Dec. 30, 1952 E. E. MASTERSON 2,623,702

REELING SYSTEM FOR REELABLE MAGNETIC RECORDS

Filed July 9, 1948 3 Sheets-Sheet 1

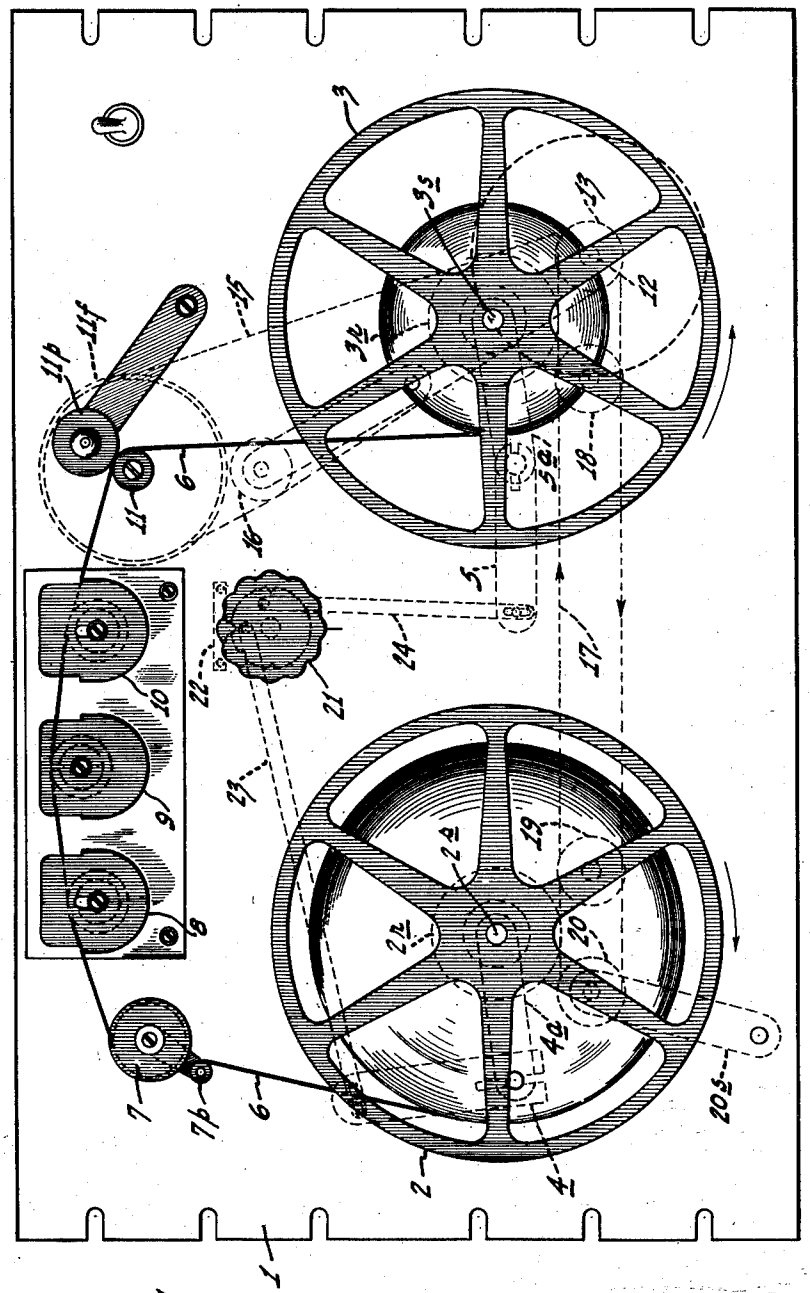


Fig. 1.

