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SELECTOR SYSTEM FOR MAGNETIC WIRE REPRODUCERS

Filed June 29, 1945

2 Sheets-Sheet 1

Fig. 1

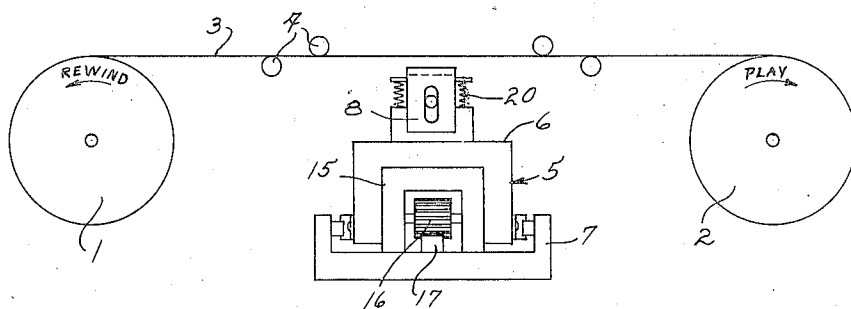
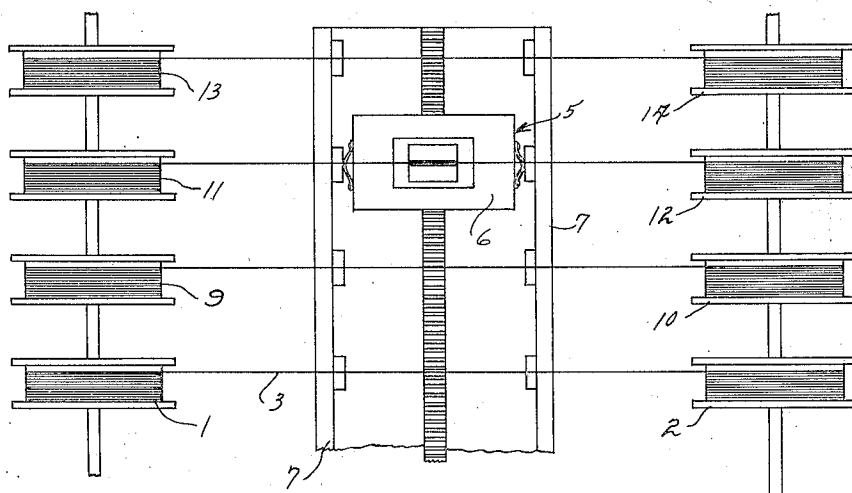


Fig. 2



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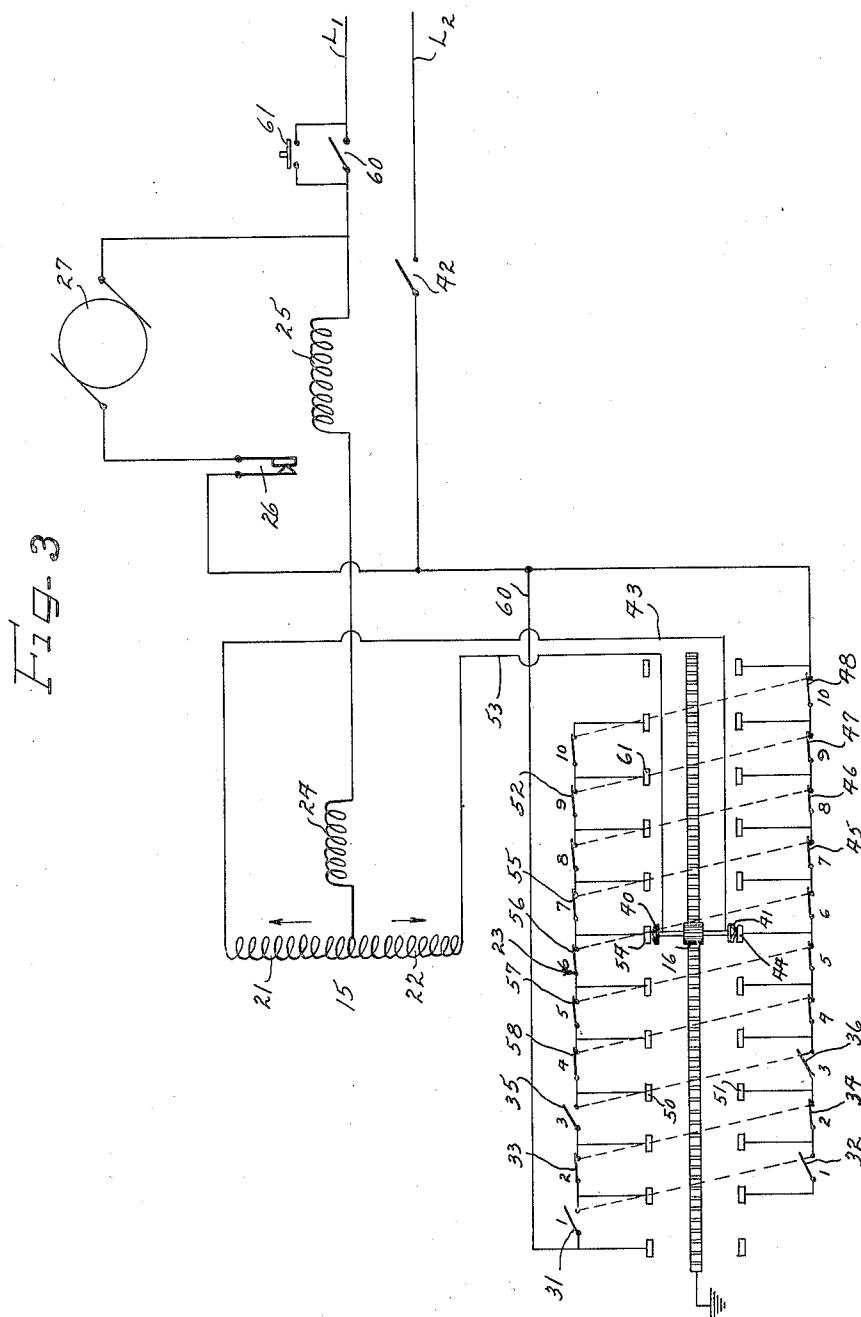
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SELECTOR SYSTEM FOR MAGNETIC WIRE REPRODUCERS

