

Oct. 29, 1968

ISAMU HASHIMOTO

3,408,017

SOUND RECORDING-REPRODUCING DEVICE OF TAPE-MAGAZINE TYPE

Filed July 5, 1966

4 Sheets-Sheet 1

FIG. 1

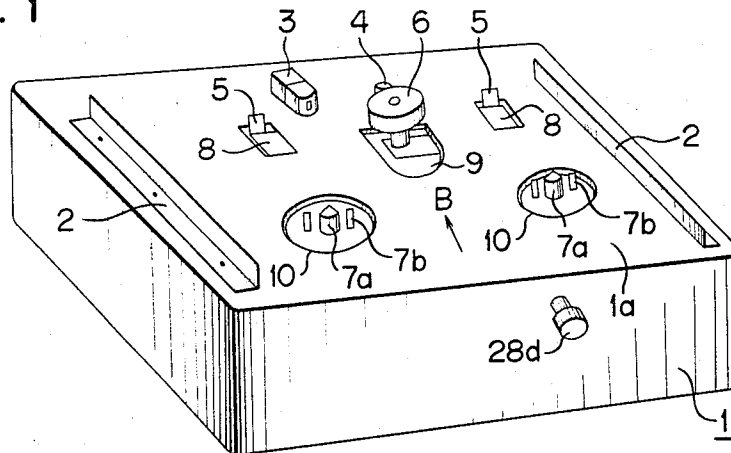


FIG. 2

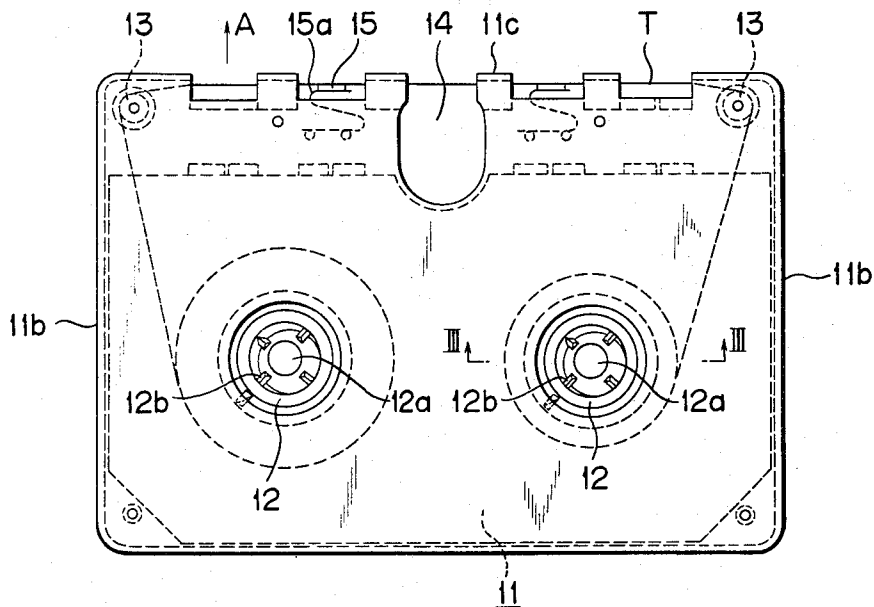
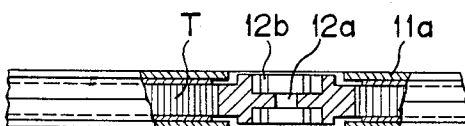


FIG. 3



Isamu Hashimoto,

INVENTOR.

