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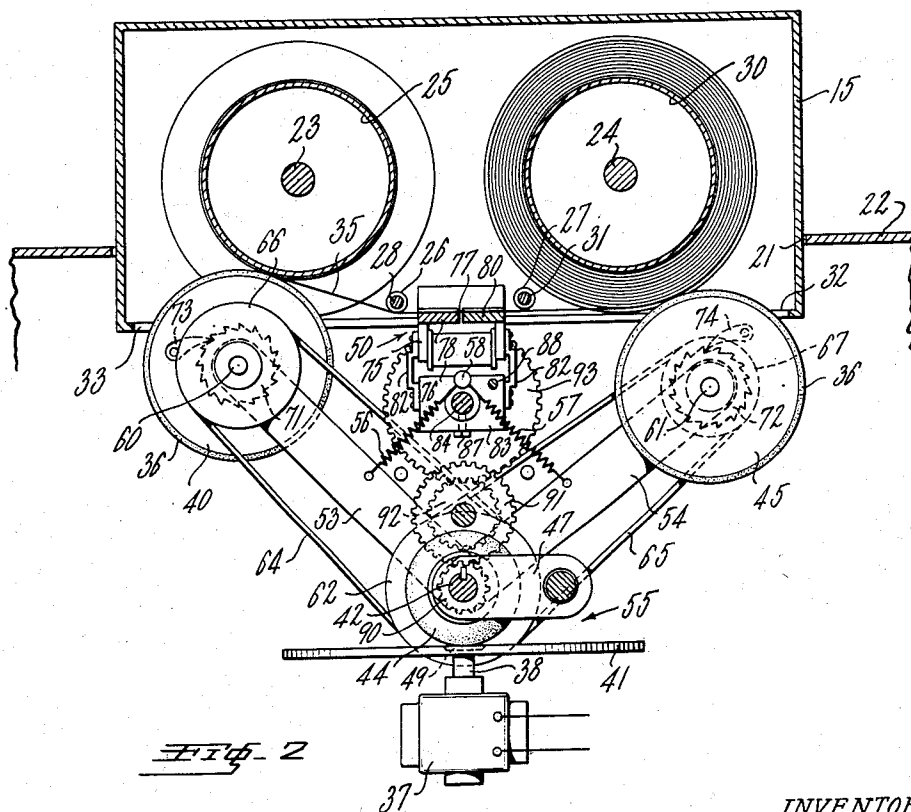
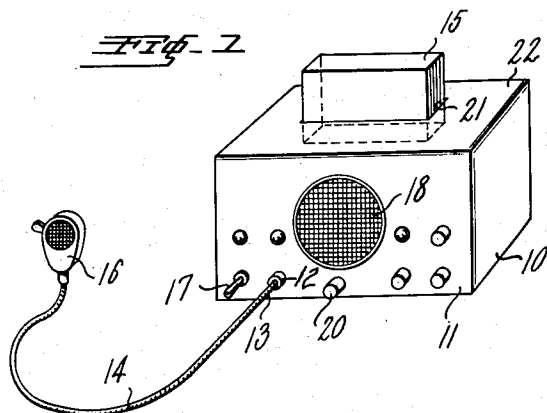
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2,441,679