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2 Sheets-Sheet 2



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SELECTOR SYSTEM FOR MAGNETIC
WIRE REPRODUCERS

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The present invention relates to a magnetic recording and reproducing device, and more particularly, relates to an electrical control system for selectively playing one of a plurality of magnetic wire sound records in a reproducing unit.

In the past, so-called "juke boxes" have been widely used in places of amusement, which boxes commonly include a plurality of phonograph records which can be selectively played by depressing one of a plurality of switches after insertion of a coin. An outstanding disadvantage of such devices has been that of cumbersome and heavy mechanisms involved which are expensive to manufacture and assemble.

An object of the present invention is to provide a sound recording or reproducing unit involving a plurality of magnetizable wires for selective operation for either recording or reproducing, which unit is devoid of the disadvantages of the above described units commonly used, in that it requires a minimum number of parts and is, therefore, light in weight, small in size, and inexpensive to manufacture.

Another object of the present invention is to provide a plurality of pairs of reels for longitudinally moving a plurality of magnetizable wires in a given direction, each wire bearing a different magnetic record, together with means for selectively moving an electromagnetic head in alignment with any one of the aforesaid wires so as to play any desired record.

A more specific object of the present invention is to provide a reproducing device having a plurality of wires, each bearing a different magnetic record, and each mounted for winding and unwinding by different pairs of spools, together with a carriage means having a recording head and having a switch controller so arranged that by selective operation of a plurality of switches, the recording head may be selectively moved into alignment with any of the wires so as to play or reproduce any magnetic wire record desired.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization, method of operation and manner of construction, together with further objects and advantages thereof, may best be understood by reference to the accompanying drawings, in which:

Figure 1 is a side view of one of the magnetic wire reproducing units including a magnetic recording head;

Figure 2 is a top view of a plurality of pairs of spools, each bearing a wire having a different

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magnetic record, together with a carriage supporting a magnetic recording head so that it may be slid into alignment with any of the wires; and

Figure 3 is a wiring diagram of the entire reproducing device with many of the parts shown schematically for purposes of clarity.

As is well known in the art, when a wire or tape of paramagnetic material is longitudinally moved between closely adjacent confronting pole faces of an electromagnetic recording head, the wire may be incrementally magnetized longitudinally by varying amounts in accordance with electrical variations such as imposed in an electric circuit by a loudspeaker or other transmitting device in which voice signals or other sounds or vibrations are received.

After such magnetic wire record is made, it is rewound onto a spool from which it was originally unwound, and then is again unwound from said spool, but this time it passes through the recording head for the purpose of causing electromagnetic variations corresponding to the wire record, which variations are used to operate a receiver such as a loudspeaker, or other similar device, for reproducing the sounds originally uttered into the transmitter.

