

July 25, 1939.

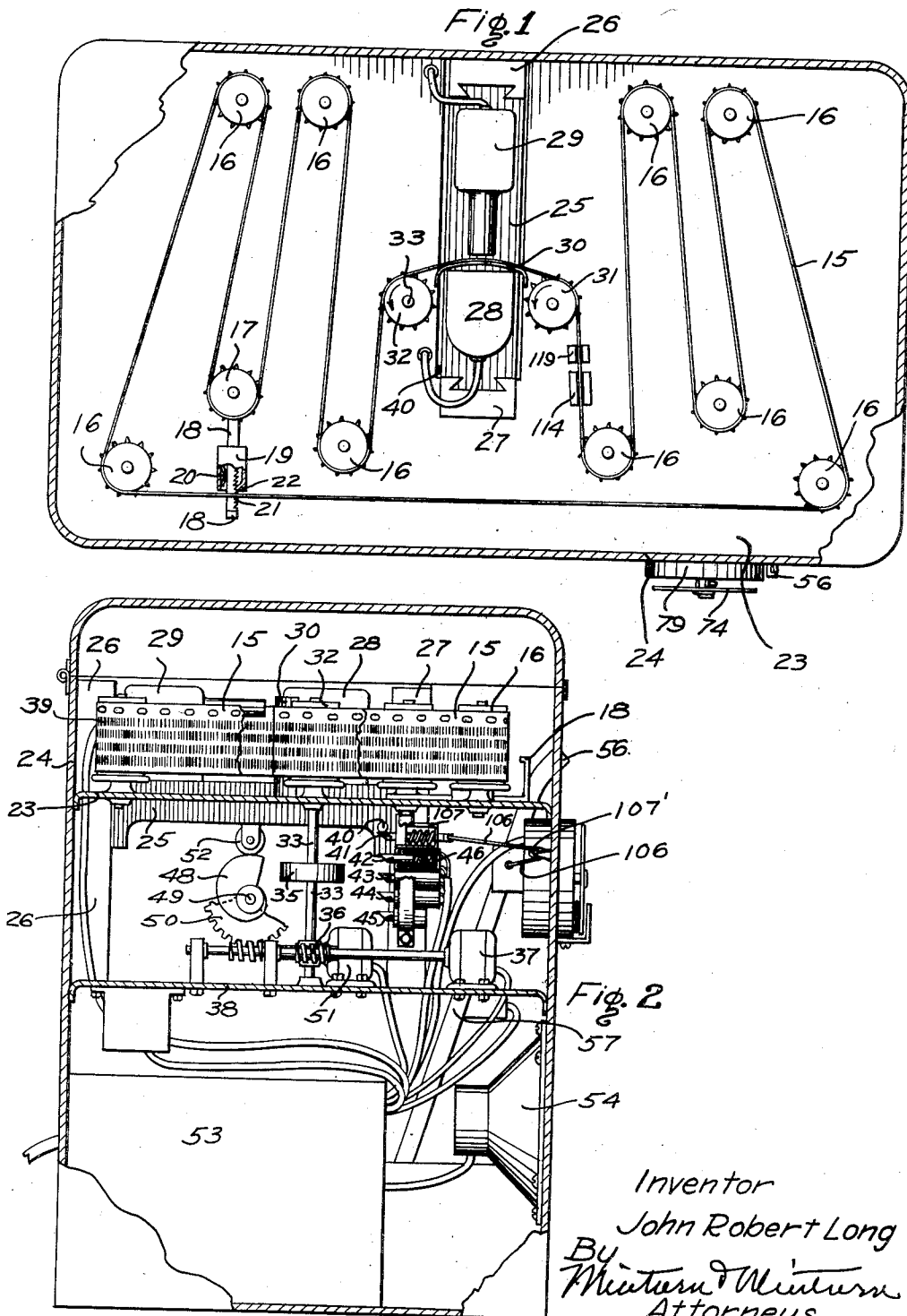
J. R. LONG

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PHONOGRAPH

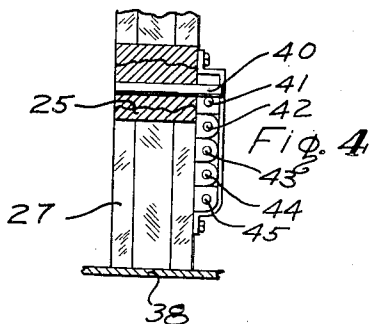