BY Wendroth Lind
and Porack,
attorneys

Oct. 29, 1968

ISAMU HASHIMOTO

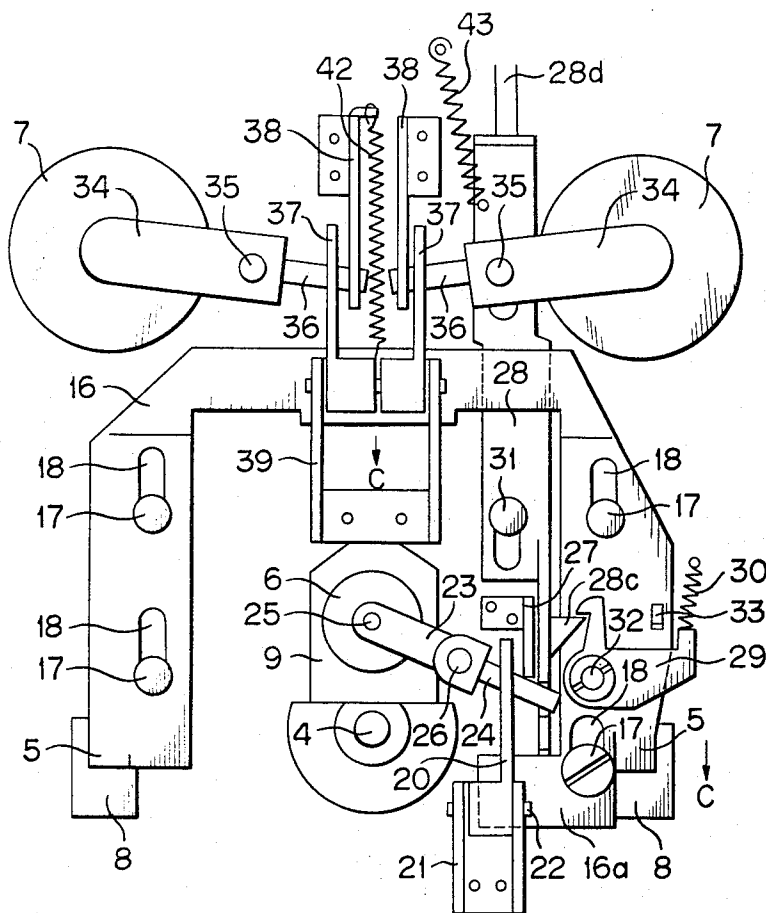
3,408,017

SOUND RECORDING-REPRODUCING DEVICE OF TAPE-MAGAZINE TYPE

Filed July 5, 1966

4 Sheets-Sheet 2

FIG. 4



Isamu Hashimoto

INVENTOR.

BY *Wendell L. Ford*
and Mack
attorneys

Oct. 29, 1968

ISAMU HASHIMOTO

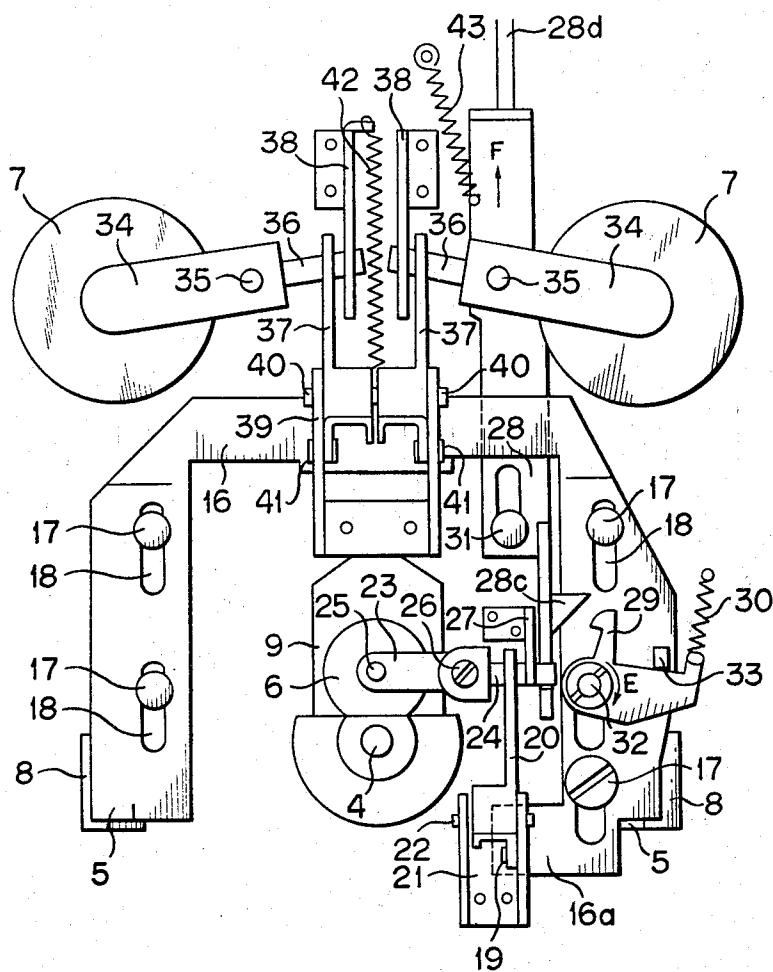
3,408,017

SOUND RECORDING-REPRODUCING DEVICE OF TAPE-MAGAZINE TYPE

Filed July 5, 1966

4 Sheets-Sheet 3

FIG. 5



Isamu Hashimoto,

INVENTOR.