INVENTOR
EARL E. MASTERSON
BY Morris A. Pabst
ATTORNEY

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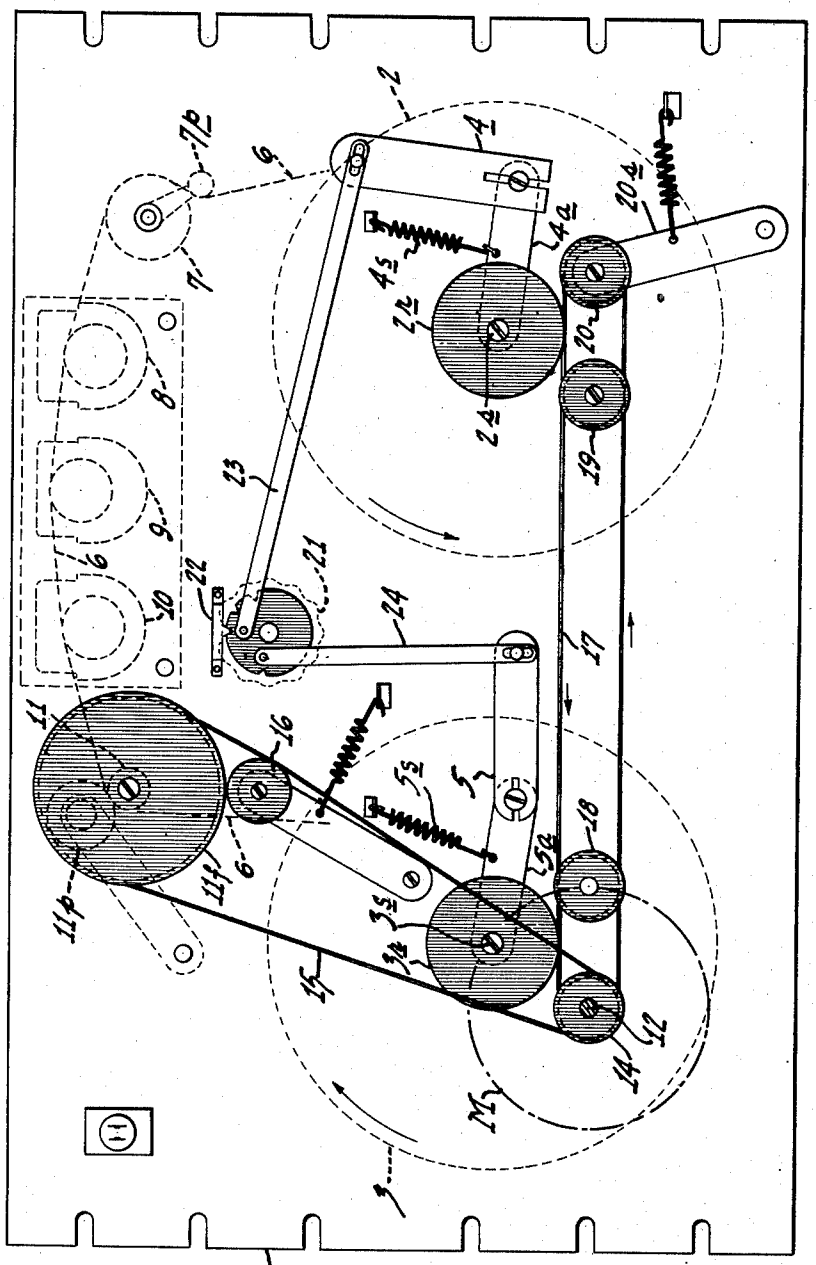


Fig. 2.

INVENTOR
EARL E. MASTERSON
BY Morris A. Pahai
ATTORNEY

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Fig. 4.

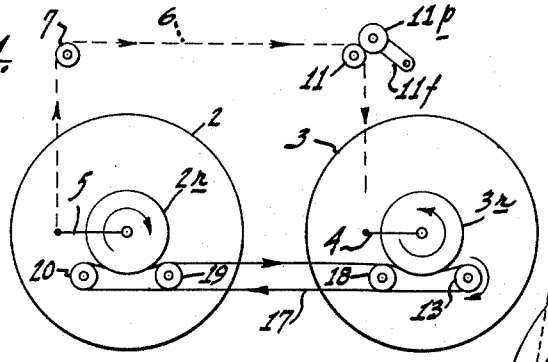


Fig. 7.

