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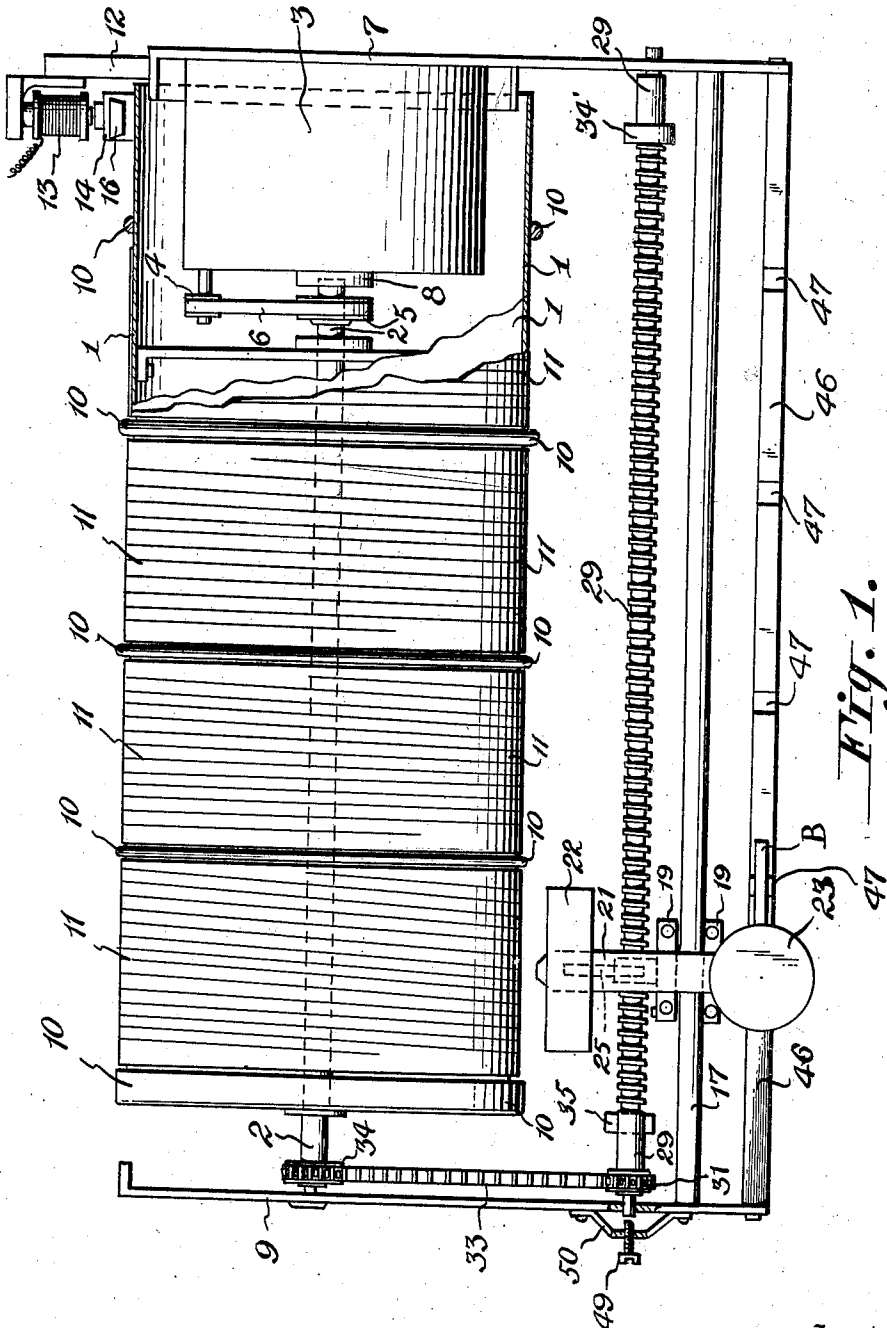
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APPARATUS FOR REPRODUCING SOUND