BY *Wanderath, Lind
and Pmack,*
attorneys

Oct. 29, 1968

ISAMU HASHIMOTO

3,408,017

SOUND RECORDING-REPRODUCING DEVICE OF TAPE-MAGAZINE TYPE

Filed July 5, 1966

4 Sheets-Sheet 4

FIG. 6

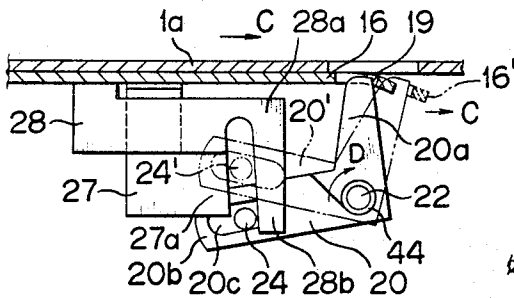


FIG. 7

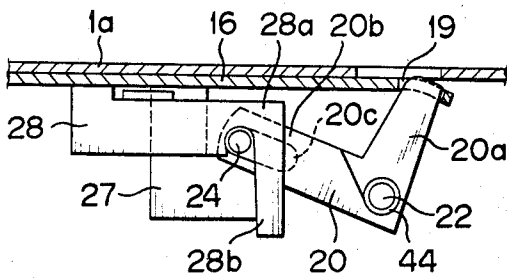


FIG. 8

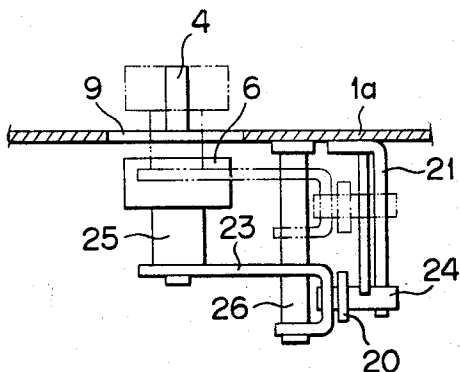


FIG. 9

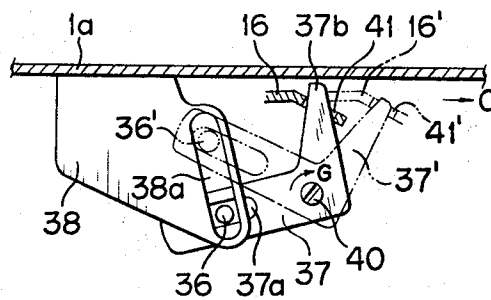
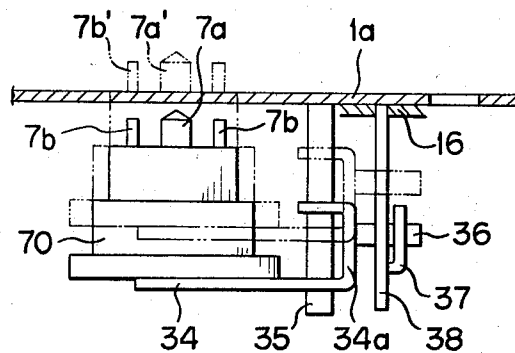


FIG. 10



Isamu Hashimoto

INVENTOR.

