Oct. 31, 1950 W. G. KNAPP 2,528,061

DRIVE MECHANISM FOR WIRE RECORDERS

Filed Nov. 28, 1945 4 Sheets-Sheet 1

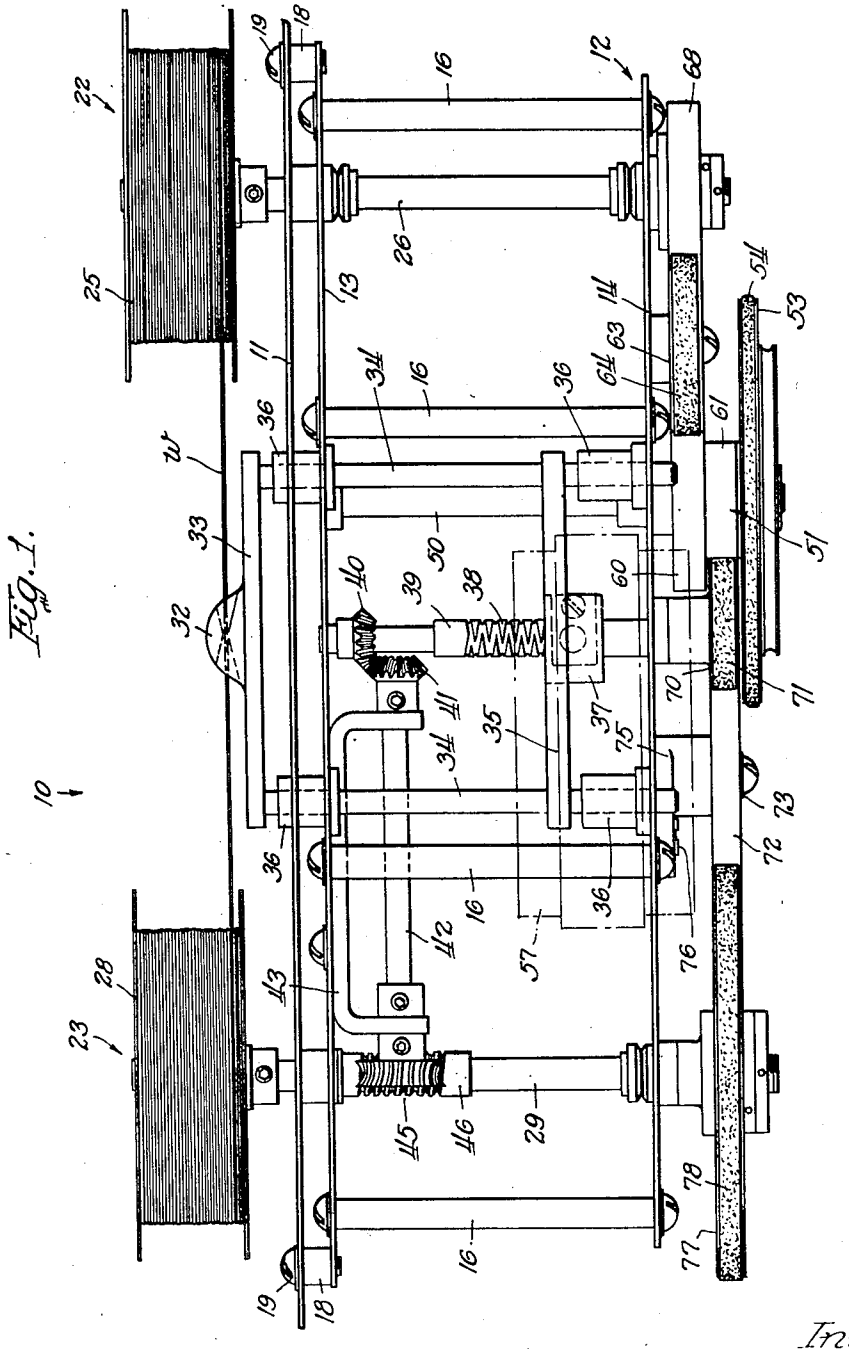

Fig. 1.

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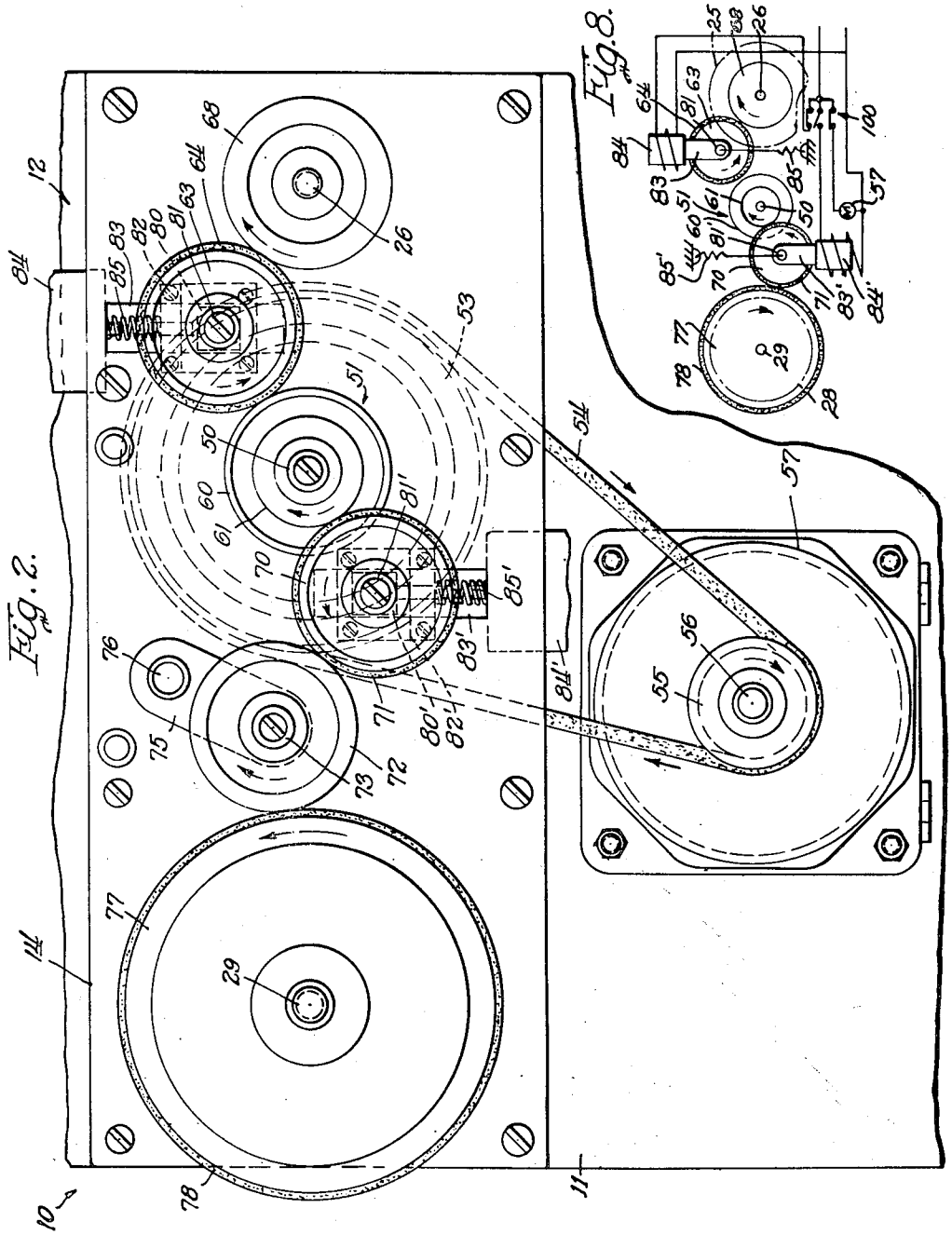

Fig. 2.