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3 Sheets-Sheet 1



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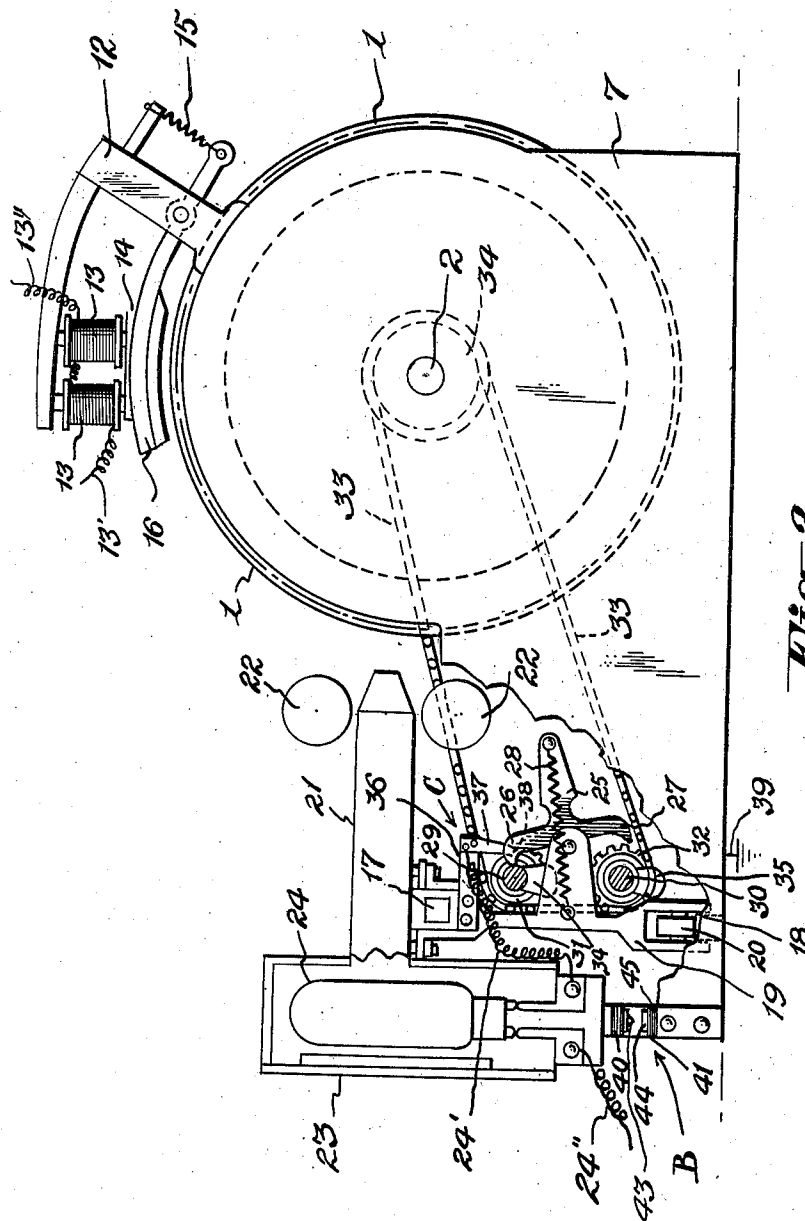


Fig. 2.

