Jan. 9, 1923. 1,441,511

R. E. LAGERQUIST.

REPEATER FOR SOUND REPRODUCING INSTRUMENTS.

FILED JUNE 2, 1922. 2 SHEETS-SHEET 1

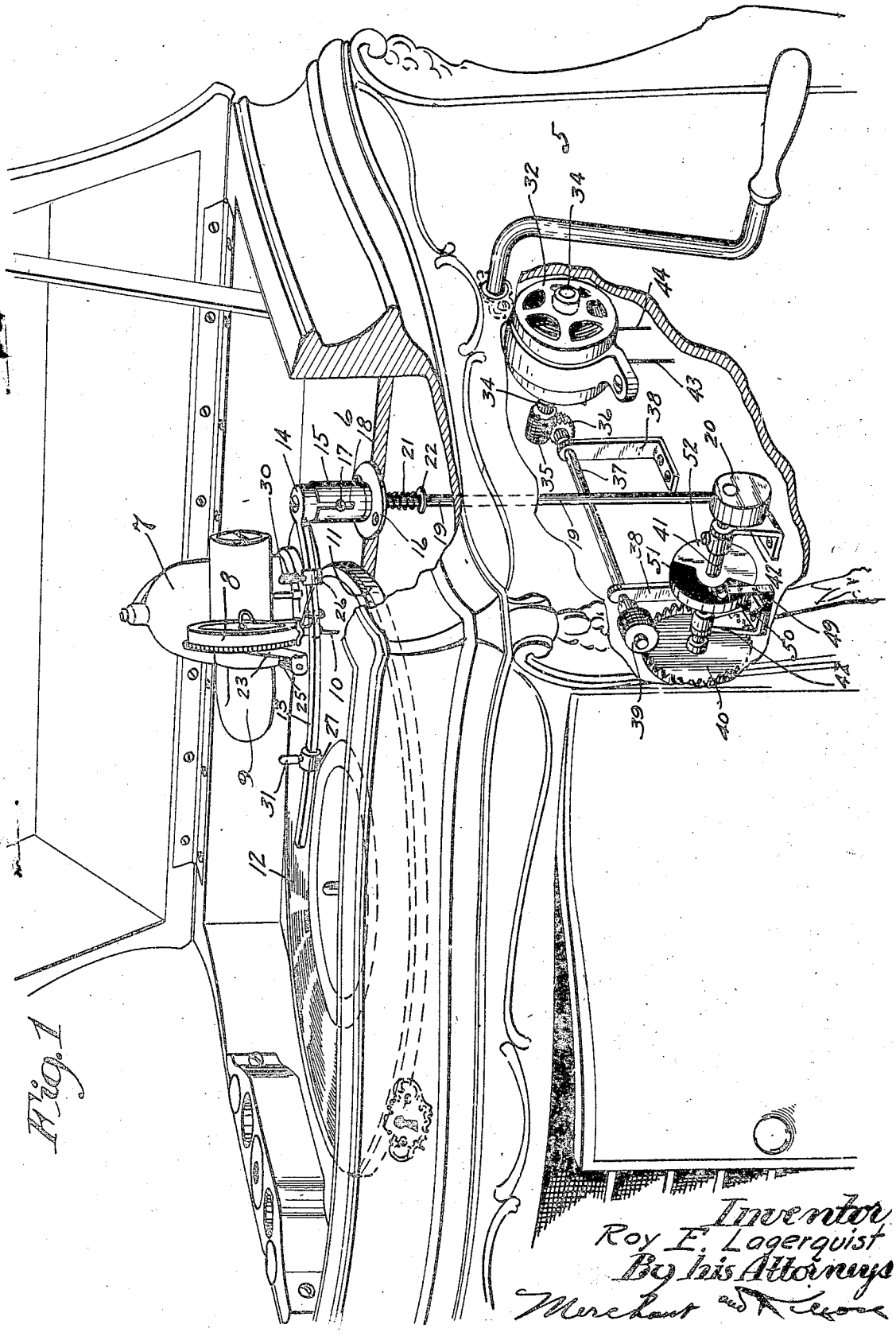


Fig. 1

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Fig. 2

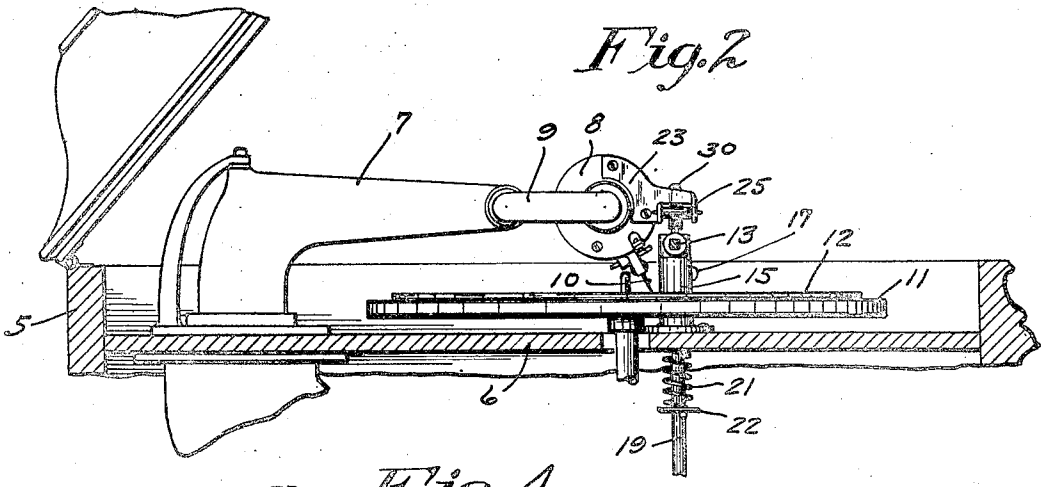



Fig. 4

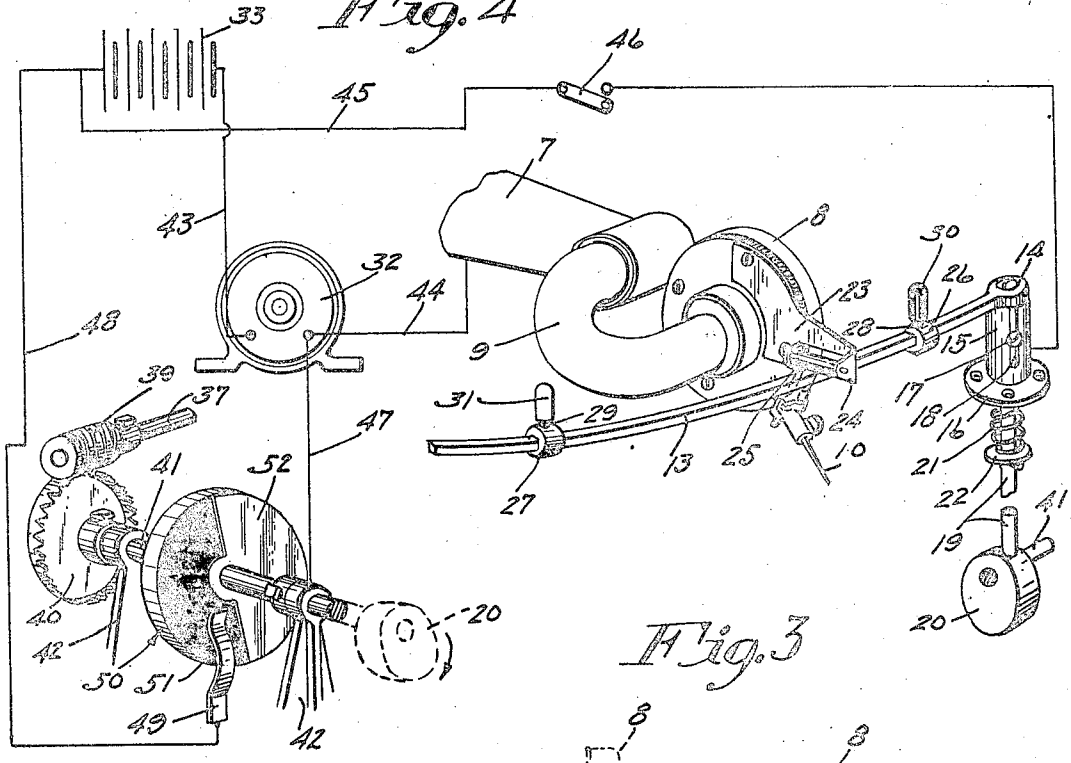
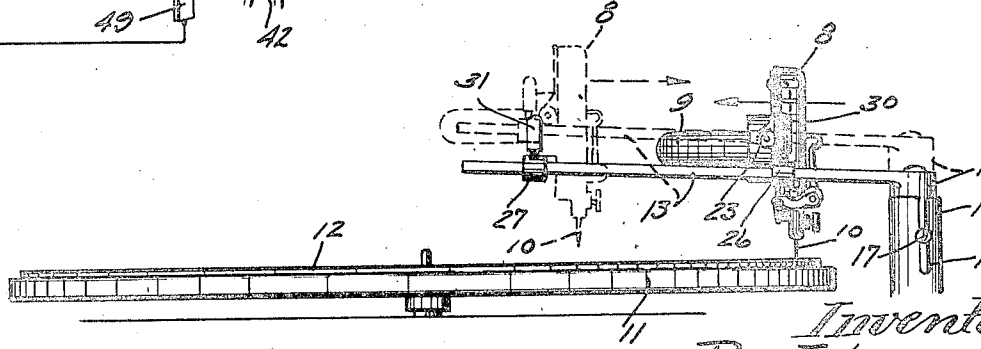



Fig. 3




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Patented Jan. 9, 1923. 1,441,511

# UNITED STATES PATENT OFFICE.

ROY E. LAGERQUIST, OF MINNEAPOLIS, MINNESOTA.

## REPEATER FOR SOUND-REPRODUCING INSTRUMENTS.

Application filed June 2, 1922. Serial No. 565,370.

*To all whom it may concern:*

Be it known that I, ROY E. LAGERQUIST, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Repeaters for Sound-Reproducing Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to sound-reproducing instruments, such as phonographs, and, more particularly, my invention relates to improvements in repeaters, whereby the needle-equipped sound box commonly used in such instruments will be caused to automatically return to its starting position after a record has been played, and has for its object to improve the same in the several particulars hereinafter noted.

To the above end, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a fragmentary perspective view of a Victor phonograph having the invention embodied therein, some parts being broken away and sectioned;

Fig. 2 is a fragmentary view partly in left side elevation and partly in vertical section taken through the cabinet at the axis of the turntable;

Fig. 3 is a front elevation of certain of the parts shown in Fig. 2, with some parts shown in different positions by means of broken lines; and

Fig. 4 is a view showing the wiring diagram for the repeater.

Of the parts of the Victor phonograph illustrated in the drawings, it is only necessary to note the cabinet 5, the motor board 6, horizontal swinging tone arm 7, sound box 8 connected to the tone arm 7 by a goose neck 9 for raising and lowering movements, needle 10 secured to the sound box, turntable 11 and record 12.