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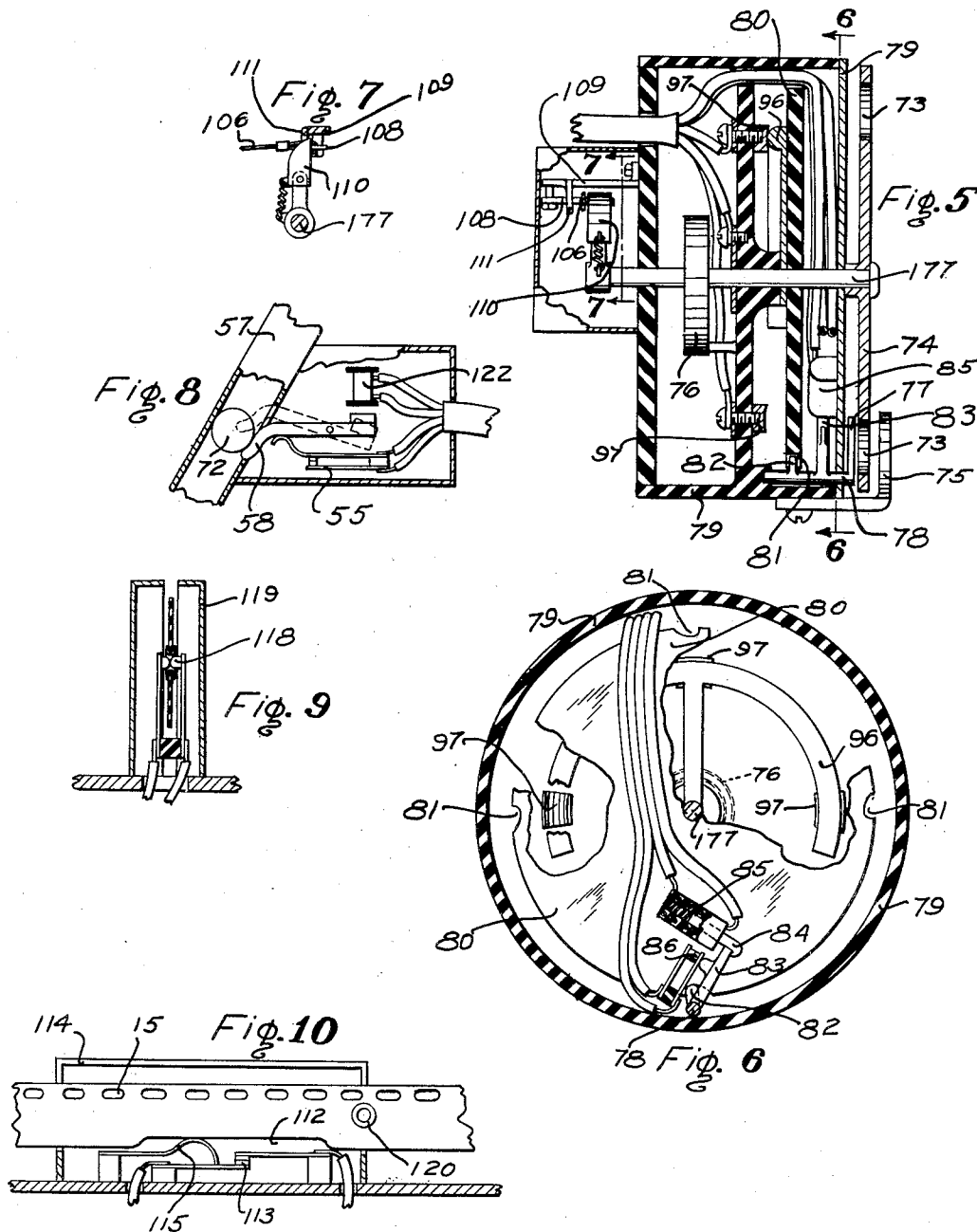
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PHONOGRAPH