In accordance with the present invention, a plurality of such record-bearing magnetic wires are provided together with a single magnetic recording head, which may be selectively moved into alignment with any of the wires so as to play a particular desired record.

Referring more particularly to Figures 1 and 2, numerals 1 and 2 denote a pair of spools for winding or unwinding a wire or tape 3 of paramagnetic material of the order of 0.005 inch in diameter. More specifically, when the magnetic record on the wire 3 is to be played or reproduced, the wire is wound onto spool 2, and is unwound from spool 1, whereas when the wire is being rewound so as to prepare it for subsequent playing or reproducing, it is wound onto spool 1 and unwound from spool 2, as indicated by the arrows. A plurality of rollers 4 are provided for accurately guiding the wire. A record selecting mechanism, denoted generally by numeral 5, is provided, and comprises a carriage 6 slidable along a track 7 in a direction substantially at right angles to the wire 3. The carriage has mounted thereon an electromagnetic recording or reproducing head 8 which is vertically movable on the carriage so that the confronting poles of the electromagnetic head 8 may be moved either alongside the wire 3 or may be moved

vertically downwardly away from the wire, as indicated.

As will be noted in Figure 2, a plurality of pairs of spools, such as 1 and 2, 9 and 10, 11 and 12, 13 and 14, etc., are provided, each pair for the purpose of longitudinally moving a paramagnetic wire in the same manner as wire 3 is moved by spools 1 and 2, and each wire bearing a different magnetic record.

A reversible electric motor 15 is mounted on carriage 6 for the purpose of rotating a pinion 16 in either one direction or in an opposite direction. Since the teeth of pinion 16 are in meshing relationship with the teeth of a rack 17, and since the carriage 6 is slidably movable along the path defined by the track 7, the carriage will move at right angles to the various magnetic wires, either in one direction or in an opposite direction, depending on the direction of rotation of pinion 16.

The remaining details of the carriage, as well as the operation of the electrical control system for affording selective movement of the carriage into alignment with any desired magnetic wire, may be best understood by reference to Figure 3.

Referring more particularly to Figure 3, numerals 21 and 22 denote the reversing windings of the reversible motor 15 for the purpose of causing rotation of pinion 16 either in one direction or in an opposite direction, depending on which winding is energized. The centrally disposed, common terminal for these windings is energized from one line terminal L₁, whereas the outermost terminals of windings 21 and 22 are selectively energized by the other line terminal L₂, which is reached after going through the switching mechanism of an electric controller selector or follow-up mechanism 23. Lines L₁ and L₂ may be energized by any suitable source of electrical energy such as, for example, a 115 volt 60-cycle alternating current source.

Coil 24, which is for the purpose of causing downward movement of the recording head 8 against the action of spring 20, as well as relay coil 25, which is for the purpose of operating a switch 26, are connected in series with the reversible motor 15 and with line L₁. When coil 25 is deenergized, it will cause closing of the contacts of switch 26, which effects completion of an energizing circuit through a wire driving motor 27. In other words, the motor 27 will cause driving of either spool 1 or spool 2 in opposite directions as the result of shifting of a friction drive roll driven thereby into engagement with either a friction drive roll coupled to spool 1 or a friction drive roll coupled to spool 2 (not shown), which form of reversible drive means is well known in the art. Spools 10, 12, and 14 may be mechanically coupled to spool 2, and spools 9, 11 and 13 may be coupled to spool 1 so as to rotate in unison therewith, so that all the wires are moved in one direction or in an opposite direction, simultaneously, even though only one wire of the group is being played or reproduced.

The electric controller or selector 23 comprises a plurality of pairs of switches, such as 31 and 32, 33 and 34, 35 and 36, etc. Each pair may be simultaneously closed or opened by a pushbutton or handle connected to both switches, as indicated by dotted lines. The pair of switches 31 and 32 corresponds to position number 1; the pair of switches 33 and 34 corresponds to position number 2; the pair of switches 35 and 36 corresponds to position number 3, and so forth, as indicated. Movable contact members 40 and 41 are mounted on the carriage, and, for purposes of

illustration, are shown as associated with the pinion 16, since the contact members, as well as the pinion 16, are movable together longitudinally with respect to the various switch pairs.

