated in counterclockwise direction from the position in which it is shown in Fig. 1 downward movement of the link 93 will swing the lever 95 and the plate 91 in clockwise direction to flat or retracted position wherein it will not interfere with the downward movement of the keys 38 necessary to actuate the tape moving means consisting of the driving roller 34 and the rollers 37.

The drums 11 and 12 are also connected by a driving tape 96, the opposite end portions of which are connected to and wound upon the rightward ends, Fig. 1, of the drums 11 and 12. When the drum 11 is driven in clockwise direction, the tape 96 will be wound thereupon and will be pulled or unwound from the drum 12, causing the drum 12 to rotate in clockwise direction at a rate of speed which will deliver the strips 10 therefrom at the same speed as that which the strips 10 are being wound upon the drum 11, to maintain the length of the strips 10 between the drums 11 and 12 constant and hold the bottoms of the loops of the strips in the reservoirs 15 spaced above the bottoms of the reservoirs, with the strips constantly held under tension by the springs 28. Likewise, when the drum 12 is driven in counterclockwise direction, the winding of the tape 96 thereon will effect a rotation of the drum 11 in counterclockwise direction.

As further shown in Figs. 1 and 2, an indicator tape 100 has its ends connected to and wound upon the leftward ends of the drums 11 and 12. From the drum 12 the indicator tape 100 extends under an idler pulley 101 and upwardly across the inner face of a front panel 102 of the device to an idler roller 103. As shown in Fig. 2 the indicator tape 100 extends over the roller 103 and downwardly diagonally and rightwardly to the drum 11. There is a window 104 in the panel 102 through which a small portion 105 of the tape 100 is visible so that markings 106 on the tape 100 may be viewed with relation to an indicator point or reference member 107, shown as an arrow on the face of the panel 102 at one side of the window 104. The markings 106 indicate sections of the indicator tape 100 and also sections of the sound record strips 10. As rotation of the drums 11 and 12 moves the strips 10 there will be a similar movement of the indicator tape 100. The markings 106 are positioned so that when one of them is in a centralized position in the window 104, it will indicate that similar sections of the strips 10 are in sound reproducing positions in the device. For example, if the strips 10 are divided longitudinally into eight sections, the indicator tape 100 will be likewise divided into eight sections, and the beginning of each section thereof will be identified by a marking such as a numeral. Accordingly, during the shifting of the strips 10 by selective rotation of the drums 11 and 12, the indicator strip 100 may be observed

through the window 104 as an aid in adjusting the strips 10 so as to bring selected sections thereof into sound reproducing positions in the device.

The strips 10 and the tapes 96 and 100 are wound in channels 13 cut in the drums 11 and 12. These channels 13 have the effect of forming in the drums 11 and 12 consecutive connected spools to receive the strips and the tapes, the effective diameters of these spools being variable within small limits by the means shown in Fig. 6 for accurately timing the start of each instrument or sound so that all notes on any section will start on the attack of that particular sound. Each channel 13 has a bottom wall 110. A member, such as the head 111 of a screw 112 is adjustable outwardly from the face of the bottom wall 110, this having the effect of increasing or decreasing the effective diameter of the portion of the drum 11 or 12 on which the strip 10 or a tape 96 or 100 is wound. Fig. 6 likewise shows a clip 114, actuated by a screw 115 for clamping the end of a strip 10 and thereby connecting it to the drum.

I claim:

1. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; means for moving said strip from said reservoir and across said pickup head toward said rear storage drum; a record strip receiver between said head and said rear storage drum comprising a container across which a portion of the strip extends, said container being disposed so that it will receive the portion of said strip which moves toward said rear storage drum from said pickup head and so that said portion of said strip will accumulate therein in convolutions; retracting means acting to return said portion of said strip to said reservoir when said means for moving said strip is inactive; a stop adjustable to hold said retracting means in strip-retracting position in said reservoir during rotation of one of said drums to wind said strip thereon; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; a lock preventing operation of said means for moving said strip when said drum driving means is operative; means for rendering said drum driving means inoperative when means for moving strip from reservoir into receiver is operative; and means for rendering said drums non-rotatable when said drum driving means is inoperative.

2. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; means for moving said strip from said reservoir and across said pickup head toward said rear storage drum, comprising a rotating roller disposed between said head and said rear drum and means for effecting engagement of said strip and said roller so that the roller will move the strip; a record strip receiver between said roller and said rear drum consisting of a flat container having an inlet opening disposed close to said roller to receive said strip as it leaves said roller, a space in which said strip accumulates in convolutions and an outlet opening through which said strip extends from the container to said front drum; and retracting means acting to return said portion of said strip from receiver to said reservoir when said means for moving said strip is inactive.

3. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage

drum and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; means for moving said strip from said reservoir and across said pickup head toward said rear storage drum, comprising a rotating roller disposed between said head and said front drum and means for effecting engagement of said strip and said roller so that the roller will move the strip; a record strip receiver between said roller and said rear drum consisting of a flat container having an inlet opening disposed close to said roller to receive said strip as it leaves said roller, a space in which said strip accumulates in convolutions and an outlet opening through which said strip extends from the container to said rear drum; retracting means acting to return said portion of said strip to said reservoir when said means for moving said strip is inactive; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; and a lock preventing operation of said means for moving said strip when said drum driving means is operative.

4. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; means for moving said strip from said reservoir and across said pickup head toward said rear storage drum, comprising a rotating roller disposed between said head and said rear drum and means for effecting engagement of said strip and said roller so that the roller will move the strip; a record strip receiver between said roller and said rear drum consisting of a flat container having an inlet opening disposed close to said roller to receive said strip as it leaves said roller, a space in which said strip accumulates in convolutions and an outlet opening through which said strip extends from the container to said front drum; retracting means acting to return said portion of said strip to said reservoir when said means for moving said strip is inactive; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; a lock preventing operation of said means for moving said strip when said drum driving means is operative; means for rendering said drum driving means inoperative; and means for rendering said drums non-rotatable when said drum driving means is inoperative.

5. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; means for moving said strip from said reservoir and across said pickup head toward said rear storage drum, comprising a rotating roller disposed between said head and said rear drum and means for effecting engagement of said strip and said roller so that the roller will move the strip; a record strip receiver between said roller and said rear drum consisting of a flat container having an inlet opening disposed close to said roller to receive said strip as it leaves said roller, a space in which said strip accumulates in convolutions and an outlet opening through which said strip extends from the container to said front drum; retracting means acting to return said portion of said strip from receiver to said reservoir when said means for moving said strip is inactive; drum driving means for selectively driving said drums so as to wind said strip from one of said drums and onto the other; means for preventing operation of said means for moving said strip when said drum driving means is operative; and means controlled by said means for preventing operation of said

means for moving said strip for preventing driving of said drums when said means for moving said strip is operative.

6. In a sound reproducing device: a front storage drum and a rear storage drum in spaced relation; a plurality of record strips in side-by-side relation and having the ends thereof wound on said drums; pickup heads between said drums and contiguous to the respective strips; strip-receiving reservoirs between said front drum and said heads to receive loops of said strips therein; yieldably maintained members in said reservoirs engaging said loops and acting to pull said strips into said reservoirs; record strip receivers disposed between said pickup heads and said rear drum; means for moving said strips from said reservoirs, across said heads and into said receivers; drum driving means for selectively driving said drums so as to shift portions of said strips from one drum to the other; means for holding said yieldably maintained members in the rearward ends of said reservoirs during the rotation of said drums so that said strips cannot be pulled out of said reservoirs; key means movable from first to second positions for actuating said means for moving said strips; and stop means acting in consequence of the operation of said means for driving said drums to prevent movement of said keys into said second positions thereof so that said strip-moving means cannot be actuated during the time said drums are being rotated for the purpose of shifting said strips.