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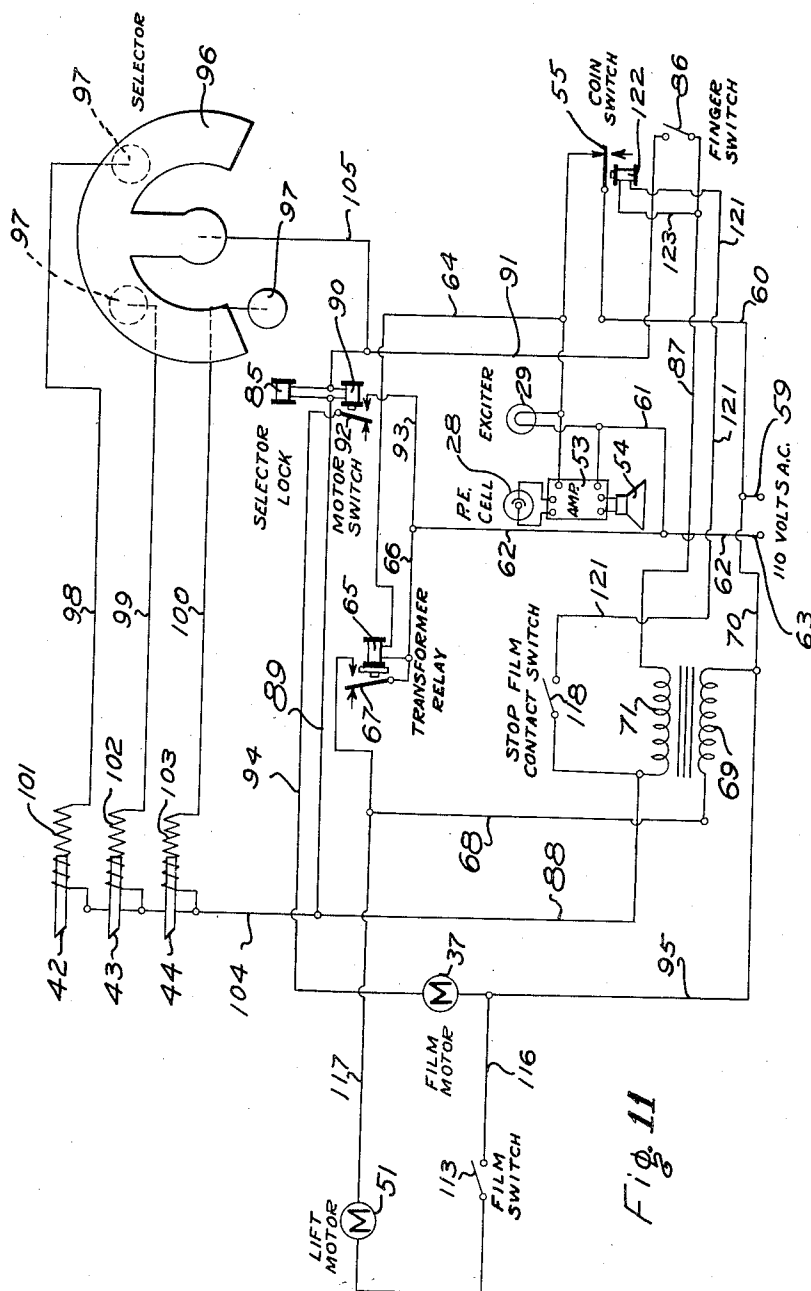
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PHONOGRAPH

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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PHONOGRAPH

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Application August 23, 1937, Serial No. 160,386

8 Claims. (Cl. 179—100.3)

This invention relates to a phonograph having in place of the usual disk or cylinder record, a film with one or more sound tracks formed thereon. It is the primary object of the invention to provide a simplified structure permitting the selection of any one of the records as carried by the film in the form of a sound track to be reproduced audibly. In the form of the phonograph herein shown and described, the entire device is initially set in operation by means of a coin, although the invention is not necessarily limited to the use of the coin, since the coin switch may be manually operated in some cases where desired.

A further important object of the invention is to secure reproduction of sound with the greatest possible fidelity. Further important objects and advantages of the invention will become apparent to those versed in the art in the following description of one particular form of the invention as illustrated in the accompanying drawings, in which:

Fig. 1 is a top plan view of the phonograph with the top cover broken away;

Fig. 2, an end elevation with the end wall removed;

Fig. 3, a front elevation with the front wall partially removed;

Fig. 4, a detail on enlarged scale in rear elevation of part of the selector mechanism;

Fig. 5, a detail in vertical section on an enlarged scale through the dial selector;

Fig. 6, a vertical section on the line 7—7 in Fig. 5;

Fig. 7, a vertical section on the line 8—8 in Fig. 5;

Fig. 8, a detail in partial section of the coin actuated switch;

Fig. 9, a detail in transverse section illustrating the film driving motor stop switch;

Fig. 10, a detail in vertical section showing a light-head motor lift switch; and

Fig. 11, a wiring diagram.