BY *Wendroth, Gird*
and *Pmaek*,
attorneys

1

3,408,017

SOUND RECORDING-REPRODUCING DEVICE OF TAPE-MAGAZINE TYPE

Isamu Hashimoto, Kawagoe-shi, Japan, assignor to
Pioneer Kabushiki Kaisha, Tokyo-to, Japan

Filed July 5, 1966, Ser. No. 562,564

Claims priority, application Japan, July 7, 1965,
40/40,297

7 Claims. (Cl. 242—55.13)

ABSTRACT OF THE DISCLOSURE

A magazine type magnetic sound recording and reproducing device. An upper base plate has a capstan roller and a pinch roller opposed to each other above said base, and roller raising and lowering means are provided on which one of said rollers is mounted. The upper base plate has an aperture therein through which said one of said rollers is moved by said raising and lowering means. The base plate has at least one further aperture therein and a contact lug projects through said further aperture. A shiftable member is positioned beneath said base plate to which said lug is attached. Still further apertures are provided in said base plate, and reel driving and braking shafts are movable up and down through said still further apertures on reel shaft raising and lowering means. Said shiftable member is coupled to said roller raising and lowering means and said reel shaft raising and lowering means for raising said roller and said reel shafts when said lug is moved in one direction and lowering said roller and reel shafts when said lug is returned to its initial position. A tape magazine having reels therein on which tape is wound and having an opening across which the tape is caused to run can be moved slidably across the said base plate of the device and the lug is engaged to raise the roller into the opening and to urge the tape against the other roller and the reel shafts are raised into engagement with the reels to drive the tape, and when the magazine is slidably removed, the roller is lowered away from the tape and the reels shafts are lowered.

This invention relates to sound recording and reproducing devices of the tape magazine type. More particularly, the invention concerns a new and improved magnetic sound recording and reproducing device of the tape magazine type in which the tape magazine containing tape feed and take-up reels with a tape wound therearound can be mounted on and removed from the device in a simple and rapid manner.

Two kinds of magnetic sound recording and reproducing devices of the magazine type are well known. In one kind, use is made of a magazine in which an endless magnetic sound recording medium is wound around a single reel; while, in the other, use is made of a magazine containing a tape feed reel and a take-up reel on which a magnetic sound recording medium having terminal ends is wound.

Heretofore, in a magnetic sound recording and reproducing device (hereinafter referred to as a "recorder") of the magazine type of the first of the above mentioned two kinds, a single reel is used, and the recorder can be operated when a suitable tension is applied to the sound recording medium by the driving action of a capstan and a pinch roller.

In a recorder in which use is made of a magazine of the above mentioned second kind, however, a feeding reel and a take-up reel are separately provided, being coupled to shafts in the recorder so that they will undergo feeding and take-up operations, respectively, in a smooth

2

manner. The capstan is driven in a manner such that a suitable braking force is imparted by the shaft to the recording medium (tape). Furthermore, for the reel drive by means of the shafts, the shafts project above the base plate of the recorder on which the magazine is to be mounted, and the magazine is mounted by fitting it in place from above.

In a recorder of the construction known heretofore, however, the procedure of fitting the magazine in place has been complicated and difficult, whereby the simplicity and convenience of handling which is the intended feature of a magazine type recorder is lacking.

It is an object of the present invention to provide a magazine type recorder of the aforementioned second kind in which the above described difficulty is overcome, and the procedure of mounting and removing the magazine is simplified thereby to afford simple, rapid, and convenient handling of the recorder, thereby to reduce greatly the gap in recording which occurs each time the end of a recording medium is reached.

Another object of the invention is to provide a recorder of the above stated character which has a relatively simple construction.

The above objects and other objects of the invention which will presently become apparent have been achieved in the recorder of the invention, in which the magazine is slidably inserted along the base plate of the recorder, and this sliding insertion of the magazine causes the central shafts of the feeding and take-up reels and a pinch roller or capstan to rise upwardly through the base plate into position for driving the magnetic sound recording medium.

According to the present invention, briefly stated, there is provided a recorder of the type referred to above in which the sliding movement of the tape magazine when being mounted causes contact lugs to be pressed, whereby a combination of intercoupled mechanisms within the device is actuated and operates to cause a pinch roller (or capstan) to rise and enter the magazine and to press a tape wound around the reels in the magazine against a capstan (or pinch roller) projecting above the base plate of the device and, at the same time, to cause shafts respectively for the tape feed and take-up reels to rise from positions below the base plate to positions thereabove and couple with the respective reels thereby to cause the tape to travel between the reels.

According to the present invention there is further provided, in the above stated recorder, a release mechanism for causing the pinch roller (or capstan) and the shafts for the reels to be retracted out of the magazine.