Fig. 8.

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DRIVE MECHANISM FOR WIRE RECORDERS

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Fig. 3.

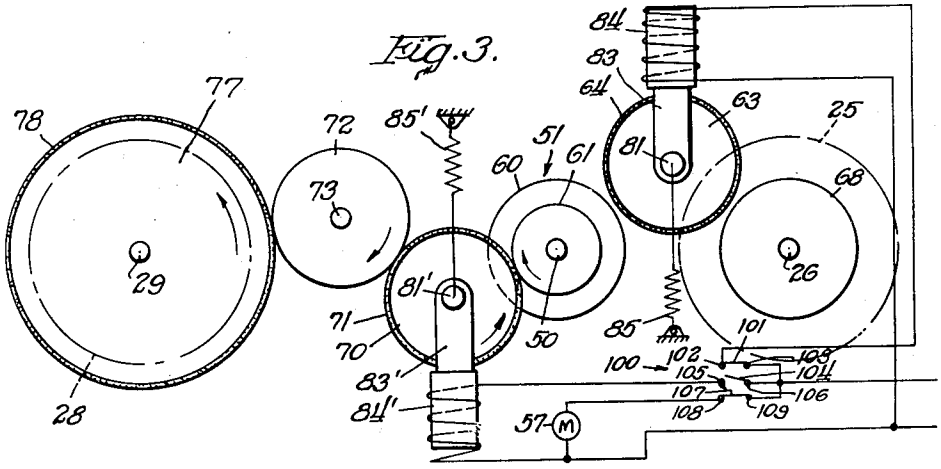


Fig. 4.

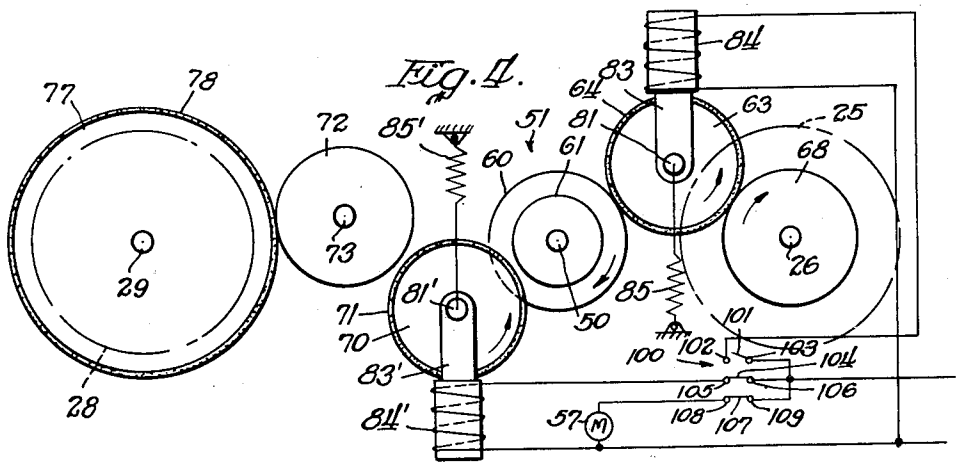
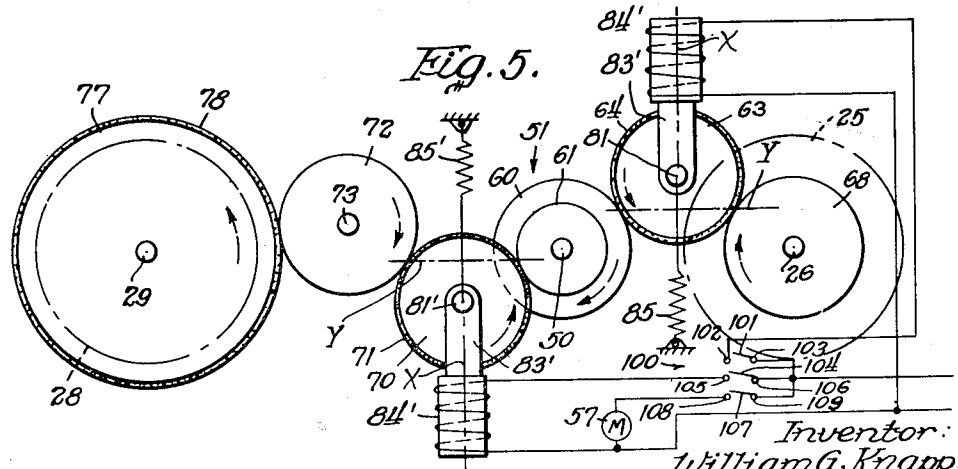


Fig. 5.



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DRIVE MECHANISM FOR WIRE RECORDERS

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Fig. 6.

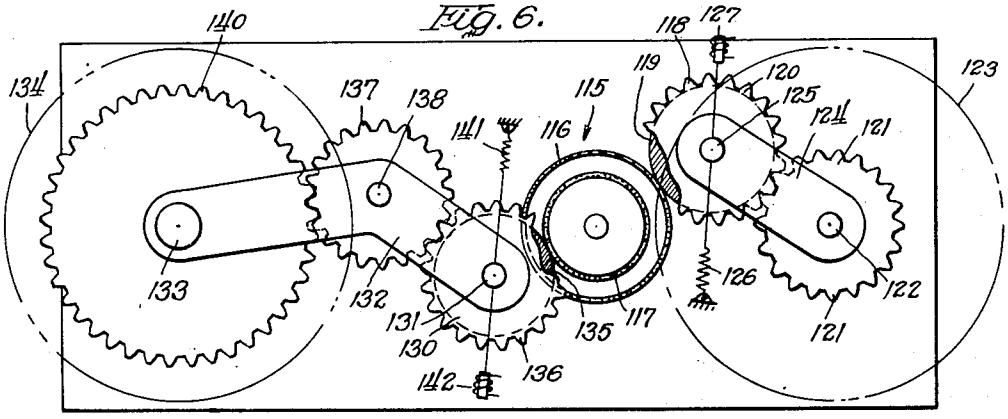
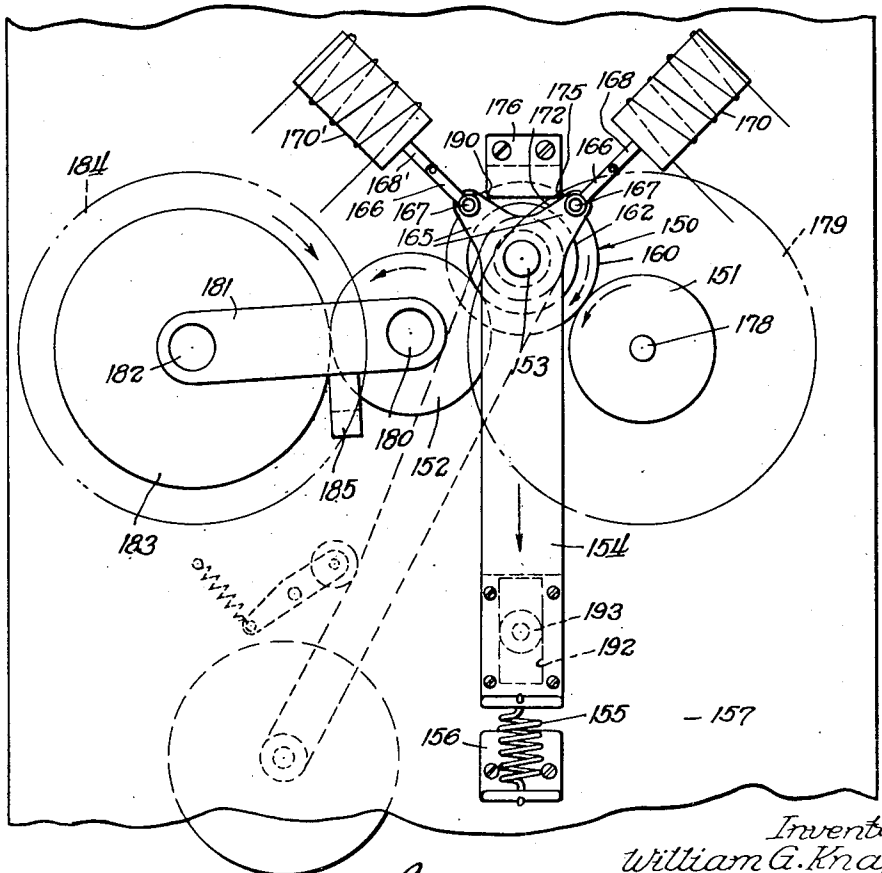