Like characters of references indicate like parts throughout the various views in the drawings.

In order to supply a sufficient length of film to carry the sound track of the matter to be reproduced, a film may be carried in the phonograph in any suitable manner to permit the film to be carried past the photo-electric cell and exciter lamp, to permit the film to be rewound or therein carried so as to be presented again in the same direction of travel for the next reproduction. In the form herein shown a film 15 is shown in the form of a continuous belt, looped around a plu-

rality of sprockets 16, sufficient in number to carry the required length within a compact space. In this form the sprocket 17 is interposed and is mounted on a bar 18 sliding through a bracket 19 to have a spring 20 normally urge bar teeth 21 into engagement with the lip 22, whereby the bar 18 may be pulled through the bracket 19 and held in an extended position so as to apply tension on the film 15. The bracket 19 and the various sprockets 16 and 17 are carried on a floor 23 within the phonograph housing 24. A head 25 is mounted to be retained between and guided in vertical travel by two posts 26 and 27 whereby the head is presented through an opening in the floor 23.

This head 25 carries a photo-electric cell unit 28 and an exciter lamp housing 29. Across the opening in the floor is secured to the head a film plate 30. This plate 30 is mounted so that the unit 28 will be on the forward side and the unit 29 on the rear side when the head 25 is raised and lowered. This plate 30 is given a curved face over which the film 15 is drawn between the sprockets 31 and 32, the sprocket 32 being a driving sprocket mounted on a shaft 33 which extends downwardly through the floor 23. The plate 30 further carries a slot 34, Fig. 3, through which light travels between units 29 and 28.

Referring to Figs. 2 and 3, the shaft 33 carries some type of torsional damper, herein shown as a fly wheel 35. The shaft 33 extends downwardly to be driven through the worm drive 36 by a motor 37 mounted on a floor 38.

The film 15 carries a plurality of sound tracks 39, herein shown as four in number and it is therefore necessary to shift the head 25 to properly align the beam of light travelling between the units 29 and 28 in order to have that beam traverse the selected sound track. Normally the head 25 is retained in an upper position by means of a pin 40 resting on a retractable latch pin 41, Fig. 2. Below the latch pin 41 in the path of the head pin 40 are additional pins 42, 43, 44 and 45, pins 42, 43 and 44 being retractable by magnetic windings thereon and which pins normally are extended into the path of the pin 41 by a spring 46 in each instance. The pin 45, being the lowest pin, is fixed in position as a lower limit stop and is located to cause the head 25 to stop for reproduction from the lowest sound track on the film 15.

Thus to select the desired sound track reproduction, the latch pin 41 is initially shifted to drop the head 25 and have the head stopped by the pin 40 striking any one of the lower pins

which has not been withdrawn from the path of the head pin.

In order to return the head to its upper initial position, a cam 48 is mounted on the shaft 49 and revolved through the worm drive 50 by a motor 51 in the path of the head 25, herein shown as in the path of the roller 52 mounted on the underside of the head, whereby by the operation of the motor 51, the cam 48 will push the head 25 to an upper position to have the pin 40 push against the under sides of the various latch pins in its path and push them back out of the way by reason of the beveled inner ends until the pin 40 is carried above the latch pin 41, at which point the cam 48 leaves contact with the roller 52 to allow the pin 40 to come down and rest upon the latch pin 41 as before.

The photo-electric cell unit 28 is in electric circuit with the usual amplifier 53, details of which do not form part of this present invention. The out-put of the amplifier 53 is through a loud speaker unit 54, herein shown as mounted on a forward wall of the housing 24.

In order to set the phonograph into operation a switch 55, Figs. 8 and 11, is closed. This switch may be either manually closed, or in the form herein shown, closed by dropping a coin 72 in a slot opening 56, Fig. 3, to have the coin fall down the chute 57, Fig. 8, to overbalance a bar 58, so as to push a switch 55 into a closed position. Upon the closing of this switch 55 a circuit is at once established from a current source terminal 59, Fig. 11, through a wire 60, switch 55, exciter lamp 29, amplifier 53, wire 61 and wire 62 back to the other current source terminal 63. Thus the current is supplied to warm up the amplifier and power tubes. Also upon the closing of the switch 55, a circuit is established from the terminal 59 through the wire 60, switch 55, wire 64, relay winding 65, wire 66 and wire 62 to the terminal 63. Upon the current flow through the winding 65, a relay switch 67 is closed. The closing of this switch 67 establishes a circuit from the terminal 63, through the wire 62, switch 67, wire 68, primary winding 69 of a transformer, and wire 70 to the terminal 59. Thus the current from a secondary winding 71 is then made available.