The nature, principle, and details of the invention will be more clearly apparent from the following detailed description with respect to a preferred embodiment of the invention, when read in conjunction with accompanying drawings, in which like parts are designated by like reference numerals.

In the drawings:

FIG. 1 is a perspective view showing the main recorder assembly of an example of a recorder embodying the invention;

FIG. 2 is a plan view of a tape cartridge or magazine designed for use in the recorder shown in FIG. 1;

FIG. 3 is a sectional view taken along the plane indicated by line III—III shown in FIG. 2 and in the direction of the arrows;

FIGS. 4 and 5 are enlarged, partial plan views showing the internal mechanisms of the recorder shown in FIG. 1, and respectively indicating the stopped and operating states of the recorder;

FIGS. 6 and 7 are enlarged, partial elevational views showing an actuating mechanism for operating the pinch roller as viewed from the right-hand side in FIG. 4 or

FIG. 5 and respectively indicating the stopped and operating states;

FIG. 8 is an enlarged, partial elevational view showing the actuating mechanism of the pinch roller as viewed in the direction of arrow C in FIG. 4;

FIG. 9 is an enlarged, partial elevational view indicating the operation of a mechanism for actuating the central shaft of a tape reel; and

FIG. 10 is an enlarged, partial elevational view showing the central shaft of a tape reel as viewed in the direction of arrow C in FIG. 4.

Referring to FIG. 1, the main recorder assembly is supported on and, for the most part, housed within a chassis or base structure 1 having an upper base plate 1_a, on which are fixed guide members 2 for slidably inserting a tape magazine into mounted position on the base plate 1_a. A recording-replaying head 3 is mounted on the base plate 1_a, and a capstan 4 and contact lugs 5, 5 are disposed to project upwardly through respective apertures in the base plate 1_a.

The base plate 1_a is further provided with apertures 8, 8 for permitting contact lugs 5, 5 to engage with a magazine 11, shown in FIG. 2, at the time when the magazine is being inserted or withdrawn, and undergo movement, an aperture 9 for permitting a pinch roller 6 to rise there-through from the interior of the base structure 1 to its operational position above the base plate 1_a, and apertures 10, 10 for permitting the upward projection from the interior of the base structure 1 of shafts 7_a, 7_a (hereinafter referred to as "reel shafts") to be coupled respectively to feeding and take-up reels in the magazine 11.

The magazine 11, whose essential construction is shown in FIG. 2, has opposite side walls 11_b, 11_b for slidably contacting the guide members 2, 2 when the magazine is inserted into position and a side wall 11_c provided with an aperture for permitting the tape T to contact the recording-replaying head 3 and an aperture 14 for exposing the tape outside of the magazine casing so that the tape can be pressed between the capstan 4 and pinch roller 6.

The magazine 11 contains therewithin reels 12, 12 for feeding and taking up tape around which the tape is wound, and which are retained in a freely rotatable manner between the upper and lower walls 11_a, 11_a of the magazine casing. The reels 12, 12 are respectively provided with central holes 12_a, 12_a into which shafts 7_a, 7_a can be fitted and with members 12_b, 12_b for engaging with pins 7_b, 7_b projecting upwardly and parallel to shafts 7_a, 7_a thereby to establish positive coupling between the shafts 7_a, 7_a and reels 12, 12. Each shaft 7_a and two pins 7_b, 7_b project upwardly from a single drive shaft 7.

Rollers 13 are supported in a freely rotatable manner in the magazine 11 to guide the tape T smoothly along its path of travel. Pads 15 fixed by way of springs 15_a to the interior of the magazine 11 are provided to press the tape T against the recording and replaying head 3.

The aforementioned contact lugs 5, 5 are provided at the extreme ends of a shiftable member 16 having a U shape in plan view as shown in FIGS. 4 and 5 and shiftable supported against the base plate 1_a by four screws 17 slidably engaged in respective slots 18 in the shiftable member 16. One end 16_a of this shiftable member 16 is formed as an L-shaped extension with a hole 19 in which the end of one arm 20_a of an L-shaped lever 20 for actuating the pinch roller 6 is engaged as shown in FIGS. 5 and 6.