MAGNETIC RECORDING APPARATUS

Filed May 28, 1945

2 Sheets-Sheet 1



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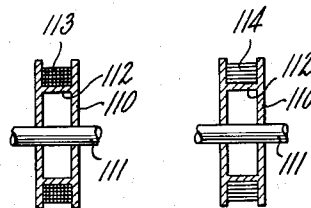
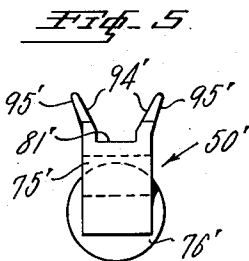
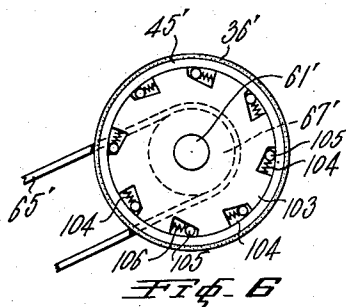
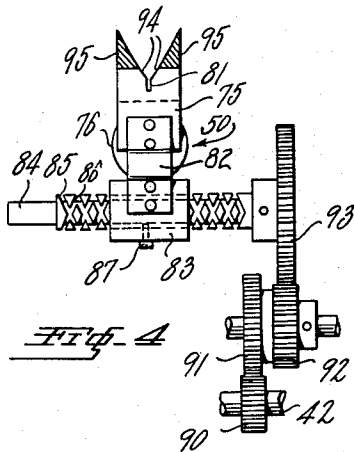
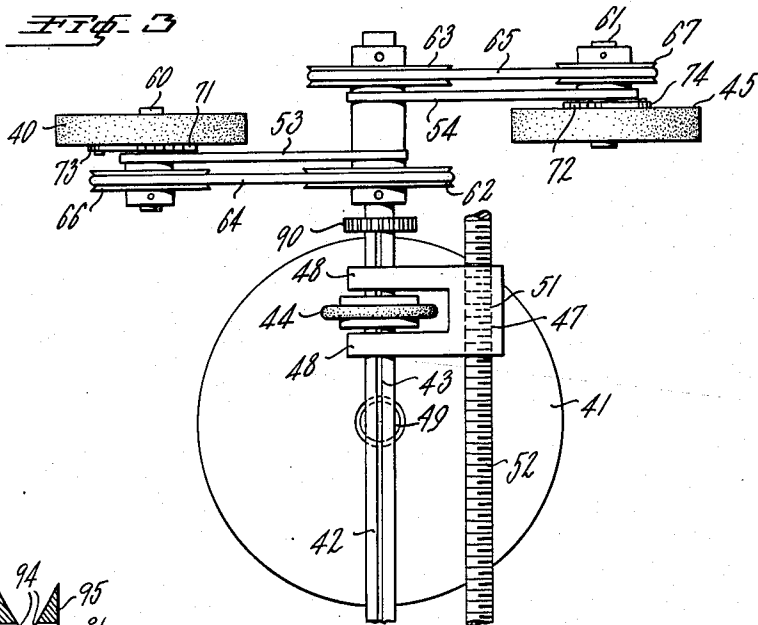
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MAGNETIC RECORDING APPARATUS

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2 Sheets-Sheet 2



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MAGNETIC RECORDING APPARATUS

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Application May 28, 1945, Serial No. 596,296

6 Claims. (Cl. 179—100.2)

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This invention relates to magnetic recording apparatus and more particularly to such recording apparatus of the magazine type in which magazines containing a supply of recording medium are interchangeably cooperative with sound translating units.

It is among the objects of the present invention to provide a simple, inexpensive magazine type recording apparatus; to provide a magazine type recording apparatus in which simple means are included for insuring uniform speed of the recording medium relative to a magnetic translating head; to provide a magazine type magnetic recording apparatus including a sound translating unit containing sound translating means and "one-way" driving means frictionally cooperable with storage elements of a magazine containing the magnetic recording medium; to provide such an apparatus including means for maintaining the recording medium taut at all times; to provide a magnetic recording apparatus including a novel magazine containing a magnetic recording medium and means for traversing the same with respect to a magnetic translating head, which are quickly and easily engaged with driving means and a magnetic translating head in a sound translating unit; and, in general, to provide an improved magnetic recording apparatus of the magazine type.

These and other objects, advantages and novel features of the invention will be apparent from the following description and the accompanying drawings. In the drawings:

Fig. 1 is a perspective view of a magnetic recording apparatus embodying the invention.

Fig. 2 is a longitudinal sectional view through a portion of the apparatus shown in Fig. 1.

Fig. 3 is a plan view of driving mechanism for the apparatus of Figs. 1 and 2.