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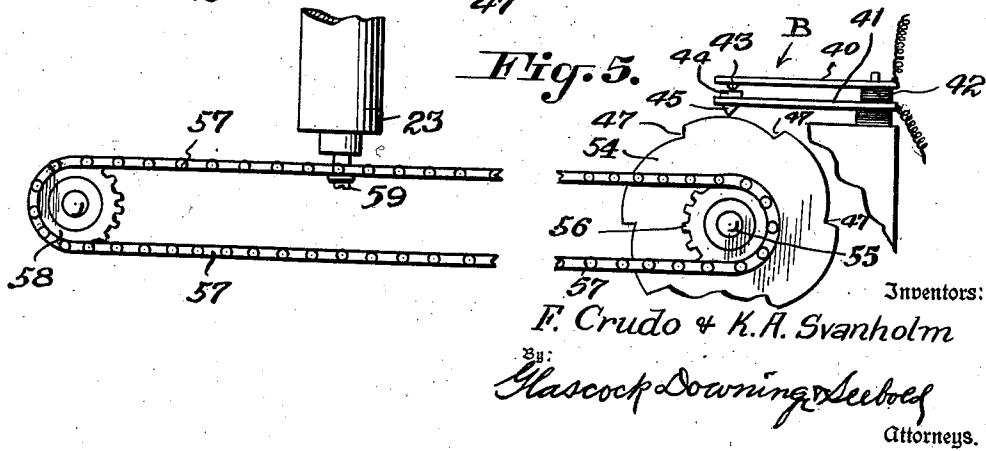
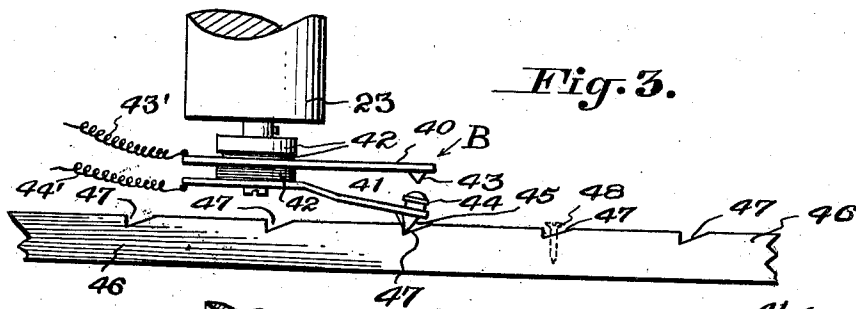
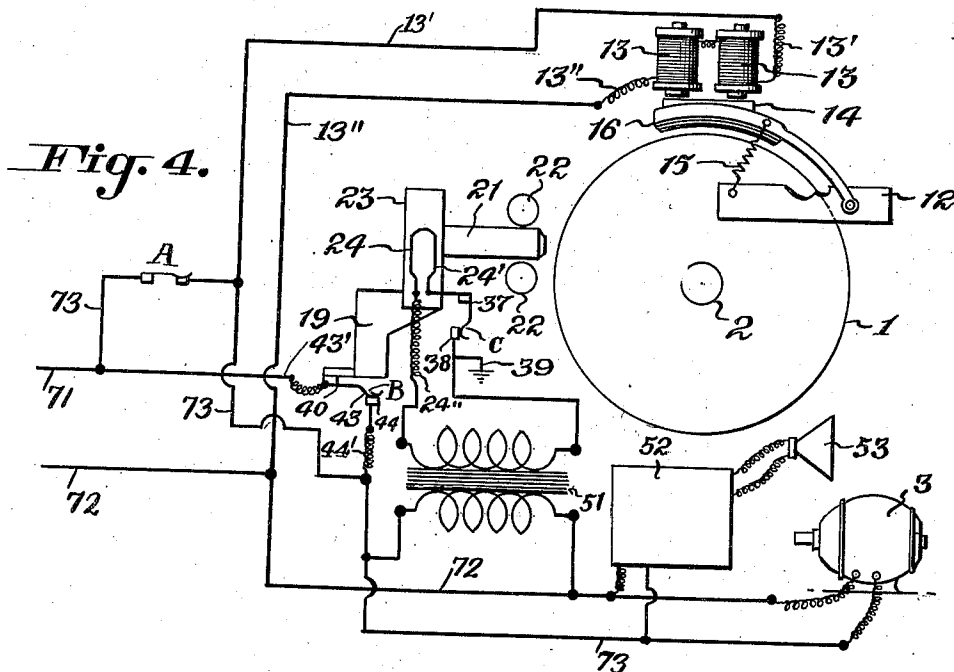
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UNITED STATES PATENT OFFICE

2,137,157

APPARATUS FOR REPRODUCING SOUND

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6 Claims. (Cl. 179-100.3)

This invention relates to apparatus for the photoelectric reproduction of sound and has for its object to provide an arrangement which may be intermittently set in operation for successively reproducing selected signals or other sounds at desired intervals under manual or other control.

In the accompanying drawings wherein approved embodiments of the invention are illustrated:

Figure 1 is a plan view of the improved apparatus, partly broken away, and shown in section.

Fig. 2 is a side elevation partly broken away and in section.

Fig. 3 is an enlarged fragmentary detail view of the holding contacts and parts associated therewith.

Fig. 4 is a diagrammatic view illustrating the electric circuits in detail.

Fig. 5 is a fragmentary detail of a modified form of means for operating the holding contacts.

Referring to the drawings in detail, the numeral 1 indicates a cylindrical carrier for the phonogram which is supported by a drive shaft 2 driven by an electric motor 3 through a belt 6 engaging pulleys 4 and 5 carried, respectively, by the shaft of the motor 3 and the supporting shaft 2. The motor 3 is supported on one end member 7 of the frame of the apparatus and the adjacent end of the shaft 2 is mounted in a bearing 8 carried by the motor casing. The opposite end of the shaft is journaled in the opposite end member 9 of the frame.

The phonogram is divided into sections indicated at 11 which are separated by guides 10 provided on the carrier 1.

The end member 7 is provided with a supporting arm 12 carrying electromagnets 13, the terminals of the coils of which are indicated at 13' and 13''. A brake arm 14 is pivotally connected with the arm 12 and the shoe 16 thereof is normally urged toward the cylinder 1 by a spring 15. The arm 14 extends below the electromagnet 13 and when the latter is energized the arm 14 is moved against the tension of the spring 15 and disengaged from the carrier cylinder 12 whereby the latter may be freely rotated.