The operation of the device is as follows: Assume that the main switch 42 is manually closed or closed by any suitable coin controlled mechanism (not shown), and assume that it is desired to move the carriage from the number 7 position illustrated to the number 3 position. The pair of switches 35 and 36 is manually opened for the purpose of selecting such number 3 position while the remaining pairs of switches, corresponding to positions 1, 2 and 4 to 10, inclusive, are closed as shown. A motor energizing circuit will now be completed extending from line L₁ through relay coil 25, coil 24, motor winding 21, conductor 43, movable contact member 41, stationary contact member 44, closed switches 45, 46, 47 and 48, main switch 42 to line conductor L₂. Due to opening of switch 35, the circuit that would otherwise extend from movable contact member 40 to the closed switches 55 to 58, inclusive, to line L₂, is now interrupted. Therefore, only winding 21 is energized. This will effect rotation of motor 15 in such a direction so as to drive pinion 16 to make it propel carriage 6 and head 5 towards position 3. In the meanwhile, as the result of the aforesaid energization of coil 24, recording head 8 is attracted downwardly against the action of spring 20 and out of operating relationship with any of the wires, such as 3, so that it will readily clear the wires during movement to a new position. Due to energization of coil 25, switch 26 is opened, thus interrupting the energizing circuit through the wire driving motor 27.

When the carriage arrives at position 3, the energizing circuit for motor 15 will be interrupted because of open switch 36, hence, the motor 15 will cease to rotate, and the carriage will remain in position number 3 which has been selected. Since coil 24 now becomes deenergized, spring 20 will cause upward movement of recording head 8 into operative position with the record bearing wire selected; that is, with the poles of the recording head substantially surrounding the wire. Coil 25 will also become deenergized causing closing of switch 26 and completion of an energizing circuit for motor 27 to start the driving of the reels and consequent longitudinal movement of the wires for reproducing purposes. This drive is interrupted after a predetermined period of time sufficient for complete playing of the record by means of a limit switch 60 operated through reduction gearing (not shown) coupled to motor 27 and that effects opening of the main circuit. Any suitable means such as reset switch 51 may be operated subsequently to shunt this limit switch or to close switch 61 to prepare the circuit for the next operation.

Assume now, instead, that it is desired to move the carriage from position number 7, shown, to position number 9 in order to move the recording head in operative relationship with a different wire record. Switches 35 and 36 are now closed, and switches 52 and 47 are opened. An energizing circuit will be completed through motor 15 extending from line L₁ through coil 25, coil 24, winding 22, conductor 53, movable contact member 40, stationary contact member 54, closed switches 55, 56, 57, 58, 35, 33, 31, conductor 60, switch 42 to line L₂. This will cause operation of motor 15 in such direction as to rotate pinion 16 and propel carriage 5 towards position number 9. In the meanwhile, coil 25 is now energized,

hence will open switch 26 and interrupt the motor energizing circuit through motor 27. When the carriage reaches the number 9 position at which contact members 49 and 61 come together then, due to interruption of the circuit for energizing winding 22 by the open switch 52, motor 15 will stop and relay coil 24 will be deenergized so as to allow upward movement of the recording head into operating relationship with the wire selected. Also, coil 25 will be deenergized so as to start motor 27, and, therefore, effect drive of the reels for longitudinally moving the wires. In this manner, it will be seen that by opening the appropriate pair of switches, the carriage 6 may be moved to any desired position so as to be in registry with the wire desired.

Thus, it will be seen that I have provided an efficient and simple control system for selecting one of a plurality of wires bearing magnetic records, and which system is particularly suitable for incorporation in a "juke box" or other similar reproducing apparatus. It should be noted that while the above described system is directed to reproducing apparatus, the same system may be used for the purpose of magnetic recording. That is to say, if the electromagnetic head 8 is used for impressing an electromagnetic record on wires 3 and the like, it may be selectively moved from one wire to the other to effect successive recordings on the various wires by the same control system described herein. The use of the same recording head for either recording or reproducing is well known in the art.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. Reproducing apparatus comprising a plurality of longitudinally movable, elongated recording media, an electromagnetic recording head, and electric means for selectively moving said recording head in a direction substantially at right angles to said recording media but removed from said recording media and for moving said recording head towards a preselected one of said recording media after reaching a position in alignment therewith.

2. Reproducing apparatus comprising a plurality of pairs of spools, a paramagnetic elongated recording medium adapted to be wound onto one spool from the other of each pair, an electromagnetic recording head, electric means including a reversible electric motor, a carriage for carrying said recording head and which is reciprocable by said motor in a direction substantially perpendicular to said recording media, and a plurality of selector switches for selectively limiting the movement of said carriage so as to align said recording head with any of said media selected, and a relay mounted on said carriage for withdrawing said recording head away from said recording media during transit of said carriage.