Fig. 4 is a view showing spooling mechanism for a recording head forming part of the apparatus.

Fig. 5 is an end elevational view of one type of a modified form of recording head for use with the invention.

Fig. 6 is an elevation view illustrating an alternative form of a "one-way" drive.

Figs. 7 and 8 are transverse views through reels which may be used with the invention.

Generally speaking, the present invention comprises a magazine containing a pair of reels for drawing a linear magnetic recording medium, such as a tape or wire of magnetic material, through a magnetic translating head. The magazine is interchangeably cooperative with a

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sound translating unit containing electronic sound translating means, a magnetic translating head, and driving elements adapted to frictionally engage the recording medium coiled on the magazine reels to drive the medium relative to the magnetic translating head. A common driving mechanism is provided for the translating unit driving means whereby such driving means are operated in unison as shown and described in the copending application of Richard A. Marsen for Magnetic recording system, Ser. No. 585,545, filed March 29, 1945. The present invention is in the nature of an improvement on said application. Each driving means herein is connectible to the driving mechanism through the medium of "one-way" driving arrangements, such as pawls and ratchets or one-way clutches, to insure the recording medium being maintained in a taut condition at all times.

The sound translating unit is provided with a recess in its upper surface adapted to receive the magazine which is inserted through such recess into driving engagement with the driving means in the translating unit. Preferably, such driving means are so disposed that they automatically tension the wire in the magazine when the latter is engaged with the sound translating unit. The magnetic translating head is reciprocated in a directional parallel to the axis of the reels for layer winding the recording medium on to and off of the reels. The head is so formed as to engage the wire in substantially any position thereof with respect to the width of the reels to guide the wire or tape into proper relation with the translating head.

Referring more particularly to Fig. 1, the apparatus of the invention includes a magnetic translating unit 10 having a magazine 15 interchangeably cooperative therewith. Unit 10 is provided with a front control panel 11 having thereon suitable control elements, including a plug 12 adapted to receive a jack 13 connected by a cable 14 to a microphone 16 for recording purposes. A main control switch 17 is mounted on the panel as well as grill 18 behind which may be disposed suitable sound translating means such as a loud speaker. A knob 20 disposed beneath grill 18 controls the direction and speed of operation of the driving mechanism in the sound translating unit, for recording and reproducing or for rewinding. Magazine 15 is engageable with unit 10, as by being inserted through a recess 21 in the upper surface 22 of the unit, and suitable releasable latching means are preferably provided for stably maintaining the maga-

zine in operative relation with the unit as shown in the aforesaid application.

Referring more particularly to Figs. 2, 3 and 4, magazine 15 comprises a substantially rectangular casing having shafts 23 and 24 extending transversely thereof upon which are rotatably mounted reels 25 and 30 which interchangeably receive a linear magnetic recording medium 35, such as a magnetic wire or tape. Medium 35 is coiled onto one reel 25 or 30 as it is unwound from the other. Rollers 26, 27 are rotatably mounted on shafts 28 and 31 extending transversely of magazine 15 for maintaining medium 35 substantially parallel to the lower wall 32 of magazine 15 for effective cooperation with the magnetic translating head in unit 10. Lower wall 32 is formed with an aperture 33 which permits entry of driving means in magazine 10 into frictional engagement with medium 35 coiled on reels 25 and 30, upon engagement of magazine 15 with unit 10 by insertion of the magazine through aperture 21 in the top wall 22 of the unit generally as shown in said application.

Translating unit 10 includes friction driving rollers 40 and 45 respectively cooperable with the recording medium on reels 25 and 30. For the purpose of frictionally driving the recording medium with respect to a magnetic translating head 50 in unit 10, rollers 40 and 45 are provided with frictional driving surfaces 36 of rubber or other suitable material. Due to the direct engagement of driving rollers 40 and 45 with the magnetic recording medium, the medium is drawn at a uniform rate through recording head 50 irrespective of the diameter of the coil of medium on either reel 25 or 30.