The lever 20 is pivotally supported by a pivot pin 22 on a support bracket 21 fixed to the base structure 1. A spring 44 is wound around the pivot pin 22, being anchored at one end to the bracket 21 and fixed at the other end to the lever 20 thereby to impart a return force to the lever 20.

The other end 20_b of the lever 20 is provided with a slot 20_c through which is passed a rod 24 fixed to the

end of a bracket 23 for supporting the pinch roller 6. The pinch roller 6 is rotatably supported by a shaft 25 on the bracket 23, which is slidably engaged with and guided in vertical movement by a vertical post 26 fixed to the base plate 1_a. The free end of the rod 24 is inserted in a guide slot for functioning as a guide means for guiding the pinch roller in its ascending and descending movements so that after it rises in an approximately vertical direction, it is caused to move horizontally toward the capstan.

This guide slot is encompassed by a fixed bracket 27 and release member 28 and has a U-shaped wall configuration. The fixed bracket 27 is fixed to the base plate 1_a, while the release member 28 is slidably supported against the lower surface of the base plate 1_a by a screw 31. The fixed bracket 27 has an L shape as viewed from the side and constitutes a side wall part 27_a of the above mentioned guide slot, the upper part of which is formed by a curved part 28_a of the release member 28. The curved part 28_a is extended as an arm 28_b which is parallel to the side wall part 27_a of the fixed bracket 27, whereby the U-shaped slot is formed.

The release member 28 has a lug 28_c, which is engaged and locked by a latch 29 when the recorder is in the stopped state, in which the U-shaped slot is open. The release member 28 further has at its other end a manipulating (pushing) part 28_d extending out through a side wall of the base structure 1 as shown in FIG. 1. If, when the recorder is in the operative state, and the lug 28_c is disengaged from the latch 29, the manipulating part 28_d is pushed, the lug 28_c can be caused to be engaged again by the latch 29.

A spring 30 is provided to impart a force on the latch 29 tending to cause it to engage with the lug 28_c, the fixed end of the spring 30 being anchored to the base structure 1. The latch 29 is pivoted by a pivot pin 32 on the base structure 1. A projection 33 is formed on the aforementioned shiftable member 16 and, when the recorder is in the operative state, presses the latch 29 in a direction opposite to the tension of the spring 30 thereby to release the lug 28_c of the release member 28.

Referring to FIGS. 4, 5, 9, and 10, each of the driving shafts 7, 7 is supported by a sliding support 34 which is slidably fitted on a vertical guide post 35 by which it is guided in vertical movement as shown most clearly in FIG. 10. A pin 36 rigidly fixed to one end 34_a of each sliding support 34 extends horizontally and is engaged in a slot 37_a in one end of an L-shaped lever 37 for transmitting force causing the respective shaft 7 to move vertically and in a guide slot 38_a in a fixed member 38 for guiding the shaft 7 in an inclined up-and-down path as shown in FIG. 9.

The two levers 37, 37 (respectively for the two shafts 7, 7) are pivoted at their bent parts on a pin 40 on support members 39, 39 suspended from the base structure 1 as shown in FIGS. 4 and 5. The other end 37_b of each lever 37 is engaged in a hole 41 provided in approximately the central part of the aforementioned shiftable member 16.

A spring 42 is stretched between the shiftable member 16 and the base structure 1 and functions to pull the shiftable member 16 when said member 16 is in its stopped state thereby to cause the operations of the various mechanisms to terminate. A spring 43 is stretched between the release member 28 and the base structure 1 and functions to hold the lug 28_c disengaged from the latch 29 when the recorder is in its operative state.

The recorder of the above described construction and arrangement according to the invention operates in the following manner.

When the recorder is not operating, the pinch roller 6 and the shaft 7, 7 for the reels of the tape magazine are in their respective retracted positions below the upper surface of the base plate 1_a. With the recorder in this state, the magazine 11, with its side 11_c as the leading

edge, is inserted in the direction of arrow B from the near side (as viewed in FIG. 1) of the main recorder assembly, the magazine 11 thereby being guided by the guide members 2, 2 to a position where it presses against the contact lugs 5, 5.

The magazine 11 is inserted further, whereupon the contact lugs 5, 5 are pressed, and, as a result, the shiftable member 16 is pressed in the direction of arrow C in FIG. 4. Simultaneously, the following two movements occur.