7. In a sound reproducing device: a front storage drum and a rear storage drum in spaced relation; a plurality of record strips in side-by-side relation and having the ends thereof wound on said drums; pickup heads between said drums and contiguous to the respective strips; strip-receiving reservoirs between said front drum and said heads to receive loops of said strips therein; yieldably maintained members in said reservoirs engaging said loops and acting to pull said strips into said reservoirs; record strip receivers disposed between said pickup heads and said rear drum; means for moving said strips from said reservoirs, across said heads and into said receivers; drum driving means for selectively driving said drums so as to shift portions of said strips from one drum to the other; means for holding said yieldably maintained members in the rearward ends of said reservoirs during the rotation of said drums so that said strips cannot be pulled out of said reservoirs; keys for actuating said means for moving said strips into receivers; stop means for preventing operation of said keys when drum driving means is operative; locking means for preventing rotation of said drums when said drum driving means are inactive; a control member movable between first and second positions; means operative in response to movement of said control member into its first position to retract said stop means so that said keys may be actuated, activate said locking means so that said drums cannot be rotated during the time said keys are operative, and releasing said means for holding said yieldably maintained members in the rear ends of said reservoir; and means operating in response to the movement of said control member into its second position to render said drum driving means operable to move said stop means into positions to prevent operation of said keys, and to activate said means for holding said yieldably maintained members in the rearward ends of said reservoirs.

8. In a sound reproducing device having at least one record strip, such as a tape, with its ends connected to and wound upon a front storage drum and a rear storage drum: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum; strip moving means operable to move said strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said head and said rear storage drum disposed

so that it will receive the portion of said strip which moves toward said rear storage drum from said pickup head; retracting means acting in consequence of discontinuance of the operation of said strip moving means to return said portion of said strip to said reservoir; a separate indicator tape having its ends connected to and wound upon said drums, said indicator tape having markings thereon to indicate parts of said record strip; a reference member; and means for guiding said indicator tape so that it will move past said reference member as said drums are rotated.

9. In a sound reproducing device: a front storage drum and a rear storage drum in spaced relation; a plurality of record strips in side-by-side relation and having the ends thereof wound on said drums; pickup heads between said drums and contiguous to the respective strips; strip-receiving reservoirs between said front drum and said heads to receive loops of said strips therein; yieldably maintained members in said reservoirs engaging said loops and acting to pull said loops into said reservoirs; record strip receivers disposed between said pickup heads and said rear drum; means for moving said strips from said reservoirs, across said heads and into said receivers; drum driving means for selectively driving said drums so as to shift portions of said strips from one drum to the other; means for holding said yieldably maintained members in the rearward ends of said reservoirs during the rotation of said drums so that said strips cannot be pulled out of said reservoirs; a separate indicator tape having its ends connected to and wound upon said drums, said indicator tape having markings thereon to indicate parts of said record strip; a reference member; and means for guiding said indicator tape so that it will move past said reference member as said drums are rotated and thereby indicate the portions of said strips positioned in said reservoirs.

10. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum comprising a container across which a portion of the strip extends, said container being disposed so that said portion of said strip which moves toward said rear storage drum from said pickup head will pass freely into said container and fold back and forth therein in convolutions; and retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive.

11. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum comprising a container across which a portion of the

strip extends, said container being disposed so that said portion of said strip which moves toward said rear storage drum from said pickup head will pass freely into said container and fold back and forth therein in convolutions; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; and lock means correlated with the operation of said drum driving means, preventing operation of said strip moving means when said drum driving means is operative.

12. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum comprising a container across which a portion of the strip extends, said container being disposed so that said portion of said strip which moves toward said rear storage drum from said pickup head will pass freely into said container and fold back and forth therein in convolutions; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; lock means correlated with the operation of said drum driving means, preventing operation of said strip moving means when said drum driving means is operative; means for rendering said drum driving means inoperative; and means for preventing rotation of said drums when said drum driving means is inoperative.

13. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum for receiving the portion of said strip which moves from said head toward said rear drum; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; drum driving means for driving at least one of said drums so as to wind said strip from one to the other of said drums; lock means correlated with the operation of said drum driving means, preventing operation of said strip moving means when said drum driving means is operative; means for rendering said drum driving means inoperative; and means for preventing rotation of said drums when said drum driving means is inoperative.

14. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; drum driving means for selectively driving said drums so as to wind said strip from one of said drums onto the other; and means acting in response to operativeness of said drum driving means to prevent operation of said strip moving means.

15. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; drum driving means for selectively driving said drums so as to wind said strip from one of said drums onto the other; means acting in response to operativeness of said drum driving means to prevent operation of said strip moving means; and means controlled by said means for preventing operation of said strip moving means for preventing rotation of said drums.

16. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed between said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum for receiving the portion of said strip which moves from said pickup head toward said rear drum; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; and means for varying the effective diameter of at least one of said drums.

17. In a sound reproducing device having at least one strip, such as a tape with its ends connected to and wound upon a front storage drum and a rear storage drum and drum driving means for effecting transfer of said strip from one drum to the other: a pickup head disposed be-

13

tween said storage drums and contiguous to the record strip which extends therebetween; a record strip reservoir between said pickup head and said front storage drum having a portion of said record strip therein; selectively operable strip moving means for moving said portion of said record strip from said reservoir and across said pickup head toward said rear storage drum when said drum driving means is inactive; a record strip receiver between said means for moving said strip and said rear storage drum for receiving the portion of said strip which moves from said pickup head toward said rear drum; retracting means acting upon discontinuance of the operation of said strip moving means to instantaneously return said portion of said strip from said receiver to said reservoir when said means for moving said strip is inactive; and a stop operable to hold said retracting means in strip-retracting position in said reservoir so that during rotation of said drums, said strip cannot be pulled out of said reservoir.

18. In a sound reproducing device having record strips arranged with the ends thereof wound on spaced drums, pickup heads cooperating with the sections of the strips which extend between the drums, strip reservoirs adjacent one of said drums containing therein portions of said strips and strip receivers adjacent the other of said drums, said receivers having inlets and outlets for the film strip, and strip moving means for moving said strips from said reservoirs to said strip receivers: means connecting said drums for correlated rotation in the same direction whereby said strips will be wound upon and unwound from the respective drums at the same rate to maintain the lengths of said strip sections between said drums constant; drive means for rotating said drums; and means frictionally engaging said strips near the outlets of said receivers for resisting movement of said strips through said outlets causing said strips to form loops in said receivers when said strips are moved by said strip moving means.

14

19. In a sound reproducing device having record strips arranged with the ends thereof wound on spaced drums, pickup heads cooperating with the sections of the strips which extend between the drums, strip reservoirs adjacent one of said drums containing therein portions of said strips and strip receivers adjacent the other of said drums, said receivers having inlets and outlets for the film strip, and strip moving means for moving said strips from said reservoirs to said strip receivers: means connecting said drums for correlated rotation in the same direction whereby said strips will be wound upon and unwound from the respective drums at the same rate to maintain the lengths of said strip sections between said drums constant; driving pulley means; driven pulleys connected respectively to said drums; loose belts extending over said driving pulley means and said driven pulleys; a control member movable in first and second directions; means operating in response to movement of said control member in said first direction to tighten one of said loose belts; and means operating in response to movement of said control member in said second direction to tighten the other of said loose belts.

References Cited in the file of this patent

UNITED STATES PATENTS

464,476	Herrington	Dec. 1, 1891
947,148	Browne	Jan. 18, 1910
1,218,324	Severy	Mar. 6, 1917
2,551,198	Barrett	May 1, 1951
2,706,637	Cain	Apr. 19, 1955
2,792,217	Weidenhammer	May 14, 1957
2,838,250	Stavrakis	June 10, 1958

FOREIGN PATENTS

828,450	Germany	Jan. 17, 1952
---------	---------	---------------