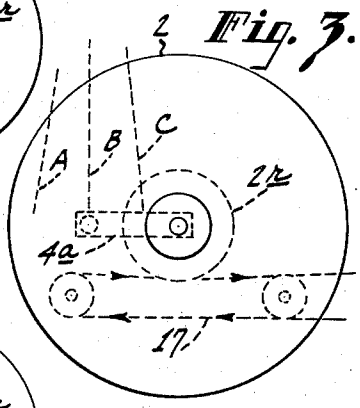


Fig. 5.

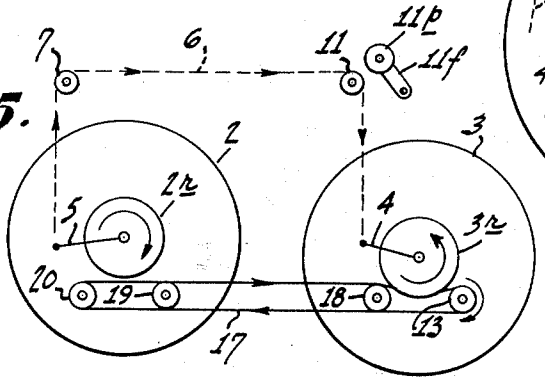
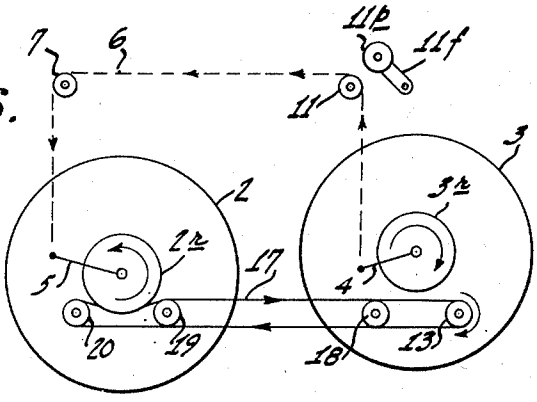


Fig. 6.



INVENTOR
EARL E. MASTERSON
BY Morrish & Rabin
ATTORNEY

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REELING SYSTEM FOR REELABLE MAGNETIC RECORDS

Earl E. Masterson, Palmyra, N. J., assignor to Radio Corporation of America, a corporation of Delaware

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3 Claims. (Cl. 242—55)

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This invention relates to improvements in reeling systems for reelable magnetic records.

It is an object of the present invention to provide a quiet-running reeling system and one which employs simple pulleys and no expensively machined parts.

Another object of the present invention is to provide a reeling system wherein the tape or other reelable record is maintained under constant tension during its recording and reproducing intervals and is subject to positive control during starting and stopping at both normal and high speeds.

Still another object of the invention is to provide a reeling system which may employ an inexpensive, single speed, single directional, low-speed motor, said system nevertheless being capable of high speed winding in either direction without shifting the path of the record.

The invention will be described in connection with the accompanying three sheets of drawings wherein:

Fig. 1 is a front elevational view and Fig. 2 is a rear view of a constant tension reeling system constructed in accordance with the principle of the invention.

Fig. 3 is a schematic view of the storage reel and driving assembly of Figs. 1 and 2,

Fig. 4 is a schematic view of both reels and their driving rollers and belt mechanism showing the reel-rollers in their "normal" relation with respect to the belt.

Fig. 5 is a view similar to Fig. 4 but with the reel-rollers in the position required for high-speed forward winding,

Fig. 6 is a view similar to Fig. 4 but with the reel-rollers in the position required for high-speed reverse winding.