During the preceding circuit closing operations, the film 15 has remained stationary and the head 25 has remained in its upper inoperative position. Following the deposit of the coin 72, the selection of the particular program desired may then be made by operating a selector to effect selective closing of circuits with the windings of the pins 42, 43, and 44 to cause the head 25 to drop down to the corresponding sound track 39. This selection is made by inserting the operator's finger in a hole 73 of a dial 74 and revolving that dial in a clockwise direction to bring the finger into abutment with a stop 75. The dial is provided with a plurality of holes 73, one for each of the sound tracks 39 of the film 15, four of such holes being provided in the present form. Back of each of these holes 73 is carried a number or some indication of the program to be provided by the corresponding sound tracks. These numbers are placed on the front side of the cover 79 of the selector housing.

The dial 74, when turned by the finger as above indicated, is revolved in opposition to a torsional spring 76, having its outer end fixed to the selector housing and its inner end fixed to the shaft 177, carrying the dial 74.

When the finger strikes the abutment 75, as

above indicated, the finger tip will have come against the lever 77, presented between the dial 74 and the front face of the housing 79. This lever 77 is carried on the outer end of the shaft 78 which extends into the selector housing 79 to be rotatably carried thereby. A contact disk 80 is fixed to the shaft 177 to turn therewith inside of the housing 79. The outer edge of the contact disk 80 is provided with a plurality of notches 81, one for each of the holes 73 provided in the disk 74. Upon moving the lever 77 with the finger, a foot 82 is carried into one of these notches 81 and simultaneously another arm 83, on the shaft 78, is hooked into engagement with a pin 84 which forms the armature of a solenoid magnet 85. Upon making this engagement, this arm 83 also closes a switch 86 which closes a circuit including the winding of the magnet 85 so as to retain the engagement of the pin 85 with the arm 83 and thereby hold the contact disk 80 in position in opposition to the return pull of the spring 76. The circuit closed by the switch 86 is indicated in Fig. 11 as being that circuit including switch 86, wire 87, transformer winding 71, wire 88, wire 89, magnet winding 85, relay winding 90 and wire 91.

The relay winding 90 included in this circuit, closes the motor switch 92 in the circuit leading from the terminal 63 through the wire 62, wire 93, through the switch 92, wire 94, film driving motor 37, wire 95 and wire 70, to the other terminal 59. Thus upon making the selection by turning the dial 74, the film 15 is then set in motion to be pulled over the plate 30, as above indicated. Going back to the selector operation, when the dial 74 has been turned by bringing the finger into abutment with the stop 75, the contact disk 80 has carried a segment 96 into engagement with all of the contacts 97, other than the one which is interconnected with the latch pin on which the head pin 40 will rest in the position of the used sound track 39. In other words, in the path of this segment 96 are carried a plurality of contacts 97, one for each of the windings surrounding the respective pins 42, 43 and 44. Wires 98, 99 and 100 interconnect these windings with the respective contacts 97 as indicated in the diagram, Fig. 11.

The other side of these latch windings, designated respectively by the numbers 101, 102 and 103, are interconnected through the wire 104, with the wire 88 leading to the winding 71, thence through the wire 87, switch 86, wire 91, and wire 105, connected with the segment 96 to complete the circuit. Supposing that the third sound track from the top is to be used, the dial 74 is turned around by placing a finger in the hole 73 over the number 3 to bring the finger around to abut the stop 75, whereupon the third latch pin 44 remains in an extended position since the third winding 103 is left out of that circuit, whereas the windings 101 and 102 are energized to retract the pins 42 and 43 out of the path of the head pin 40, leaving the pin 44 in its path. In other words, should the first sound track be used, the upper pin 42 would not be retracted; for the second sound track, the pin 42 would be retracted, leaving the pin 43 extended; and for the fourth track, all three of the pins would be retracted.