To additionally insure uniform speed of the recording medium, rollers 40 and 45 are driven from a common driving mechanism indicated generally at 55. In accordance with the invention, suitable "one-way" driving means are included between driving mechanism 55 and each of the rollers 40 and 45 to insure the medium 35 being maintained taut in its travel between reels 25 and 30. Referring more particularly to Figs. 2 and 3, driving mechanism 55 comprises a suitable constant speed electric motor 37 having its armature shaft 38 vertically disposed, with a friction drive disk 41 secured to the outer end of the armature shaft. A shaft 42 formed with a key way 43 extends transversely of unit 10 and diametrically of friction driving disk 41. Shaft 42 has a friction driving wheel 44 rotatable therewith, as by having its hub 46 provided with a key engaged in key way 43. Wheel 44 is movable axially of shaft 42 so that the speed and direction of rotation of wheel 44 are varied in accordance with the distance of wheel 44 either side of the center of disk 41.

A frusto-conical recess 49 is provided adjacent the center of disk 41 so that wheel 44 is out of contact with disk 41 in the central or neutral position. This prevents undue "idling" wear on disk 41 and wheel 44. A U-shaped bracket 47 has its arms 48, 48 straddling wheel 44 and apertured to slidably receive shaft 42. Base 51 of bracket 47 threadedly receives a threaded shaft 52 extending transversely of unit 10 and operable by the knob 20 shown in Fig. 1 to vary the disposition of wheel 44 with respect to driving disk 41 to in turn control the direction and speed of rotation of shaft 42.

A pair of arms 53 and 54 are pivotally mounted on shaft 42 and are urged in a direction toward each other by springs 56, 57 each connected to

one of the arms and to a pin 58 secured to unit 10. Rollers 40 and 45 are rotatably supported on shafts 60 and 61 in the outer ends of arms 53 and 54, respectively. A pair of grooved driving pulleys 62 and 63 are secured for rotation with shaft 42 and connected by suitable driving means such as belts 64 and 65 to pulleys 66 and 67 secured for rotation with shafts 60 and 61, respectively.

Pulleys 62 and 63 are driven at a uniform speed. However, pulley 67 is smaller in diameter than pulley 66. The reason for this is as follows. Reel 25 is a "storage" reel and 30 is a "rewind" reel. Normally, in advance of a recording or reproduction, substantially all of recording medium 35 is wound on "rewind" reel 30. During the recording or reproduction, medium 35 is unwound from reel 30 and wound onto reel 25. The rate of movement of medium 35 during such recording and reproduction is selected to obtain the best and most uniform recording and reproduction results. Generally, this speed is somewhat slower than the maximum speed to which medium 35 can be subjected. After a recording or reproduction has been finished, the medium is rewound on reel 30. Such rewinding operation may take place at a much greater rate of speed of medium 35 than its speed during recording or reproduction. Due to the smaller diameter of pulley 67, this pulley and consequently driving roller 45, are rotated at a higher rate of speed than are pulley 66 and driving roller 40.

In order to maintain medium 35 taut between reels 25 and 30, one way driving arrangements are provided between pulleys 66, 67 and rollers 40, 45, respectively, so that only one of the rollers 40 or 45 is effectively driven at a given time. In the form of the invention shown in Figs. 2 and 3, such one way driving arrangement comprises reversely directed ratchet wheels 71 and 72 each secured for rotation with a shaft 60 or 61, respectively. Ratchets 71 and 72 are engageable by pivoted pawls 73 and 74 secured to rollers 40 and 45, respectively.