Fig. 7.



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Patented Oct. 31, 1950 2,528,061

UNITED STATES PATENT OFFICE

2,528,061

DRIVE MECHANISM FOR WIRE RECORDERS

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Application November 28, 1945, Serial No. 631,392

13 Claims. (Cl. 242—54)

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The present invention relates to improvements in wire recorders and more particularly to drive mechanisms therefor for selectively driving the supply or take-up reels to cause wire to travel from one to the other of the reels.

It is an object of my invention to provide a wire recorder having a drive mechanism of the friction type in which substantially positive traction is provided in driving either the supply or take-up reels to eliminate the disadvantages of slippage in the friction drive.

A further object is to provide a wire recorder having a drive mechanism of the friction type providing for maintaining the wire taut between the reels upon stopping of the driven reel or in reversing the direction of travel of wire between the reels without the use of brakes, friction retarding devices or other like devices.

A still further object is to provide a drive mechanism of the friction type providing substantially positive driving connection for either the supply or take-up reels whereby the rate of speed of travel of the wire between the reels may be maintained substantially uniform except for slight variation due to varying diameter of wire on the reels so that the speed of travel of the wire for recording purposes may be considerably reduced and thus effect a recording of sound on less wire than formerly required for that purpose.

In order to accomplish the aforesaid objects I propose to provide a wire recorder having a friction drive mechanism which comprises a drive wheel driven by any suitable power source such as an electric motor. In the embodiment of the drive mechanism in a wire recorder having a supply reel means and a take-up reel means, I further provide a pair of driven wheels which are adapted to have frictional engagement with the drive wheel to be driven thereby and in which the driven wheels are associated one each with the supply and take-up reel means for effecting rotation thereof. One of the primary structural aspects of my invention which distinguishes it from the prior art devices lies in the arrangement of the drive and driven wheels together with the supply and take-up reels so that when engaged there is substantially no slippage therebetween to provide substantially positive drive of the wire in either direction between the reels. This is accomplished in one embodiment of my invention hereinafter disclosed by providing means for biasing the driven wheels and drive wheel into frictional engagement together with means for mounting the drive and driven wheels so that the action of rotation of the drive wheel when frictionally engaged with either of the driven wheels is in the same direction as the action of the means biasing the wheels together, which is effective to prevent any substantial amount of slippage in the friction drive mechanism. Thus my arrangement differs from the

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arrangements of the prior art in that the action of rotation of the drive wheel is in the same direction as the action of the biasing means pressing the driven wheels into contact therewith. This is achieved by the simple expedient of providing a mounting arrangement between the drive and driven wheels in which a pair of fixed reaction points are provided for the action of the biasing means for effecting frictional engagement between the drive and driven wheels, with the action of rotation of the drive wheel serving to tend to wedge either the drive wheel into engagement with either of the driven wheels, or vice versa, between the fixed reaction points which for all practical purposes substantially eliminates slippage in the drive. In the arrangements of the prior art the action of drive wheel actually tends to throw or urge at least one of the driven wheels away from it thus reducing the pressure therebetween to an amount less than the force exerted by the biasing means forcing the wheels into engagement. In such an arrangement substantial slippage between the drive and at least one of the driven wheels will occur with the resultant above noted disadvantages. In one preferred form of my invention a separate means is provided for normally biasing each of the driven wheels into frictional engagement with the drive wheel with further means being provided to selectively render inoperative either of the biasing means to effect travel of the wire in the desired direction between the reels. In this form of my invention I propose to provide spring means for biasing the driven wheels into engagement with the drive wheel, and electromagnetic means for selectively rendering either of the spring biasing means inoperative to achieve the desired direction of movement of the wire between the reels. The electromagnets and electric motor for driving the drive wheel are arranged in circuit having switch means so that when the electric motor is deenergized both electromagnets are deenergized permitting the biasing springs to come into play and engage both driven wheels with the drive wheel. The end rotative movement of the drive wheel before it is brought to a stop is effective to provide a limited amount of drive to both supply and take-up reels which draws the wire taut therebetween. It will be understood that while I have shown and described electromagnetic means for effecting selective driving of either the supply or take-up reels that suitable mechanical means comprising cams or the like operating in connection with a switch controlling the electric motor for driving the drive wheel may be utilized for the selective engagement of either or both of the driven wheels with the drive wheel.

The above disclosed arrangement of the drive and driven wheels for the selective engagement of either one or both of the driven wheels with

the drive wheel may be accomplished by providing for relative movement of the driven wheels with respect to the drive wheel, or vice versa. Also, many variations of drive means either friction or gear type beyond the pair of driven wheels and their relation with the drive wheel may be resorted to. For example, if it is desired to provide a wire recorder in which the supply and take-up reels are to be driven about their axes in opposite directions as when the wire between the reels travels in a straight line from one to the other, one of the driven wheels may be connected to the shaft carrying one of the reels with the other driven wheel being adapted to have frictional engagement with a wheel fixed to the shaft of the other reel. In this arrangement it is preferable to provide means for mounting the drive wheel for the selective engagement thereof with either one or both of the driven wheels for purposes already above noted. This same direction of drive may also be achieved by providing an arrangement wherein one of the driven wheels is adapted to have frictional engagement with a wheel fixed to the shaft carrying one of the reels with the other driven wheel being adapted to have frictional engagement with an intermediate driven wheel which in turn has frictional engagement with a wheel fixed to the shaft carrying the other reel, and in which arrangement both driven wheels are movable into and out of engagement with the drive wheel. It will be understood that many variations may be made, as for example, in a wire recorder of the type in which the wire in passing through the recording head travels in a direction opposite the normal direction of movement of the wire from one reel to the other reel. In the latter an appropriate arrangement of friction wheels may be made so that the take-up and supply reels are each selectively driven in the same direction to effect travel of wire from one to the other.