One other operation remains to be accomplished before the head 25 may be moved even to the first sound track, to allow the pin 41 to rest on 42. The latch pin 41 must be retracted and this is accomplished by attaching a cable 75

106 to the other end of the latch pin 41 to pull it in opposition to the return spring 107. This cable 106 is carried around the pulley 107' and tied by the other end to the lever 108 rockably mounted on the bracket 109 extending from the rear side of the housing 79, Figs. 5 and 7. This lever 108 is in the path of the arm 110, which is fixed to the dial shaft 177 so that when the dial 74 starts its initial rotation, the arm 110 will immediately push against the lever 108 and then pull on the cable 106 to retract the pin 41 and let the head 25 drop at least as far as the first pin 42. Continuous rotation of the shaft 177 lets the arm 110 carry past the lever 108 so as to permit the pin 41 to return to its normal position. The arm 110 is in two parts, the outer part being hinged so as to permit the lever 110 to return to the opposite side of the lever 108 for return travel, the lever 108 then returning to abut a pin 111.

Therefore, immediately the selection is made by the operator through the dial 74, the film 15 is set in operation and the head 25 dropped to a selected sound track position and the program is then reproduced without further attention. At the end of the sound track on the film 15, a notch 112 is provided along the under edge of the film, Fig. 10, to operate the head lift motor 51 by permitting the switch 113 to close. In the form herein shown, the film is carried through a locating box 114, surrounding the switch 113 to have a light spring 115 in contact with the lower edge of the film. The free end of this spring 115 normally holds an arm of the switch 113 in open position so that when the arm 115 drops into the notch 112, the switch 113 may close. The closing of this switch 113 completes a circuit from the terminal 59 through the wire 70, wire 95, wire 116, motor 51, wire 117, switch 67, and wire 66 and wire 62 back to terminal 63. Thus the motor 51 is set in operation to revolve the cam 38 and lift the head 25 back to its initial inoperative position with the pin 40 resting on the latch pin 41. Immediately the cam 42 leaves the roller 52, a switch 118 carried in a locating box 119, Figs. 1, 9 and 11, closes. This closure in the present form is obtained by permitting the contact to be made between the opposing arms of the switch 118 through the hole 120 in the film adjacent to notch 112. The hole 120 is preferably surrounded by a grommet of any material which will prevent the possible slight arc occurring from causing any particular damage to the film. The momentary closing of the switch 118, effected in the manner described by moving the film, closes a circuit from the winding 71, through the switch 118, wire 121, relay winding 122, wires 123 and 87 back to the winding 71. The relay winding 122, when thus energized, opens the switch 55 whereby the winding 85 is permitted to release the selector dial 80 to allow it to return to its initial position; de-energizing the winding 90 to stop the film driving motor 37; de-energizing the winding 65 to stop the flow of current through the transformer winding 69 and cut off the current to the photo-electric cell, exciter lamp and amplifier, thereby returning all of the members to their initial condition, ready for a second operation, all as above described.

It is understood that the film 15 will travel a slight distance after the switch 118 has been closed so as to carry the notch 112 on beyond the switch arm 115 and to again open the switch 118 by carrying the film perforation therebeyond. This over-travel is taken care of by use of a

blank portion of film between the beginning and the ends of the sound tracks. The head 25 lifts and drops while the blank portion of the film travels across the plate 30. As the switch 55 is opened by the magnet 122, the arm 58 is pulled out of the path of the coin 72 so that the coin may roll on down the chute.

While I have herein shown and described my invention in one particular form, it is obvious that structural changes may be made without departing from the spirit of the invention and I therefore do not desire to be limited to this precise form beyond the limitations as may be imposed by the following claims.

I claim:

1. In a selecting means, a rotatable dial carrying a plurality of finger engagements for dial rotation, a stop against which the finger will abut to limit dial rotation, a member switch operating adjacent said stop and shifted as the finger comes to rest against the stop, a spring normally returning the dial to an initial position, latch means operated by said member holding said dial in its rotated position against the pull of said spring, and a plurality of electrical contacts interengaged in accordance with the degree of rotation of the dial.

2. In a selecting means, a rotatable dial carrying a plurality of finger engagements for dial rotation, a stop against which the finger will abut to limit dial rotation, a member switch operating adjacent said stop and shifted as the finger comes to rest against the stop, a spring normally returning the dial to an initial position, latch means operated by said member holding said dial in its rotated position against the pull of said spring, and a plurality of electrical contacts interengaged in accordance with the degree of rotation of the dial, said latch means comprising an electro-magnet having a latching armature interengaging with an arm connecting with said member, said member further effecting an interconnection with said dial in its latched position.