Assuming, for instance, that medium 35 is to be rewound on reel 30, in this instance driving mechanism 55 will be conditioned to rotate ratchet wheel 72 in a clockwise direction. Through engagement of pawl 74 with the teeth of ratchet wheel 72, roller 45 will be rotated in a clockwise direction and through engagement with recording medium 35 coiled on reel 30 will rotate reel 30 in the counter clockwise direction to wind medium 35 thereupon. At the same time, ratchet wheel 71 will be rotated in a clockwise direction, but pawl 73 will simply slide over the teeth of the ratchet and roller 40 will thus not be driven except by frictional engagement with wire 35 as it is withdrawn from wheel 35.

During a recording and reproducing operation, ratchet wheels 71 and 72 are rotated in the counter clockwise direction of mechanism 75, and in this instance roller 40 is driven and roller 45 is not driven. It should be noted that rollers 40 and 45 are disposed outside perpendiculars through shafts 23 and 24. Therefore, when magazine 15 is engaged with unit 10, the frictional engagement of rollers 40 and 45 with recording medium 35 will tend to spread the rollers further apart resulting in a tensioning of wire 35 for suitable cooperation with recording head 50.

Recording head 50 and its spooling arrangements are shown more particularly in Figs. 2 and 4. Head 50 comprises a magnetic member 75 having its base extending through magnetizing

coil 76 and its adjacent inner ends slightly spaced to form gap 77 in the magnetic circuit. The upper arms 78 and 80 of magnetic member 75 are grooved as at 81 to guide magnetic recording medium 35 through the head. Brackets 82 of non-magnetic material support head 50 on a travelling nut 83 threaded to engage a shaft 84 having reversely directed intersecting threads 85, 86. A suitable pin 87 in head 83 engages in threads 85, 86, so that member 83 and thus translating head 50 is reciprocated axially of shaft 84 when the shaft is rotated. A rod 88 slidably engages nut 83 to restrain the same against rotation with shaft 84.

A driving pinion 90 secured to shaft 42 meshes with a spur gear 91 rotatable with a pinion 92 engaging a spur gear 93 secured to shaft 84. Shaft 84 is thus driven at a reduced rate of speed relative to shaft 42. Accordingly, head 50 is reciprocated transversely of unit 10 at a reduced rate relative to the rotation of rollers 40 and 45 to layer wind recording medium 35 on to and off of reels 25 and 30.

Guide means are provided on head 50 for engaging magnetic wire 35 in any position thereof axially of reels 25 and 30. For this purpose, arms 78 and 80 of magnetic member 75 are flared outwardly as at 94 from groove 81. The flared groove is continued by non-magnetic members 95, 95 secured to the upper surfaces of arms 79, 80 in any suitable manner as by brazing, soldering, etc. Non-magnetic members 95 are substantially triangular or trapezoidal in cross-section to provide a wide entrance into groove 81 so that wire 35 may be accurately guided therein.

The operation of the embodiment of the invention thus far described is as follows. Magazine 15 is inserted into recess 21 whereupon rollers 40, 45 engage recording medium 35 and tension the same. Motor 37 is then energized to rotate driving disk 41. Depending upon the relative position of driving roller 44 with respect to disk 41, which position is adjustable by actuation of knob 20 to rotate shaft 52, ratchet wheel 71 or 72 will be driven in the proper direction to insure movement of wire 35 in the desired direction. When a recording or reproducing operation has been completed, knob 20 is adjusted to rewind wire 35 on reel 30 after which magazine 15 is disengaged from aperture 21 and stored or otherwise disposed of.

Fig. 5 illustrates a modified form of magnetic translating head 50' in which groove 81' is made relatively wide so that the head may be used with a tape of magnetic material. Otherwise, the construction of the head and its function is the same as that previously described.

Fig. 6 illustrates an alternative form of one way drive which may be used with the embodiment of the invention shown in Figs. 2, 3 and 4. In this arrangement, belt 65' drives a pulley 67' secured to shaft 61'. Shaft 61' has thereon a disk member 103 provided with trapezoidal recesses 104 at spaced points around its periphery. Each recess 104 contains a roller 105 biased by a spring 106 toward the shallow end of recess 104. A driving roller 45' having a rim 36' of suitable friction material such as rubber, is rotatable on the outer periphery of disk 103. When disk 103 is rotated in a clockwise direction, rollers 105 move to the shallower portions of recesses 104 to establish frictional engagement between the disk and roller 45', thus driving the roller. Upon rotation of disk 103 in the opposite direction, rollers 105 move to the deeper portions of recesses

104 and driving force is not imparted to roller 45'.