Guides 17 and 18 are arranged one above the other in parallel relation to the shaft 2 and are fixed at their ends to the end members 7 and 9. A carriage 19 is movable in both directions along the guides 17 and 18 and the lower part thereof is provided with a roller 20 adapted to roll over

the lower guide 18 to reduce frictional resistance to the movement of the carriage.

A casing 23 is fixed to the carriage 19 and encloses a lamp 24, the light rays from which are focused on the sound track of the phonogram sections 11 by a suitable optical system located in the tube 21. The light reflected by the sound track influences photoelectric cells 22 in a manner well known in the art of photoelectric reproduction of sound.

Feed and return screws 29 and 30, respectively, are journaled in the end members 7 and 9 and the threads thereof are alternately engaged by the teeth 26 and 27 located at the opposite ends of a pivoted lever 25. A spring 28 is connected with the carriage 19 and an extension of the lever 25 that operates to maintain said lever in either of its two operative positions. Rotary movement of the shaft 2 is imparted to the screws 29 by a chain 33 engaging the several chain wheels 31, 32 and 34.

According to the position of the lever 25, one or the other of the teeth 26 or 27 thereof is engaged with a related screw and the carriage is thereby moved either in the direction of feeding thereof or in the opposite return direction. The right hand end of the feed screw 29 is provided with a cam 34' which, when the carriage reaches the end of its feed movement, strikes the tooth 26 thereby disengaging the latter from the feed screw 29, the spring 28 operating to swing the lever 25 to its other position in which the tooth 27 engages the return screw 30. The left hand end of the return screw 30 is also provided with a cam 35 which, at the completion of the return movement of the carriage, strikes the tooth 27 and restores the lever 25 to the position in which the tooth 26 is engaged with the feed screw 29.

An insulating member 36 is attached to the carriage 19 and supports a contact brush 37 engaged by the contact member 38 of the tooth 26 when the latter is in operative engagement with the feed screw 29. The brush 37 is connected with one pole of the lamp 24 by a conductor 24' while the contact 28 is grounded as indicated at 39 in Fig. 4 on the conducting material of the apparatus. A conductor 24'' is connected with the other pole of the lamp 24.

As shown in Fig. 3, a circuit closing and holding device B is provided which is constituted by flexible members 40 and 41 fixed to the base of the casing 23 by insulators 42 and provided with holding contacts 43 and 44 normally held in spaced relation by the lower flexible member 41. The flexible members 40 and 41 are connected,

respectively, with conductors 43' and 44'. The end of the flexible member 40 is provided with a tooth 45 slidable along the top edge of a rod 46 fixed between the end members 7 and 9 and provided at intervals with notches 47 into which the tooth is pressed by the tension of the lower flexible member 41. As the tooth 45 is carried upwardly along the inclined surface of each notch 47 incident to the motion of the carriage 19, the holding contacts 43 and 44 are engaged. If it is desired to render one or more of the notches 47 ineffective, a screw 48 may be applied to the rod 46 the head thereof preventing the tooth 45 from entering the notch 47.

In order to bring the beam of light from the lamp 24 into proper registration with the sound track of the phonogram sections 11 the feed screw 29 may be adjusted axially in its bearing by means of a screw 49 threaded in a bracket 50.

Fig. 4 represents diagrammatically the electrical connections to the various parts of the apparatus and the electrical conductors supplying the current for operation thereof are designated at 71 and 72. The operation of the apparatus is controlled by a manually operable circuit controlling device A interposed in a conductor 73 leading from the supplying conductor 71 to the motor 3. The other pole of the motor is connected directly with the supply conductor 72. An audio frequency amplifier 52 and the primary winding of a transformer 51 are also supplied with current from the conductors 72 and 73. The amplifier 52 is influenced in the usual manner by the photoelectric cells 22 and the audible reproduction of the recorded sound is emitted by a loud speaker 53. One pole of the secondary winding of the transformer 51 is connected with the conductor 24' leading to the lamp 24 and the other pole of the secondary winding is grounded as indicated at 39 and supplies current to the lamp 24 over the conductor 24' when the brush 37 is in engagement with the contact 38.