Further objects and advantages of my invention will appear from the detail description.

Now in order to acquaint those skilled in the art with the manner of constructing and utilizing devices in accordance with my invention, I shall describe in connection with the accompanying drawings certain preferred embodiments of my invention.

In the drawings:

Figure 1 is a plan view of a wire recorder constructed in accordance with my invention with certain parts being omitted for purposes of clearness;

Figure 2 is a rear elevational view of the wire recorder of Figure 1;

Figure 3 is a diagrammatic view of the drive mechanism of the recorder shown in Figures 1 and 2 illustrating the position of the parts in effecting travel of wire from the supply reel shown at the right hand side of the drawing to the take-up reel shown at the left hand side of the drawing;

Figure 4 is a view similar to Figure 3 showing the position of the parts of the drive mechanism of the recorder of Figures 1 and 2 in which the wire is travelling from the take-up reel to the supply reel;

Figure 5 is a view similar to Figures 3 and 4 showing the positions of the several parts of the friction drive embodied in Figures 1 and 2 when the wire between the reels is stationary;

Figure 6 is a diagrammatic view showing a modified form of drive mechanism constructed in accordance with my invention;

Figure 7 is a diagrammatic view of still another embodiment of a drive mechanism constructed in accordance with my invention in which the drive wheel is movable relative to a pair of stationary driven wheels; and

Figure 8 is a diagrammatic view of another modified form of drive mechanism embodying my invention and similar in most respects to that of Figures 1 through 5.

Referring now to Figures 1 and 2, I have shown a wire recorder 10 comprising a vertically extending front panel or wall 11 to which a drive assembly supporting frame 12 comprising a pair of vertical panels 13 and 14 which are maintained in spaced relation by a plurality of spacing sleeves 16 secured between the panels 13 and 14 by screws, as shown, is secured. The drive supporting frame 12 is supported in spaced relation rearwardly of the front wall 11 by a plurality of screws extending through spacing sleeves or collars 18 disposed between adjacent faces of the panels 12 and 13 with the screws 19 having threaded engagement with panel 13. In the form of wire recorder disclosed in this embodiment of my invention I provide a wire supply reel means 22 and a take-up supply reel means 23. The supply reel means 22 comprises a reel 25 adapted to be removably associated and fixed for rotation with a shaft 26 mounted in the panels 13 and 14 for rotation about a fixed horizontal axis. The take-up reel means 23 also comprises a reel 28 which is adapted to be removably mounted upon and rotatable with a shaft 29 which shaft 29 is also suitably supported for rotation about a fixed horizontal axis in the panel members 13 and 14. A magnetic recording head 32 of known construction is carried by a plate or panel 33 the opposite side edges of which have one end of each of a pair of guide rods 34 suitably secured thereto with the guide rods adjacent their opposite ends being secured to a reciprocating plate member 35. Suitable guide bearing sleeve members 36 are carried by the panels 13 and 14 with each pair of guide sleeves 36 for each of the slide rods 34 providing for guiding the horizontal movement of the latter. The reciprocating plate member 35 carries a nut 37 substantially centrally thereof which is adapted to have threading engagement with the double screw threads 38 formed in a shaft 39 the opposite ends of which are suitably journaled in panels 13 and 14 so that upon rotation of the shaft 39 the reciprocating mechanism comprising the reciprocating plate 35, the pair of guide shafts 34 and the panel 33 effect reciprocation of the magnetic head 32 axially of the reels to effect the guiding of wire from the supply reel 25 to the take-up reel 28 or vice versa. The shaft 39 adjacent its forward end has a bevel gear 40 suitably secured thereto which has meshing engagement with a bevel gear 41 fixed to a shaft 42 which shaft 42, adjacent its opposite ends is supported in a substantially U-shaped bracket 43 suitably fixed to the rear face of wall 13. The shaft member 42 at its other end has a worm gear 45 secured thereto which is adapted to have meshing engagement with a worm member 46 fixed to the shaft 29 of the take-up reel means 23. Thus upon rotation of the take-up means 23 the worm member 46 fixed to the shaft 29 drives the worm gear 45 so that the bevel gear 41 carried by the shaft 42 effects rotation of the bevel gear 40 and the shaft 39, and which through the threads 38 and nut 37 is effective to move the magnetic head 32 for guiding the wire W from the supply

reel to the take-up reel or vice versa. The general arrangement of the parts of a wire recorder thus far described are old in the art and form no part of my present invention and may vary widely in the application of my invention thereto.

The friction drive means of my invention for selectively driving either the supplying reel shaft 26 or the take-up reel shaft 29 comprises a jack or drive shaft 50 suitably mounted for rotation in the vertical panels 13 and 14, and which jack shaft at its end disposed rearwardly of the panel 14 has a drive wheel means 51 suitably secured thereto. The outer rearward end of the jack or drive shaft 50 has a pulley wheel 53 secured thereto and about which and a drive pulley 55 fixed to the armature shaft 56 of an electric motor 57 a friction belt 54 is trained. The drive wheel 51 comprises a pair of cylindrical friction contact surfaces 60 and 61 of different diameter with the surface 60 being adapted to have driving engagement with a driven wheel 63 through the ring of friction material 64 secured to the latter and which driven wheel 63 is mounted for rotation about a horizontal axis on a shaft 81 carried in a bearing block 80. The supply reel shaft 26 has a friction wheel 68 suitably secured to the rear end thereof which is adapted to have driving engagement with the driven wheel 63 through the ring of friction material 64. The friction contact surface 61 of the drive wheel 51 is also adapted to have driving engagement with a second driven wheel 70 which is provided with an annular ring of suitable friction material 71, and which second driven wheel is adapted to have driving engagement with an intermediate driven wheel 72 mounted for rotation about a horizontal axis on a shaft 73. The shaft 73 for the intermediate driven wheel 72 is suitably supported in the enlarged lower end of a supporting lever 75 which is pivotally mounted at its opposite end on the rear panel 14 at 76. The intermediate driven wheel 72 is adapted to have driving engagement with a wheel 77 fixed adjacent the outer end of the take-up shaft 29 for rotation therewith and in which the wheel 77 is provided with a ring 78 of friction material for engaging the cylindrical contact surface of the intermediate driven wheel 72. As shown more clearly in Figure 2, the bearing block member 80 carrying the shaft 81 for rotatably supporting the first driven wheel 63 is adapted to have vertical rectilinear movement together with a supporting frame 82 fixed to an armature 83 of a stationary electromagnet 84. A coil spring 85 is arranged between one end of the electromagnet 84 with the other end of the spring 85 bearing against the supporting frame 82 so that the spring 85 normally biases the first driven wheel 63 into frictional engagement with the friction drive surface 60 of the drive wheel 51, and the cylindrical contact surface of the wheel 68 fixed to the supply reel shaft 26. The electromagnet 84 is of known construction and comprises a suitable energizing coil which, when energized, is effective to draw the armature 83 vertically upwardly against the force of spring 85, and in this manner disengage the first driven wheel from the drive wheel 51 and supply reel shaft wheel 68. The mounting of the second driven wheel 70 is accomplished with the same arrangement of parts as the first driven wheel 63 and the prime reference numerals applied thereto indicate parts already described. Thus it will be observed that upon energization of the coil of the electromagnet 84' the armature 83' is drawn vertically downwardly against the force of the spring 85' to disengage the second driven wheel 70 from the cylindrical drive surface 61 of the drive wheel 51 and the intermediate driven wheel 72. When the coil of the electromagnet is deenergized the coil spring 85' is effective for positioning the second driven wheel 70 into driving engagement with the drive wheel 51 and intermediate driven wheel 72. It is to be observed that in the arrangement of the parts of a wire recorder, as shown in Figures 1 and 2, the supply and take-up reels are mounted for rotation about fixed horizontal axes, and that the axes of the driven wheels 63 and 70 are disposed on opposite sides of a horizontal plane passing through the axis of the drive wheel 51. For purposes of a clear understanding of my invention, it is assumed that the electric motor 57 is rotating the armature shaft 56 in a clockwise direction as indicated by the arrow applied to the pulley 55 fixed to the armature shaft which drives the belt 54 in the direction indicated by the arrows. The pulley 53 will thus also be driven in a clockwise direction and which being fixed to the jack or drive shaft 50 effects rotation of the drive wheel means 51 in a clockwise direction, as indicated by the arrows in Figures 3 through 5.