Figs. 7 and 8 are transverse sections through reels illustrating how the invention may be used either with wire or with tape. Referring to Fig. 7, a reel 110 is illustrated as mounted on a shaft 111 and provided with a channelled periphery 112 for receiving coiled magnetic wire 113. In Fig. 8, reel 110 has a magnetic tape 114 coiled about its channelled periphery 112.

The invention provides a simple, inexpensive magazine type recording apparatus in which a uniform rate of movement and tautness of the magnetic recording medium is provided at all times irrespective of the diameter of the coiled medium on either reel. The one way driving mechanisms incorporated with the driving rollers 40 and 45 assure magnetic recording medium 35 being maintained taut at all times, as only one of the rollers is operated in any given direction of movement of medium 35 with respect to head 50. The invention is equally applicable for use with both wire and tape recording mediums, and the magnetic translating head is provided with means for accurately guiding the recording medium into operative relation with the head.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles thereof, it will be understood that the invention may be otherwise embodied, without departing from such principles.

What is claimed is:

1. A magnetic sound translating unit adapted to detachably receive a magazine containing a linear magnetic recording medium coiled on spaced reels, comprising a casing having an aperture in a wall thereof adapted to receive the magazine; a shaft extending transversely of said casing substantially centrally of the aperture; a pair of arms pivoted on said shaft; a friction roller mounted in the outer end of each arm, said rollers frictionally peripherally engaging the recording medium coiled on the reels when the magazine is engaged in the aperture; resilient means urging said arms toward said aperture for maintaining uniform engagement of said rollers against the medium on the reels; a pair of driving pulleys rotatable with said shaft; driving means, each including a unidirectional clutch device, connecting each of said pulleys to one of said rollers; a friction driving disk having its axis perpendicular to and intersecting the axis of said shaft; a motor for rotating said disk; a driving roller frictionally engaging said disk and rotatable with said shaft while movable longitudinally thereof; and means for adjusting the position of said driving roller diametrically of said disk to select the speed and direction of rotation of said pulleys.

2. A magnetic sound translating unit adapted to cooperatively receive a magazine containing a linear magnetic recording medium coiled on spaced reels, comprising a casing having an aperture in a wall thereof adapted to receive the magazine; a shaft extending transversely of said casing substantially centrally of the aperture; a pair of arms pivoted on said shaft; a friction roller mounted in the outer end of each arm, said rollers frictionally peripherally engaging the recording medium coiled on the reels when the magazine is engaged in the aperture; resilient means urging said arms toward said aperture for maintaining uniform engagement of said rollers against the medium on the reels; a pair of driv-

ing pulleys rotatable with said shaft; driving means, each including a unidirectional clutch device, connecting each of said pulleys to one of said rollers; a friction driving disk having its axis perpendicular to and intersecting the axis of said shaft; a motor for rotating said disk; a driving roller frictionally engaging said disk and rotatable with said shaft while movable longitudinally thereof; means for adjusting the position of said driving roller diametrically of said disk to select the speed and direction of rotation of said pulleys to motivate the medium in reverse longitudinal directions at a constantly uniform rate irrespective of the diameter of the coils of medium on the reels; a magnetic translating head intermediate said rollers adapted to cooperatively engage the recording medium when the magazine is engaged in the aperture; and spooling mechanism operable at a reduced rate by said shaft to reciprocate said head axially of the reels to layer wind the medium onto and off of the reels.