- (1) Rising movement of the pinch roller 6.
- (2) Rising movement of the shafts 7, 7 for the reels in the magazine.

At the time when these movements are completed, the engagement action of the holding mechanism described hereinbelow takes place to hold the entire device.

Considering first the rising movement of the pinch roller 6, when the shiftable member is pressed as mentioned above, it shifts in the direction of arrow C in FIG. 6, whereby the pinch roller actuating lever 20 is caused to rotate in the direction of arrow D. These movements of the shiftable member 16 and lever 20 and the resulting movement of the rod 24 are respectively indicated by their resulting positions 16', 20', and 24' as shown by chain lines.

When these positions shown by chain lines are reached by the respective parts, the lug 33 fixed to the shiftable member 16 pushes one arm of the latch 29, thereby causing the latch 29 to rotate clockwise in the direction of arrow E as shown in FIG. 5. Consequently, the latch 29 is disengaged from the lug 28_c of the release member 28, and the parts of the mechanism shown in FIG. 4 change their respective positions to that shown in FIG. 5.

The release member 28 thus released is caused by the force of the spring 43 to move in the direction of arrow F in FIG. 5, whereby the part 28_a of the release member 28 pushes the rod 24 along the slot 20_c of the pinch roller actuating lever 20 to the end of the slot 20_c as shown in FIG. 7. That is, the resultant movement of the rod 24 is a rising movement from its position in FIG. 6 to that in FIG. 7. As a result of the above described operation, the pinch roller 6 is caused to rise in an inclined direction and enter the aperture 14 in the magazine 11, finally pressing the tape T horizontally against the capstan roller 4.

Considering next the rising movement of the shafts 7, 7 for the reels 12 in the magazine 11, when the shiftable member 16 is moved in the direction of arrow C as described above, the levers 37, 37 whose ends 37_b, 37_b are engaged with holes 41, 41 in the shiftable member 16 are rotated about the pivot pin 40 in the direction of arrow G in FIG. 9. Consequently, the rods 36, 36 slidably fitted in the slots 37_a, 37_a of the levers 37, 37 and in the guide slots 38_a, 38_a of the fixed member 38, 38 slide within these slots 37_a, 37_a and 38_a, 38_a until each rod 36 reaches the position 36' shown by chain line in FIG. 9.

As a result, the sliding supports 34, 34 of the shafts 7, 7 rise along their respective guide posts 35, 35, whereby the shafts 7, 7 are raised in an inclined direction, and the shaft 7_a and pins 7_b, 7_b of each shaft 7 are caused to project upwardly through their respective aperture 10 in the base plate 1_a to the positions 7_a', and 7_b', 7_b' indicated by chain lines in FIG. 10. Thus, the shaft 7_a and pins 7_b, 7_b of each shaft 7 are caused to engage with the corresponding reel 12 in the magazine 11 mounted on the base plate 1_a.

Thus, as described above, the insertion of the magazine 11 into the mounted position on the main recorder assembly actuates the shiftable member 16 and causes the pinch roller 6 and shafts 7, 7 to engage with respective parts of the magazine 11. Consequently, the pinch roller 6 causes the rotational power of the capstan 4 to be imparted to the tape T which is thereby driven in its traveling movement. At the same time, one portion of the rotational power of the capstan 4 is transmitted by trans-

mission means such as an endless belt (not shown) to parts 7_c, 7_c of the shafts 7, 7, whereby a braking action is applied to the feeding reel 12, and a winding rotational torque is applied to the take-up reel 12.

When the operation is stopped, and the magazine 11 is to be removed from the main recorder assembly, the manipulating part 28_d of the release member 28 is pushed, whereupon the lug 28_c is engaged by the latch 29 as described above. At the same time, the rod 24 fixed to the bracket 23 supporting the pinch roller 6 is pressed by the bent part 28_a of the release member 28, and simultaneously, the aforementioned U-shaped slot is formed. The rod 24 is then released from its engaged state, and the pinch roller actuating lever 20 is returned from its position 20' to its position 20 as shown in FIG. 6 by the force of the spring 44 disposed around the pivot pin 22 of the lever 20.