The direction of rotation adapted to be imparted to the several driven wheels and the shafts 26 and 29 of the supply and take-up reel means are illustrated by arrows in Figures 2 to 5, and upon reference to Figure 3 it will be observed that I have provided an electric circuit including a three-way switch 100 comprising a first switch blade 101 for closing a pair of contacts 102 and 103 for establishing a circuit with the line leads through the energizing coil of the electromagnet 84 for the first driven wheel 63. A switch blade 104 is adapted to establish a circuit by bridging of contacts 105 and 106 through the coil of the electromagnet 84' associated with the second driven wheel 70. A third switch blade 107 is arranged to have bridging contact with contacts 108 and 109 for establishing a circuit through the electric motor 57 to drive the drive pulley 55 thereof. The switch means 100 diagrammatically shown in Figures 3 to 5 is of known construction and it is believed that the circuits adapted to be controlled thereby will be readily apparent from the above description. Referring now particularly to Figure 3 it will be observed that upon closure of switch blades 101 and 107, the electric motor is energized as is the coil of the electromagnet 84 which effects drawing of the armature 83 thereof vertically upwardly against the force of the spring 85 normally tending to bias the first driven wheel 63 into engagement with the contact surface 60 of the drive wheel 51 and the friction wheel 68 fixed to supply reel shaft 26. Thus with the several blades of switch 100 in the position shown in Figure 3, it will be observed that the spring 85' biases the second driven wheel 70 into driving engagement with the cylindrical surface 61 of drive wheel 51 and with the intermediate driven wheel 72 and forcing the latter about its pivotal mounting into driving engagement with the friction wheel 77 fixed to the take-up reel shaft 29. This drive also effects operation of the worm and worm gear means above described for reciprocating the recording head 32 to guide the wire in even layers upon the take-up reel 23.

Referring now to Figure 4, it will be observed that the switch means 100 has been actuated to move the switch blade 101 to open the circuit

through contacts 102, 103 and hence the circuit through the coil of the electromagnet 84; to close the switch blade 104 to bridge the contacts 105, 106 to energize the coil of the electromagnet 84'; and with the switch blade 107 remaining closed and bridging the contacts 108, 109 so that the electric motor is in circuit. The opening of the circuit through the switch blade 101 is now effective to deenergize the coil of the electromagnet 84 for the first driven wheel so that the spring 85 biases the latter into driving engagement with the contact surface 60 of the drive wheel 51 and with the wheel 68 fixed to the supply reel shaft 26. It will further be observed that since the switch blade 104 is in closed position a circuit through the energizing coil of the electromagnet 84' is completed overcoming the force of spring 85' thereof to disengage the second driven wheel 70 from the friction contact surface 61 of the drive wheel 51 and with the intermediate driven wheel 72. The drive from the drive wheel 51 is then effective to rotate the first driven wheel 63 in a counterclockwise direction and which through its engagement with the wheel 68 fixed to the supply shaft 26 rotates the supply reel 25 in a clockwise direction to draw the wire from the take-up reel to the supply reel. It will be observed that the rotation of the supply reel 25 by the drawing of wire from the take-up reel 28 is effective to cause actuation of the mechanism for reciprocating the magnetic head 32 for guiding the wire in even layers upon the supply spool 25.

Referring now to Figure 5 I have shown the switch means 100 of my invention with the switch blades 101, 104 and 107 all in open position from which it will be observed that the coils of both electromagnets 84 and 84' are deenergized so that the springs 85 and 85' thereof urge the first and second driven wheels 63 and 70, respectively, into engagement with the drive wheel 51 and with the first driven wheel 63 also urged into engagement with the wheel 68 carried by the supply reel shaft 26 and of the second driven wheel with the intermediate driven wheel 72 having frictional driving engagement with the wheel 77 fixed to the take-up shaft 29.

As above mentioned in the arrangement of the supply and take-up reels as described of the recorder of Figures 1 and 2, it is to be observed that the first and second driven wheels 63 and 70 are arranged to either side of a horizontal plane passing through the axis of the jack or drive shaft 50 with the arrangement being such that upon frictional engagement of either of the driven wheels with the drive wheel means 51, the driven wheels are caused to be pulled in the direction in which they are normally biased by means of the springs 85 and 85'. Stated in another way the first and second driven wheels 63 and 70 when in engagement with the drive wheel 51 are in effect tended to be wedged between the drive wheel with the first driven wheel 63 having such wedging engagement with the contact surface 60 of the drive wheel means 51 and the contact surface of the wheel 68 fixed to the supply shaft 26, and with the second driven wheel having wedging engagement with the contact surface 61 of the drive wheel means 51 and the contact surface of the intermediate driven wheel 72 which is biased into engagement with the wheel 77 fixed to shaft 29. Thus as shown in Figures 3 and 4 with either of the driven wheels engaged with the drive wheel means and with the other wheel means which they are adapted to drive there is no tendency for the friction surfaces to slip relative to each other and a substantially positive drive of the wire from one reel to the other is effected so that a substantially uniform speed of travel is imparted to the wire in either direction of travel thereof upon driving of either of the supply or take-up shafts 26 and 29 through the friction wheel means above described. When the recording apparatus is to be brought to a stop as by effecting operation of the switch 100 to open the several switch blades 101, 104 and 107, it will be observed that upon deenergization of the motor and of the electromagnets that the first and second driven wheels are biased into frictional engagement with the drive wheel 51 by means of the springs 85 and 85' so that the drive wheel 51 in coming to a rest imparts a limited amount of rotation to the friction drive train above described to impart limited rotation of both the supply shaft 26 and the take-up shaft 29 in opposite directions with respect to each other which draws the wire taut between the reels. Also, if the switch means 100 is first actuated to the position shown in Figure 3 to effect recording of sound on wire and immediately upon completion of the recording the switch means 100 is actuated to effect the arrangement of the switch blades as shown in Figure 4, it will be observed that no slack can develop in the wire since either the supply shaft 26 or the take-up shaft 29 is being positively driven with the arrangement of the drive and driven wheels being such that slippage therebetween is maintained at a minimum.