In the accompanying drawings, wherein like reference characters designate the same or corresponding parts in all figures, 1 designates a vertically arranged motor board or panel adjacent to the front surface of which two reels 2 and 3 are mounted for independent rotation and for independent vertical movement on spindles 2*s*, 3*s*, respectively, which are supported upon the free ends or "weight arms" 4*a*, 5*a*, respectively, of two levers 4 and 5 of the first class. Each of these arms 4*a*, 5*a* extends along a line parallel to the radius of its reel and is pivoted, preferably, at a point on the said line intermediate the spindle and the perimeter of its reel. The reel spindles 2*s*, 3*s* extend behind the panel 1 and each carries a solid metal roller 2*r*, 3*r*, respectively, on its inner end. The functions of these reel-rollers are described later.

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The reel 2 at the left in Fig. 1 is a "storage" reel and contains a roll of paper or "plastic" magnetizable-tape 6 which is wrapped to be unwound when the reel 2 is turned in the clockwise direction. The tape is led over a guide roller 7 and over three magnetic applicators 8, 9 and 10 and thence over a capstan 11 to the take-up reel 3 upon which the tape is wrapped to be wound in the counter-clockwise direction, as viewed in Fig. 1. The guide roller 7 and the capstan 11 each has a gravity (or spring) actuated roller 7*p*, 11*p*, respectively, associated therewith for maintaining the tape in frictional engagement with the said roller or capstan. In the instant case the first magnetic applicator 8 comprises an erasing head, the second applicator 9 is a recording head and the third applicator 10 is a playback head. As is well known in the art, the functions of two or more of these applicators may be combined in a single "soundhead," if desired.

There is a driving motor M with a drive shaft 12 having two pulleys 13 (Fig. 1) and 14 (Fig. 2) thereon mounted behind the panel 1 beneath and slightly to one side of the roller 3*r* of the take-up reel 3. The pulley 13 uses a belt 15 to drive a flywheel 11*f* on the shaft of the capstan 11 and thus provides constant speed motion at this point in the reeling system. A spring-tensioned roller 16 serves to keep this belt 15 under tension. The other pulley 14 drives a belt 17 which serves the following purposes of (*a*) applying torque of varying intensity to the take-up reel (*b*) a hold-back action of varying intensity to the storage reel and (*c*) when required, provides the power for high-speed winding in either direction. This belt 17 runs in a horizontal direction over two idler rollers 18 and 19 and around a third roller 20 which is mounted upon a spring biased lever 20*s* to maintain the belt under tension.

The solid metal rollers 2*r*, 3*r* on the reel spindles 2*s*, 3*s*, respectively, rest on the top surface of the belt 17 with a force determined for the most part, by the weight (and hence the quantity) of the magnetic tape 6 on the reels. The weight of the reels 2 and 3 and of the reel rollers 2*r* and 3*r* on the said belt 17 may be relieved, to a certain extent, by a pair of light springs 4*s*, 5*s* anchored at their upper ends to the rear of the panel 1 and secured at their lower ends to the lever arms 4 and 5, respectively, upon which the reel spindles 2*s*, 3*s* for the reels are mounted.

As will hereinafter more fully appear (in connection with the description of Figs. 5 and 6) high speed winding in either direction, is accomplished by turning a knob 21 on the panel 1 to

bring the appropriate notch on the back of the knob into register with a detent 22 on the back of the panel 1. This knob 21 operates through two rod-like links 23 and 24 which are connected to the "power arms" 4b, 5b, respectively of the first class levers 4, 5 upon which the reels are mounted, to lift one of the reel rollers 2r, or 3r off the horizontal belt 17 while increasing the pressure of the other reel roller upon the said belt. A third link (not shown) may be connected between the knob 21 and the pinch roller 11p adjacent to the capstan 11 for moving the said roller out of contact with the tape 6 during a "fast-winding" interval. In the absence of such a third link the operator may simply swing the said pinch roller 11p on its pivot, away from the tape 6.