3. In a selecting means, a rotatable dial carrying a plurality of finger engagements for dial rotation, a stop against which the finger will abut to limit dial rotation, a member adjacent said stop and shifted as the finger comes to rest against the stop, a spring normally returning the dial to an initial position, latch means operated by said member holding said dial in its rotated position against the pull of said spring, and a plurality of electrical contacts interengaged in accordance with the degree of rotation of the dial, said latch means comprising an electro-magnet having a latching armature interengaging with an arm connecting with said member, said member further effecting an interconnection with said dial in its latched position, a switch closed by travel of said member, an electrical circuit including said electro-magnet and said switch.

4. In a phonograph, a plurality of sound records, means electrically reproducing sound from the records including a head relatively shiftable with said records, electro-magnetic means, determining the relative location between said head and said records, and means selectively operating said electro-magnetic means, and location selecting means comprising a rotatable dial carrying finger abutments corresponding to the locations, a stop in the path of the finger to limit dial rotation, electrical switch means operated by dial rotation, and an electrical circuit including said electro-magnetic means and said switch means, an electro-magnetic stop for re-

taining said dial in the selected position, switch means rendering said magnetic stop operative in each of the dial selected positions, and a switch actuated upon predetermined travel of said records rendering said magnetic stop means inactive.

5. In an electrically operated phonograph, a film carrying a plurality of sound tracks thereon, a motor moving said film in one direction, a sound reproducing head shiftable across the film for selective positioning at any one of the sound tracks, a master switch initiating phonograph operation, stops in the path of said head determining said positioning, a selector mechanism rendered operative by closing of said master switch, means controlled by said mechanism selectively shifting said stops, an electrical circuit including said film motor, a switch in said circuit closed by operation of said mechanism, means for shifting said head back to an initial position following the passage therepast of a predetermined length of film, means actuated by said passage for setting said shifting means into operation, and means also actuated by predetermined travel of said film for opening said master switch.

6. In an electrically operated phonograph, a film carrying a plurality of sound tracks thereon, a motor moving said film in one direction, a sound reproducing head shiftable across the film for selective positioning at any one of the sound tracks, a master switch initiating phonograph operation, stops in the path of said head determining said positioning, a selector mechanism rendered operative by closing of said master switch, means controlled by said mechanism selectively shifting said stops, an electrical circuit including said film motor, a switch in said circuit closed by operation of said mechanism, means for shifting said head back to an initial position following the passage therepast of a predetermined length of film, means actuated by said passage for setting said shifting means into operation, and means also actuated by predetermined travel of said film for opening said master switch, said head being raised to an upper position as said initial position by said shifting means, and said head being allowed to drop by gravity therefrom against said stops.

7. In an electrically operated phonograph, a film carrying a plurality of sound tracks thereon,

a motor moving said film in one direction, a sound reproducing head shiftable across the film for selective positioning at any one of the sound tracks, a master switch initiating phonograph operation, stops in the path of said head determining said positioning, a selector mechanism rendered operative by closing of said master switch, means controlled by said mechanism selectively shifting said stops, an electrical circuit including said film motor, a switch in said circuit closed by operation of said mechanism, means for shifting said head back to an initial position following the passage therepast of a predetermined length of film, means actuated by said passage for setting said shifting means into operation, and means also actuated by predetermined travel of said film for opening said master switch, said stop shifting means comprising electromagnets and said selector mechanism including switch means selectively brought into circuit with said magnets.

8. In an electrically operated phonograph, a film carrying a plurality of sound tracks thereon, a motor moving said film in one direction, a sound reproducing head shiftable across the film for selective positioning at any one of the sound tracks, a master switch initiating phonograph operation, stops in the path of said head determining said positioning, a selector mechanism rendered operative by closing of said master switch, means controlled by said mechanism selectively shifting said stops, an electrical circuit including said film motor, a switch in said circuit closed by operation of said mechanism, means for shifting said head back to an initial position following the passage therepast of a predetermined length of film, means actuated by said passage for setting said shifting means into operation, and means also actuated by predetermined travel of said film for opening said master switch, said stop shifting means comprising electromagnets and said selector mechanism including switch means selectively brought into circuit with said magnets, an electro-magnetic lock in said mechanism retaining it in a selected position against normally returning spring means, said lock magnet being energized upon closing of said switch in said motor circuit.

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