In the preferred embodiment of my invention I have found that it is desirable to mount the first and second driven wheels 63 and 70 for relative rectilinear movement as indicated by the dot and dash lines shown at X in Figure 4 and with the contact surfaces of the drive wheel means 51 and of the wheel 68 fixed to the supply reel shaft 26 and of the intermediate driven wheel 72 so that lines such as the dot and dash lines Y—Y in Figure 5 drawn through the points of contact of the driven wheels 63 and 70 lie in a straight line and with which the line of the rectilinear movement of either of the driven wheels is substantially perpendicular. With this arrangement of the driven wheels at either side of a horizontal plane through the axis of the drive wheel, I have found that slippage in the drive mechanism is substantially entirely eliminated resulting in driving of the wire from one reel to the other reel without slippage in the drive mechanism and maintaining the wire taut at all times and under all conditions of operation.

It will be further observed that the shafts 50 and 26 provide a pair of fixed reaction points for the action of the biasing spring 85 and that the shafts 50 and 29 provide a second pair of fixed reaction points for the action of biasing spring 85' with the shaft 50 providing a common reaction point for each of the biasing springs 85 and 85'. With this arrangement of a pair of reaction points for the action of springs 85 and 85' it has been discovered that with the first and second driven wheels 63 and 70 arranged with respect to the drive wheel 51 as shown, that the first and second driven wheels when engaged with the drive wheel are in effect wedged into engagement with the drive wheel and with the driven wheels in engagement therewith in the direction which the driven wheels are tended to be moved by the biasing springs 85 and 85'. Thus when either of the driven wheels are in driving engage-

ment the action of rotation of the drive wheel 51 does not tend to throw the driven wheels 63 or 70 outwardly but actually draws them in the same direction as the force of the biasing springs. In this manner the force of frictional engagement of the driven wheels with the drive wheel is actually increased above that exerted by the biasing springs with the result that the first driven wheel 63 is tended to be wedged between the drive wheel means 51 and the wheel 68 fixed to shaft 26, and that the second driven wheel 70 is tended to be wedged between the drive wheel means 51 and the intermediate driven wheel 72, together with the friction wheel fixed to shaft 29. In practice the biasing springs need only be relatively light springs sufficient for positioning the driven wheels into the positions shown in Figures 3 through 5.

Also it will be understood that my invention has application to wire recorders in which the number of friction wheels in the friction drive may be fewer or greater in number with the distinguishing characteristic of any embodiment of my invention lying in the arrangement of the drive wheel and a pair of driven wheels as above described. In Figure 8, I have shown a drive mechanism for a wire recorder of the type in which the wire is adapted to travel through the recording head in a reverse direction from the general direction of travel of wire from one reel to the other reel. The construction shown in Figure 8 is identical to that already described in connection with Figures 3 through 5 except the intermediate drive wheel 72 has been eliminated and with the shaft 29 and wheel 77 being shifted so that the second driven wheel 70 is adapted to have direct frictional engagement with the wheel 77. The take-up shaft 29 is thus caused to be rotated in the same direction as the supply reel shaft 26. This arrangement except as noted operates in the same manner described in connection with Figures 3 through 5.

Referring now to Figure 6 I have shown another embodiment of my invention in which a drive wheel means 115 comprising a first cylindrical friction drive surface 116 and a second cylindrical friction drive surface 117 adapted to be driven in any suitable manner as, for example, in the manner described in connection with the embodiment of my invention in Figures 1 through 5. In this form of the invention a first driven wheel 118 is provided with a cylindrical contact surface 119 adapted to have contact with the friction surface 116 of the drive wheel means 115 and which is further provided with a gear portion 120 which is adapted to have meshing engagement with a gear 121 fixed to a shaft 122 carrying the supply reel 123. A link 124 pivoted at one end on shaft 122 carries a shaft 125 at its other end for rotatably supporting the first driven wheel 118 and a spring 126 is provided for normally biasing the first driven wheel 118 into engagement with the drive wheel means 115 with an electromagnet 127 being provided for swinging the first driven wheel means 118 out of engagement with drive wheel means 115 against the force of spring 126.

A second driven wheel means 130 is mounted for rotation on a shaft 131 carried in the end of a lever 132 which at its opposite end is pivotally mounted upon the shaft 133 which carries the take-up reel 134. The second driven wheel 130 comprises a cylindrical contact surface 135 and a gear portion 136 having meshing engagement with an intermediate gear 137 mounted for rotation about a pin or shaft 138 carried intermediate the ends of the lever 132 with the gear 137 having meshing engagement with the gear 140 fixed to the shaft 133. A suitable biasing spring 141 is also provided for normally urging the second driven wheel 130 into frictional driving engagement with the drive wheel 115 by swinging of the lever 132 about its pivotal mounting on the shaft 133. An electromagnet 142 is also provided which when energized overcomes the force of the spring 141 to disengage the friction drive between the second driven wheel 130 and the drive wheel 115. The circuit arrangement for the drive of Figure 6 is identical to that described in conjunction with Figures 3 to 5 with the distinction of this embodiment of my invention over the embodiment first described lying in the provision of the gear train between the first and second driven wheels with the gears carried by the supply and take-up shafts to provide a positive driving connection therebetween, but with the frictional engagement of the driving wheel means 115 together with the first and second driven wheels 118 and 130 being the same as that in the embodiment previously described.

In Figure 7 I have shown diagrammatically a still further embodiment of my invention in a drive mechanism for a wire recorder in which the drive wheel means 150 is shiftable relative to a first driven wheel 151 and a second driven wheel 152 to effect selective driving of either of the driven wheels 151 and 152 in accordance with the principle of operation previously described. In this embodiment of the invention the drive wheel 150 is mounted for rotation on a shaft 153 carried at the upper end of a lever 154. The lever 154 at its lower end has one end of a coil spring 155 secured thereto with the other end of the coil spring being anchored in a bracket 156 suitably secured to a panel 157 so that the drive wheel 150 is normally biased in the direction indicated by the arrow on the lever to engage the cylindrical friction drive surface 160 thereof with the cylindrical friction surface of the first driven wheel 151 and with the friction drive surface 162 thereof in driving engagement with the cylindrical friction surface of the second driven wheel 152. The lever 154 at its upper end is provided with a pair of generally laterally and upwardly extending ears 165 to each of which a link 166 is pivotally mounted at at 167. Armature shafts 168 and 168' of electromagnets 170 and 170', respectively, have pivotal connection with the other ends of the links 166. Upon energization of the coil of the electromagnet 170 the friction contact surface 160 is biased into engagement with the drive wheel 151 with the upper surface 172 of the adjacent ear 165 being cammed into engagement with the corner edge 175 of a plate member 176 secured to the panel 157.

In this embodiment of the invention the first driven wheel 151 is suitably keyed or otherwise fixed to the shaft 178 which shaft carries the supply reel 179 with the shaft 178 serving as a reaction point for the resultant biasing force of the energized electromagnet 170 and the spring 155 with the engagement of the upper edge 172 of the ear 165 with the corner 175 of the plate 176 serving as a second reaction point so that with the parts in the position described the drive wheel 150 is tended to be wedged into driving engagement with the first driven wheel 151 to prevent slippage in frictional drive therebetween. In this embodiment of the invention it is assumed that the drive wheel means 150 is adapted to be

rotated in a clockwise direction in a conventional manner as by means of an electric motor 200 and drive belt 201 whereby it will be observed that the resistance to movement of the shaft 178 and the first driven wheel 151 carried will tend to cause the drive wheel to roll off in a clockwise direction on the first driven wheel 151, which effects the wedging of the drive wheel between the stationary reaction points provided by the shaft 170 and the camming engagement of the ear 165 with the corner 175 of the plate member 176.