As previously described, and as shown in Fig. 3, the storage reel 2 and its reel-driving roller 2r are mounted on the end of the lever arm 4a and hence are free to move in a vertical plane as determined essentially, by (a) the weight (and hence the quantity) of the tape on that reel during normal-speed reeling intervals and, in part, by (b) the variable leverage exerted upon the reel through the lever 4a by the tape in leaving the reel at different points along its radius, i. e. as the effective diameter of the tape on the reel is decreased the pressure of the roller 2r on the belt 17 is decreased.

The reel-driving belt 17 is driven at a constant speed in the direction indicated by the arrows in Fig. 3, and the sliding friction between this belt and the reel-driving roller 2r provides the variable holdback counter-torque required to maintain the tape under constant tension during normal-speed reeling. If the reel is about empty, the reduced weight of the assembly will reduce the friction between the reel-driving roller 2r and the belt 17. This reduction in friction is necessary to maintain the proper tape tension when the tape is working on the small diameter of the reel, such as at C in Fig. 3. When the reel is more nearly full, as indicated at B or at A, the reel will weigh more, which increases the frictional contact with the belt 17. This again, is the required conditions since the tape is working at the large reel diameter. Since the storage and take-up reel assemblies are of duplicate construction and are similarly disposed with respect to the reel-driving belt 17 it will be apparent the same forces are at work, though in the opposite sense, upon both reels at the same time.

Fig. 4 shows the basic schematic of the path of the tape 6 between the storage reel 2 and the take-up reel 3, and of the path of the reel-driving belt 17 with respect to the reel-rollers 2r and 3r, respectively. This illustrates the normal recording or reproducing condition wherein both of the reel-rollers 2r and 3r are in free contact with the belt 17, which is moving in the direction indicated by the arrows. Here the storage reel 2 is held back by the sliding friction between the belt 17 and the reel-roller 2r and the take-up reel 3 is frictionally driven so it will wind up the tape as the capstan 11 measures it out.

Fig. 5 shows the "high-speed forward" condition in which the pinch roller 11p is thrown back so that the capstan 11 no longer controls the tape speed. Here the storage reel 2 is lifted clear of the reel-driving belt 17 and the take-up reel 3 is forced down into engagement with the said belt to provide the power necessary to wind the tape in the forward direction at high speed. The control of the position of the two reels is accomplished by the link mechanism described in connection with Figs. 1 and 2.

Fig. 6 shows the condition for "high-speed rewinding" in which the storage reel 2 is forced into contact with the reel-driving belt 17 and the take-up reel 3 is lifted off the said belt. The direction of rotation of the driving motor, and hence of the reel-driving belt 17, is the same under all conditions.

It will now be apparent that the present invention provides a simple inexpensive and trouble-free constant-tension reeling system for a reelable magnetic record.

What is claimed is:

1. Apparatus of the character described comprising, a storage reel and a take-up reel mounted for independent rotation in a vertical plane about parallel axes and for independent vertical movement in said plane, a reelable record wound to run from said storage reel to said take-up reel, a roller on the axis of each of said reels for applying torque thereto, an endless belt mounted for movement beneath said rollers and upon a common surface of which said rollers normally rest with a force substantially proportional to the weight of the reelable material on each wheel, means comprising a capstan in the path of said record between said reels for pulling said record off said storage reel, and means for driving said belt at a speed and in the direction calculated to exert a winding torque upon said take-up reel through its roller and simultaneously to exert a torque upon said storage reel counter to that applied thereto through said capstan-driven record, whereby said tape is maintained under constant tension during its passage between said reels.

2. The invention as set forth in claim 1 and wherein means are provided for lifting said take-up reel off said endless belt whereby the counter-torque applied to said storage reel by said belt operates to re-wind said record upon said storage reel.

3. The invention as set forth in claim 1 and wherein means are provided for lifting said storage reel off said endless belt whereby said belt operates to wind said record upon said take-up reel at the rate dictated by the speed of said belt.

EARL E. MASTERSON.

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