3. Reproducing apparatus comprising a plurality of pairs of spools, a paramagnetic elongated recording medium adapted to be wound onto one spool from the other of each pair, an electromagnetic recording head, electric means including a reversible electric motor for effecting reciprocation of said head in a direction substantially perpendicular to said recording media while said head is withdrawn from said media, selector

switching means, and a controller operated by said switching means for selectively limiting the movement of said head to align it with any of said recording media selected.

4. Magnetic wire reproducing apparatus comprising a plurality of longitudinally movable wires of paramagnetic material having magnetic records thereon, an electromagnetic head for magnetic coupling with any of said wires to translate said records into electromagnetic variations for recording purposes, record selector means including a carriage for supporting said head and including a reversible motor and translating device for selectively moving said carriage into alignment with one of said wires, relay means on said carriage for holding said head in a withdrawn position away from said wires during movement of said carriage, a second motor for driving said wires and a relay actuated switch for controlling energization of said second motor in response to energization of said first reversible motor.

5. Magnetic wire reproducing apparatus comprising a plurality of longitudinally movable wires of paramagnetic material having magnetic records thereon, an electromagnetic head for magnetic coupling with any of said wires to translate said records into electromagnetic variations for recording purposes, record selector means including a carriage for supporting said head and including a reversible motor and translating device for reciprocating said carriage in a direction substantially perpendicular to said wires, said motor including a pair of reversing windings, a controller including a plurality of pairs of stationary switches, each pair having one switch connected in series with one winding and another connected in series with the other winding, said controller also including a pair of movable contact elements mounted on said carriage and connected to said respective windings, a plurality of stationary contact elements each connected intermediate said stationary switches and adapted to slide in contact relationship with said movable contact elements for effecting selective movement of said carriage up to a position corresponding to the position at which one of said pairs of stationary switches is opened.

6. Magnetic wire reproducing apparatus comprising a plurality of longitudinally movable wires of paramagnetic material magnetized longitudinally with magnetic records, an electromagnetic head having pole pieces adapted to surround any of said wires for translating said records into electromagnetic variations for reproducing purposes, reel means for longitudinally moving said wire, motor means for driving said reel means, record selector means including a carriage, having mounted thereon said electromagnetic head together with a reversible motor for propelling said carriage in either of two opposite directions substantially perpendicular to said wires, switch controller means operated by a plurality of selector switches for controlling the direction and amount of movement of said carriage relative to reversible motor so as to selectively move said head into operating relationship with any of said wires as desired.

7. Magnetic wire reproducing apparatus comprising a plurality of longitudinally movable wires of paramagnetic material magnetized longitudinally with magnetic records, an electromagnetic head having pole pieces adapted to surround any of said wires for translating said records into electromagnetic variations for reproducing pur-

poses, reel means for longitudinally moving said wire, motor means for driving said reel means, record selector means including a carriage, having mounted thereon said electromagnetic head together with a reversible motor for propelling said carriage in either of two opposite directions substantially perpendicular to said wires, said reversible motor having reversing windings, switch controller means including a plurality of stationary switches in circuit relationship with said windings so as to control the direction and amount of movement of said carriage relative to and substantially perpendicularly of said wires so as to selectively move the head into operative relationship with any of said wires depending upon operation of said stationary switches.

8. Magnetic wire reproducing apparatus comprising a plurality of longitudinally movable wires of paramagnetic material magnetized longitudinally with magnetic records, an electromagnetic head having pole pieces adapted to surround any of said wires for translating said records into electromagnetic variations for reproducing purposes, reel means for longitudinally moving said wire, motor means for driving said reel means, record selector means including a carriage, having mounted thereon said electromagnetic head together with a reversible motor for propelling said carriage in either of two opposite directions substantially perpendicular to said wires, said reversible motor having reversing windings, switch controller means including a plurality of pairs of stationary switches, each pair having one

switch serially connected with one of said windings and another switch serially connected with the other of said windings, said switch controller means also including two rows of aligned stationary contact segments connected intermediate said stationary switches with the end of one row connected to the opposite end of the other, and a pair of movable contact segments mounted on said carriage for slidable contact relationship with said stationary contact segments and connected to said respective windings so as to rotate said reversible motor and propel said carriage in a direction towards the position at which one of said pairs of stationary switches is open and by an amount limited by said position so as to selectively move said head in cooperative relationship with any selected wire for reproducing a particular record.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
876,006	Mills	Jan. 7, 1908
897,765	Morin	Sept. 1, 1908
1,825,911	Lienzen	Oct. 6, 1931
1,852,727	Van Der Horst	Apr. 5, 1932
2,167,459	Long	July 25, 1939
2,275,961	Miller	Mar. 10, 1942
2,364,556	Somers	Dec. 5, 1944