Now, assuming that the coil of the electromagnet 170' is energized and the electromagnet 170 deenergized, it will be observed that the cylindrical contact surface 162 of the drive wheel means 115 is urged into frictional engagement with the second driven wheel 152 which action is effective to disengage the driving engagement between the cylindrical friction surface 160 of the drive wheel with the first driven wheel 151. In this form of the invention the second driven wheel 152 is mounted for rotation about the pin 180 carried in one end of a lever 181 pivoted about a shaft 182 to which a wheel 183 is fixed and which shaft 182 carries the take-up reel 184. The stop 185 is provided to limit the relative downward movement of the lever 181 and the second driven wheel 152 supported thereby. It will be observed that the upper edge of the left hand ear 165 is adapted to have camming engagement with the corner 190 of the fixed plate 176 and with the direction of the drive of the drive wheel as indicated by the arrow being effective to wedge the second driven wheel 152 into engagement with the wheel 183. It will thus be observed that in this embodiment of my invention the camming engagement of the left hand ear 165 with the corner 190 of the plate 176 provides a first reaction point with the fixed shaft 182 providing the second reaction point and which together with the direction of rotation of the drive wheel as shown in the drawing being effective to wedge the second driven wheel 152 into driving engagement and which provides a positive drive of wire without substantial slippage from the supply reel to the take-up reel. The lever 154 carrying the drive wheel means 150 is provided with a lengthwise extending slot 192 which together with a fixed guide collar 193 permits of shifting the lever 154 and drive wheel means 150 by the electromagnets 170 and 170', as above described.

In this form of the invention suitable circuit means is provided for effecting selective energization of either of the coils of the electromagnets 170 and 170' to provide the desired direction of movement of the wire from one reel to the other. In the deenergization of both of the coils of the electromagnets 170 and 170' it will be observed that the drive wheel means 150 is biased into engagement with the first and second driven wheels so that upon discontinuing the application of force to the driving wheel means 150 the take-up and supply reel shafts 178 and 182 are caused to be driven a limited amount to draw the wire between the reels taut.

While I have shown what I consider to be the preferred embodiments of my invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of the invention.

I claim:

1. In a wire recorder a drive mechanism comprising drive wheel means, driven wheel means comprising a pair of driven wheels, means associated with one of said wheel means for selectively biasing the latter toward the other of said wheel means whereby either one or both of said driven wheels and said drive wheel means are adapted to have frictional engagement with each other, and means for mounting said wheel means to provide two stationary reaction points for the action of said biasing means when said drive wheel means is in frictional engagement with either of said driven wheels, and said reaction points of said mounting means being arranged to provide for the wedging of said drive wheel means with either of said driven wheels when frictionally engaged by the action of rotation of said drive wheel means.

2. A drive mechanism for a wire recorder having spaced supply and take-up reel means mounted for rotation about fixed axes, means for driving said reels to effect travel of wire on said reels from one to the other thereof, said means comprising a drive wheel and a pair of driven wheels having friction driving connection with said reel means, means for each of said driven wheels for normally biasing them into frictional engagement with said drive wheel, means for selectively rendering said baising means for each of said driven wheels inoperative, and means for mounting said drive and driven wheels comprising reaction means including the fixed axis of the supply reel means for the action of the biasing means for one of said driven wheels and the fixed axis of the take-up reel means for the action of the biasing means for the other of said driven wheels, and with said drive and driven wheels being arranged so that when said drive wheel is in engagement with either of said driven wheels the action of said drive wheel at the point of engagement thereof with either of said driven wheels is in the same direction as the action of the biasing means for said driven wheels.

3. A drive mechanism for a wire recorder having spaced supply and take-up reel means mounted for rotation about fixed axes, means for driving said reels to effect travel of wire on said reels from one to the other thereof, said means comprising a drive wheel and a pair of driven wheels, means for each of said driven wheels for normally biasing them into frictional engagement with said drive wheel, means for selectively rendering said biasing means for each of said driven wheels inoperative, and means for mounting said drive and driven wheels comprising reaction means including the fixed axis of the supply reel means for the action of the biasing means for one of said driven wheels and the fixed axis of the take-up reel means for the action of the biasing means for the other of said driven wheels, and with said drive and driven wheels being arranged so that when said drive wheel is in engagement with either of said driven wheels the action of said drive wheel at the point of engagement thereof with either of said driven wheels is in the same direction as the action of the biasing means for said driven wheels, a source of power for selectively driving said drive wheel, and means associated with said power source so that upon disconnection thereof from said drive wheel said means for rendering the selective frictional engagement between said drive and driven wheels is rendered inoperative, whereby frictional engagement is effected between said drive wheel and both of said driven wheels by said biasing means associated with each of the latter to provide limited rotation of said

take-up and supply reels to draw the wire taut therebetween.

4. A drive mechanism for a wire recorder having spaced rotatable supply and take-up reel means, means for driving said reels to effect travel of wire on said reels from one to the other thereof, said means comprising a drive wheel and a pair of driven wheels one each having driving connection with one each of said reel means, biasing means associated with said drive wheel for normally biasing it into frictional engagement with said driven wheels, means associated with said drive wheel for selectively disengaging the frictional engagement thereof with either of said driven wheels, and means for mounting said drive and driven wheels including reaction means for the action of said biasing means and with said drive and driven wheels being arranged so that when said drive wheel is in engagement with either of said driven wheels the action of said drive wheel at the point of engagement thereof with either of said driven wheels is in the same direction as the action of said biasing means.

5. In a wire recorder having spaced rotatable supply and take-up reel means, the combination of means for selectively driving said reel means to effect travel of wire from one to the other thereof, said drive means comprising a drive wheel, a pair of driven wheels, one of said driven wheels being arranged between said drive wheel and one of said reel means, and an intermediate driven wheel between the other of said reel means in frictional engagement therewith and the other of said driven wheels, means for said one driven wheel for normally biasing it into frictional engagement with said drive wheel and said one reel means, means for said other driven wheel for normally biasing it into frictional engagement with said drive wheel and said intermediate driven wheel, and electromagnetic means associated with each of said driven wheels selectively operable for disengaging each thereof from its normally engaged position, and means for mounting said drive and driven wheels with respect to each other to prevent when in frictional and driving engagement lessening of the pressure of engagement therebetween by the means for biasing said driven wheels into frictional engagement with said drive wheel.

6. In a wire recorder having spaced rotatable supply and take-up reel means, the combination of means for driving said reel means to effect travel of wire from one to the other thereof, said drive means comprising a drive wheel, a pair of driven wheels, one of said driven wheels being arranged between said drive wheel and one of said reel means, and an intermediate driven wheel between the other of said reel means in frictional engagement therewith the other of said driven wheels, means for mounting one of said driven wheels for rectilinear movement toward and away from said drive wheel and said one reel means and being arranged to effect contact of said one driven wheel with said drive wheel and said one reel means at points lying on a line substantially perpendicular to the line of rectilinear movement of said one driven wheel, means for mounting the other of said driven wheels for rectilinear movement toward and away from said drive wheel and said intermediate driven wheel and being arranged to effect contact of said other driven wheel at points lying in a line substantially perpendicular to the line of rectilinear movement of said other driven wheel, means for said one driven wheel for normally biasing it into frictional engagement with said drive wheel and said one reel means, means for said other driven wheel for normally biasing it into frictional engagement with said drive wheel and said intermediate driven wheel, an electromagnetic means associated with each of said driven wheels adapted when energized for disengaging each of said driven wheels from its normally engaged position, and said drive and driven wheels being further arranged to prevent when in driving engagement lessening of the pressure of the frictional engagement therebetween by the means for biasing said driven wheels into frictional engagement with said drive wheel.