The operation of the apparatus is as follows:

Assuming the holding contacts 43 and 44 are open as shown in Fig. 3 and the tooth 26 of the lever 25 is engaged with the feed screw 29 so that the contact 38 is engaged with the brush 37, the supply circuit is closed by actuating the control device A. The conductor 13' of the electromagnet 13 is connected with the circuit controlling device A while the conductor 13'' is connected directly with the supply conductor 72 and thus, upon actuation of the controlling device A, the electromagnet 13 is energized and the brake shoe 16 is withdrawn from the cylinder 1 thereby releasing the latter. The motor 3 is also set in operation and rotates the cylinder 1 together with the phonograms secured thereon through the driving connection 6. The motion of the shaft 2 is transmitted to the feed screw 29 by the drive chain 33 and owing to the engagement of the tooth 26 with the thread of the feed screw, the carriage 19 is advanced in the direction of its feed movement. The circuit of the lamp 24 is closed over the brush 37 engaging the contact 38 and being energized by the current of the secondary winding of the transformer 51, the light from said lamp is focused by the focussing device 21 on the sound track of the phonogram. During the initial movement of the carriage, the tooth 45 is moved upwardly along the inclined face of the notch 47 until the contact 44 is brought into engagement with the contact 43 and thus a holding circuit for the motor 3, the electromagnet 13 and amplifier 52 is closed over

the conductors 43' and 44'. The holding device B remains operative throughout the reproduction of a sound track on one of the phonogram sections 11 and at the completion of such reproduction the tooth 45 enters the next succeeding notch 47 in the rod 46 whereupon the contact 44 is disengaged from the contact 43 and the circuit is broken. Consequently, the operation of the motor 3, amplifier 52 and transformer 51 is interrupted and the electromagnet 13 being de-energized, permits the application of the brake shoe 16 to the cylinder 1 under the influence of the spring 15. At each actuation of the circuit controlling device A the carriage 19 moves to an extent corresponding to the length of one of the phonogram sections 11 and when the carriage approaches the end of its feed movement to the right in Fig. 1, the cam 34' strikes the upper tooth 26 turning the lever 25 about its pivotal axis and the tension of the spring 28 engages the lower tooth 27 with the return screw 30. The tilting of the lever 25 to cause engagement of the tooth 27 with the return screw 30 disengages the contact 38 from the brush 37 and thus, during the return of the carriage under the influence of the return screw 30 the circuit of the lamp 24 is interrupted. When the carriage 19 reaches the end of its return movement, the cam 35 of the return screw 30 strikes the lower tooth 27 thereby restoring the lever 25 to the position shown in Fig. 2 and reestablishing engagement between the contact 24 and the brush 37. Thus the circuit of the lamp is again closed and upon subsequent operation of the controlling device A, the screw 29 which is now engaged by the tooth 27 causes the carriage to resume its feed movement.

Fig. 5 shows a modification of the arrangement for operating the holding contacts 43 and 44 which, in this case, are mounted on a stationary support and actuated by a disk 54 rotatable with a shaft 55 and provided with circumferential notches 47 cooperating with a tooth 45 of the flexible member 41. The disk 54 is secured to a sprocket wheel 56 engaged by a chain 57 which is movably supported at its opposite end on a sprocket wheel 58. The two wheels 56 and 58 are spaced apart a distance approximately corresponding to the range of movement of the carriage 19 and the latter is connected with the chain 57 at 59. Thus during the feed and return movements of the carriage, motion is imparted to the chain 57 and the disk 54, the tooth 45 periodically entering a notch 47 and interrupting the holding circuit of the motor 3, electromagnet 13, transformer 51 and amplifier 52.

What is claimed is:

1. Apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage, a source of light on said carriage, focusing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, and means coacting with said controlling means at predetermined points in the travel of said carriage to open said circuit.

2. Apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage,

a source of light on said carriage, focussing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, means coacting with said controlling means at predetermined points in the travel of said carriage to open said circuit, said motor being connected with said circuit, and means for simultaneously closing the circuit of said motor and said source of light.

3. An apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage, a source of light on said carriage, focussing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, means coacting with said controlling means at predetermined points in the travel of said carriage to open said circuit, and an interrupter fixed to said carriage and interposed in the supply circuit of said source of light.

4. Apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage, a source of light on said carriage, focussing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, means coacting with said controlling means at predetermined points in the travel of

said carriage to open said circuit, and an interrupter for starting the motor driving the cylindrical phonogram carrier.

5. Apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage, a source of light on said carriage, focussing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, means coacting with said controlling means at predetermined points in the travel of said carriage to open said circuit, said phonogram carrier being provided with guides separating sections of the phonogram.

6. Apparatus for the photoelectric reproduction of sound including a rotary phonogram carrier, with sound track arranged in helicoidal form, an electric motor for driving said carrier, a carriage movable longitudinally of said carrier, an electrical pick-up movable with said carriage, a source of light on said carriage, focussing means for said light source, a supply circuit for said light source, circuit controlling means in said circuit, means coacting with said controlling means at predetermined points in the travel of said carriage to open said circuit, a brake for the phonogram carrier, and electro-mechanical means for releasing said brake.

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