3. Magnetic sound translating apparatus for use with a linear magnetic recording medium coiled on a pair of spaced reels comprising, a pair of rollers corresponding to said pair of reels, each one of said rollers being adapted to peripherally engage the recording medium coiled on the corresponding one of said reels, resilient means for maintaining each of the rollers in contact with the medium on the corresponding one of the reels, a first one-way drive mechanism associated with one of said pair of rollers, a second one-way drive mechanism associated with the other of said pair of rollers, said first and second one-way drive mechanisms being oriented whereby one roller may be driven clockwise and the other roller may be driven counterclockwise, reversible motive means, and a pair of driving means one each of which extends respectively from said motive means to each of said first and second one-way drive mechanisms.

4. Magnetic sound translating apparatus for use with a linear magnetic recording medium coiled on a pair of spaced reels comprising, a pair of rollers corresponding to said pair of reels, each one of said rollers being adapted to peripherally engage the recording medium coiled on the corresponding one of said reels, a pair of arms, one each of which pivotally supports each one of said rollers, the axes of said rollers being spaced apart farther than the axes of said reels, said arms being pivotally mounted on the side of said roller axes opposite to said reel axes, resilient means for maintaining each of the rollers in contact with the medium on the corresponding one of said rollers, a first one-way drive mechanism axially associated with one of said pair of rollers, a second one-way drive mechanism axially associated with the other of said pair of rollers, said first and second one-way drive mechanisms being oriented whereby one roller may be driven clockwise and the other may be driven counterclockwise, reversible motive means, and a pair of driving means one each of which extends respectively from said motive means to each of said first and second one-way drive mechanisms.

5. A magnetic sound translating unit adapted to cooperatively receive a magazine containing a linear magnetic recording medium coiled on spaced reels comprising, a casing having an aper-

ture in a wall thereof adapted to receive the magazine; a shaft extending transversely of said casing substantially centrally of the aperture; a pair of arms pivoted on said shaft; a friction roller mounted in the outer end of each of said arms, said rollers frictionally peripherally engaging the recording medium coiled on the reels when the magazine is engaged in the aperture; resilient means urging said arms toward said aperture for maintaining uniform engagement of said rollers against the medium on the reels; a first one-way drive mechanism associated with one of said pair of rollers; a second one-way drive mechanism associated with the other of said pair of rollers; said first and second one-way drive mechanisms being oriented whereby one roller may be driven clockwise and the other roller may be driven counterclockwise; reversible motive means; and a pair of driving means one each of which extends respectively from said motive means to each of said first and second one-way drive mechanisms.

6. A magnetic sound translating unit adapted to cooperatively receive a magazine containing a linear magnetic recording medium coiled on spaced reels comprising, a casing having an aperture in a wall thereof adapted to receive the magazine; a shaft extending transversely of said casing substantially centrally of the aperture; a pair of arms pivoted on said shaft; a friction roller mounted in the outer end of each arm, said rollers frictionally peripherally engaging the recording medium coiled on the reels when the magazine is engaged in the aperture, the axes of said rollers being spaced apart farther than the axes of said reels, said shaft being mounted on the side of said roller axes opposite to said reel axes; resilient means urging said arms toward said aperture for maintaining uniform engagement of said rollers against the reels; a first one-way drive mechanism axially associated with one of said pair of rollers; a second one-way drive mechanism axially associated with the other of said pair of rollers; said first and second one-way drive mechanisms being oriented whereby one roller may be driven clockwise and the other roller may be driven counterclockwise; reversible motive means; and a pair of driving means one each of which extends respectively from said motive means to said first and second one-way drive mechanisms.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,665,784	Hornauer	Apr. 10, 1928
1,863,066	Owens	June 14, 1932
1,933,807	Hopkins	Nov. 7, 1933
1,997,692	Laudenbach	Apr. 16, 1935
2,248,790	Stapelfeldt	July 8, 1941

FOREIGN PATENTS

Number	Country	Date
633,160	Germany	July 21, 1936
683,462	Germany	Oct. 19, 1939
698,262	France	Jan. 29, 1931