Simultaneously, the shiftable member 16 is shifted from the operative position to the inoperative state by the pulling force of the spring 42. Accordingly, the pinch roller 6 is returned from its position for pressing the tape T against the capstan roller 4 to its inoperative position within the base structure 1.

When the shiftable member 16 is returned to its inoperative position by the spring 42, this return movement causes each of the levers 37, 37 to move from the position 37' indicated by chain line to the position indicated by full line in FIG. 9. In accordance with this movement, the rod 36 fixed to the sliding support 34 of each shaft 37 is caused to slide along the guide slot 38_a and the slot 37_a of the respective lever 37 and descend, whereby each shaft 7 is retracted into the inoperative position below the base plate 1_a.

While the present invention has been described above with respect to an example of a recorder in which the pinch roller and the shafts for the reels are adapted to rise or descend simultaneously, it will be apparent that the invention is equally applicable also to a recorder in which the capstan and the shafts for the reels are adapted to rise or descend simultaneously.

As described above, the present invention provides a recorder of a type wherein a tape magazine 11 containing feed and take-up reels 12, 12 is slidably inserted onto the base plate 1_a of the main recorder assembly, in which recorder the insertion of the tape magazine 11 imparts a pressing force on contact lugs 5, 5 whereby a pinch roller 6 (or capstan 4) is inserted into the magazine 11 to press a tape T against a capstan roller 4 (or pinch roller 6) projecting above the base plate 1_a, and, at the same time, shafts for the tape feed and take-up reels are caused to rise above the base plate 1_a to engage with their respective reels.

Accordingly, the insertion of the magazine is facilitated, and the mounting and removal of the magazine for recording or reproducing sound can be accomplished in a short time. Therefore, in cases when tapes are to be exchanged during the recording of a lecture, for example, the part of the sound which is missed and unrecorded can be reduced to a minimum.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example, of the invention herein chosen for the purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A magazine type magnetic sound recording and reproducing device comprising an upper base plate, a capstan roller and a pinch roller opposed to each other above said base, roller raising and lowering means on which one of said rollers is mounted, said upper base plate having an aperture therein through which said one of said rollers is moved by said raising and lowering means, said base plate having at least one further aperture therein and

a contact lug projecting through said further aperture, a shiftable member beneath said base plate to which said lug is attached, still further apertures in said base plate, reel driving and braking shafts movable up and down through said still further apertures, reel shaft raising and lowering means on which said reel shafts are mounted to be raised and lowered thereby, said shiftable member being coupled to said roller raising and lowering means and said reel shaft raising and lowering means for raising said roller and said reel shafts when said lug is moved in one direction and lowering said roller and reel shafts when said lug is returned to its initial position, whereby a tape magazine having reels therein on which tape is wound and having an opening across which the tape is caused to run can be moved slidably across the said base plate of the device and the lug is engaged to raise the roller into the opening and to urge the tape against the other roller and the reel shafts are raised into engagement with the reels to drive the tape, and when the magazine is slidably removed, the roller is lowered away from the tape and the reel shafts are lowered.

2. A sound recording and reproducing device as claimed in claim 1 in which the shiftable member is spring loaded toward the initial position.

3. A sound recording and reproducing device as claimed in claim 1 in which there are two lugs on said shiftable member.

4. A sound recording and reproducing device as claimed in claim 1 in which said roller raising and lowering means

initially raises the roller and then moves it toward the other roller.

5. A magazine type recording and reproducing device as claimed in claim 1 in which the said one roller is the pinch roller.

6. A magazine type recording and reproducing device as claimed in claim 1 in which the said one roller is the capstan roller.

7. A magazine type recording and reproducing device as claimed in claim 1 further comprising a retracting member slidably supported beneath said base plate and coupled to said roller raising and lowering means and said reel shaft raising and lowering means and movable from a rest position to a position in which said raising and lowering means are in the lowered position and having a portion thereof projecting out of said device, and a latch means on said shiftable member engageable with said retracting member when said retracting member is moved from the rest to the position where the roller is lowered and the reel shafts are lowered and thus retracted from a tape magazine.

References Cited

UNITED STATES PATENTS

2,661,162	12/1953	Owens	242—55.13
2,867,389	1/1959	Viets	242—55.13
3,080,101	3/1963	Kreithen et al.	226—174

LEONARD D. CHRISTIAN, *Primary Examiner.*