7. In a wire recorder having spaced rotatable supply and take-up reel means, the combination of means for driving said reel means to effect travel of wire from one to the other thereof, said drive means comprising a drive wheel, a pair of driven wheels, one of said driven wheels being arranged between said drive wheel and one of said reel means, and an intermediate driven wheel between the other of said reel means in frictional engagement therewith the other of said driven wheels, means for mounting one of said driven wheels for rectilinear movement toward and away from said drive wheel and said one reel means and being arranged to effect contact of said one driven wheel with said drive wheel and said one reel means at points lying on a line substantially perpendicular to the line of rectilinear movement of said one driven wheel, means for mounting the other of said driven wheels for rectilinear movement toward and away from said drive wheel and said intermediate driven wheel and being arranged to effect contact of said other driven wheel at points lying in a line substantially perpendicular to the line of rectilinear movement of said other driven wheel, means for said one driven wheel for normally biasing it into frictional engagement with said drive wheel and said one reel means, means for said other driven wheel for normally biasing it into frictional engagement with said drive wheel and said intermediate driven wheel, an electromagnetic means associated with each of said driven wheels adapted when energized for disengaging each of said driven wheels from its normally engaged position, and said drive and driven wheels being further arranged to prevent when in driving engagement lessening of the pressure of the frictional engagement therebetween by the means for biasing said driven wheels into frictional engagement with said drive wheel and circuit means for said electromagnetic means for selectively energizing either of electromagnets.

8. In a wire recorder having spaced rotatable supply and take-up reel means, the combination of means for driving said reel means to effect travel of wire from one to the other thereof, said drive means comprising a drive wheel, a pair of driven wheels, one of said driven wheels being arranged between said drive wheel and one of said reel means, and an intermediate driven wheel between the other of said reel means in frictional engagement therewith the other of said driven wheels, means for mounting one of said driven wheels for rectilinear movement toward and away from said drive wheel and said one reel means and being arranged to effect contact of said one driven wheel with said drive wheel and said one reel means at points lying on a line substantially prependicular to the line of rectilinear movement of said one driven wheel, means for mounting the other of said driven wheels for rectilinear movement toward and away from said drive wheel

and said intermediate driven wheel and being arranged to effect contact of said other driven wheel at points lying in a line substantially perpendicular to the line of rectilinear movement of said other driven wheel, means for said one driven wheel for normally biasing it into frictional engagement with said drive wheel and said one reel means, means for said other driven wheel for normally biasing it into frictional engagement with said drive wheel and said intermediate driven wheel, an electromagnetic means associated with each of said driven wheels adapted when energized for disengaging each of said driven wheels from its normally engaged position, and said drive and driven wheels being further arranged to prevent when in driving engagement lessening of the pressure of the frictional engagement therebetween by the means for biasing said driven wheels into frictional engagement with said drive wheel, electric motor means for driving said drive wheel, circuit means including said electric motor, and switch means in said circuit means adapted to effect energization of said electric motor and one or the other of said electromagnets and effective when positioned to deenergize said motor to deenergize both of said electromagnets.

9. In a wire recorder having spaced rotatable supply and take-up reel means, the combination of means for driving said reel means to effect travel of wire from one to the other of said reel means, said drive means comprising a friction drive wheel, a pair of driven wheels, mounting means for said wheels including means for biasing said drive and driven wheels into frictional engagement to effect driving of said driven wheels by said drive wheel, said reel means each having a gear, gear means for one of said driven wheels adapted to have meshing engagement with the gear of one of said reel means, an intermediate driven gear having meshing engagement with the gear of said other reel, the other of said driven wheels having gear means adapted to have meshing engagement with said intermediate driven gear, and said mounting means including reaction means for said biasing means and with said drive and driven wheels being arranged so that when said drive wheel is in engagement with either of said driven wheels the action of said drive wheel at the point of engagement thereof with said driven wheels is in the same direction as the action of said biasing means.

10. A drive mechanism for a wire recorder having supply and take-up reel means for driving said reels to effect travel of wire from one to the other thereof comprising, drive wheel means, driven wheel means comprising a pair of driven wheels, means providing a driving connection between one each of said driven wheels with one each of said reels, means associated with said wheel means for selectively biasing said drive wheel means and said driven wheel means into frictional engagement with each other, and means for mounting said wheel means to provide two fixed reaction points for the action of said biasing means when said drive wheel and either of said driven wheels are in frictional engagement with each other, and said reaction points of said mounting means being arranged to provide for the wedging together of said drive wheel means with either of said driven wheels when frictionally engaged by the action of rotation of said drive wheel means.

11. A drive mechanism for a wire recorder having supply and take-up reels, means for driving said reels to effect travel of wire from one to the other thereof comprising, a drive wheel, a pair of driven wheels, means providing a friction driving connection between one each of said driven wheels with one each of said reels, means associated with said driven wheels for normally biasing them into frictional engagement with said drive wheel, and means for mounting said drive and driven wheels to provide two fixed reaction points for the action of said biasing means when said drive wheel and either of said driven wheels are in frictional engagement with each other, and said reaction points of said mounting means being arranged to provide for the wedging together of said drive and driven wheels with each other when frictionally engaged by the action of rotation of said drive wheel.

12. A drive mechanism for a wire recorder having supply and take-up reels, means for driving said reels to effect travel of wire from one to the other thereof comprising, a drive wheel, a pair of driven wheels, means providing a friction driving connection between one each of said driven wheels with one each of said reels, means associated with said drive wheel for normally biasing it into frictional engagement with selectively one or the other of said driven wheels, and means associated with said drive wheel and driven wheels to provide two fixed reaction points for the action of said biasing means when said drive wheel is in engagement with either of said driven wheels, and said reaction pionts being arranged to provide for the wedging together of said drive wheel and said driven wheels with each other by the action of rotation of said drive wheel.

13. A drive mechanism for a wire recorder having supply and take-up reel means mounted for rotation about fixed axes for driving said reels to effect travel of wire from one to the other thereof comprising, a drive wheel mounted for rotation about a fixed axis, a pair of driven wheels mounted for rotation about axes movable relative to the axes of said drive wheel and reels, means normally urging said driven wheels into frictional engagement with said drive wheel in which the axes of said reel means each serve as one reaction point for the action of said biasing means, and in which the fixed axis of said drive wheel serves as a second reaction point for said biasing means, and said drive wheel, said driven wheels, and said biasing means being arranged so that said reaction points provide for the wedging together of said drive and driven wheels with each other when frictionally engaged by the action of rotation of said drive wheel.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,123,147	Sherman	Dec. 29, 1914
1,789,607	Steurer	Jan. 20, 1931
1,886,856	Warwick	Nov. 8, 1932
2,180,793	Carlson	Nov. 21, 1939
2,351,005	Camras	June 13, 1944
2,369,017	Camras	Feb. 6, 1945

FOREIGN PATENTS

Number	Country	Date
506,232	Germany	Sept. 1, 1930