The repeater mechanism includes a horizontally curved track rail 13, which extends radially over the record 12, in front of the sound box 8, and has its axis at the axis of the tone arm 7. It is important to note, as best shown in Fig. 3, that the track rail 13 is downwardly inclined from its inner end to its outer end. This track rail 13, at its outer end, is rigidly secured to and supported from a vertically disposed cylindrical head 14 mounted for endwise movement in a sleeve bearing 15 having a flanged base 16 secured to the motor board 6, by screws, outward of the turntable 11. To hold the track rail 13 against horizontal swinging movement, the head 14 is provided with a guide 17 in the form of a screw, which works in a vertical slot 18 in the sleeve bearing 15 and permits the required endwse movement of said head.

The head 14 is rigidly secured to the upper end of an upright shaft 19, which, at its lower end, is supported on the periphery of a cam wheel 20. The shaft 19 extends loosely through an aperture in the motor board 6 and is yieldingly held on the periphery of the cam wheel 20 by a coiled spring 21, which encircles said shaft and is compressed between a collar 22 thereon and the motor board 6.

Attached to the back of the sound box 8 is a bracekt 23, which extends radially in respect thereto and has a pair of axially aligned bearings 24 radially spaced in respect to the sound box 8 in which is journaled a roller 25 arranged to travel on the track rail 13, as will hereinafter appear. Normally, the shaft 9 is supported on the lowermost portion of the cam wheel 20 and supports the track rail 13 in its lowermost position in which it is out of engagement with the anti-friction roller 25 when the needle 10 is resting on the record 12.

Mounted for longitudinal adjustment on the track rail 13 is an outer collar 26 and an inner collar 27 held in different adjustments by set screws 28 and 29, respectively, having pinlike heads, the former of which affords a stop 30 and is of insulating material, and the latter of which affords an electrical contact 31. The collars 26 and 27 have polygonal engagement with the track rail 13 to hold the same from turning thereon but with freedom for longitudinal sliding movement. The stop 30 is arranged to be engaged by the bracket 23 and to position the needle 10 over the outermost convolution in the record 12, and the contact 31 is arranged to be engaged by the roller 25 when

the needle 10 is in the innermost convolution of the record, or, in other words, at the completion of the playing of said record.

To give the cam wheel 20 one complete rotation and thereby raise the track rail 13, by means of the shaft 19, and then lower the same, I provide an electric motor 32, which receives its source of electrical energy from a battery 33 and has on its armature shaft 34 a worm 35. This worm 35 meshes with a worm gear 36 on one end of a countershaft 37 journaled in a pair of bearings 38. Keyed to the other end of the countershaft 37 is a worm 39, which meshes with a gear 40 on a driven shaft 41 journaled in bearings 42, to which shaft the cam 20 is keyed.

In connection with the motor 32 and battery 33, there is provided a starting circuit and a running circuit, the former of which includes wires 43, 44 and 45. The wire 43 extends from the motor 32 to the battery 33 and is also common to the running circuit, as will hereinafter appear; the wire 44 extends from the motor 32 to the tone arm 7; and the wire 45 extends from the battery 33 and is grounded on the bearing 15 and has interposed therein a manually operated switch 46. At the completion of the playing of a record, the roller 25 will come into engagement with the contact 31 and complete the starting circuit through the wires 44 and 45, tone arm 7, goose neck 9, sound box 8, bracket 23, roller 25, contact 31, track rail 13, head 14 and bearing 15.

The running circuit, as previously stated, includes the wire 45 and wires 47 and 48, the former of which extends from the same terminal on the motor 32 as the wire 44 and is grounded on one of the bearings 42. The wire 48 extends from the battery 33 to a spring switch-finger 49, which co-operates with a rotary switch 50 on the driven shaft 41 to make and break the running circuit. This rotary switch 50 comprises an insulating disk 51 and a contact disk segment 52, secured to one of the flat faces of said insulating disk, and with which elements 51 and 52, the spring finger 49 has a wiping contact. The contact disk segment 52 is electrically connected to the wire 47 through the shaft 41 and bearing 42.

*Operation.*

The operation of the repeater may be briefly stated as follows:

Before playing a record that is to be repeated, the needle 10 is positioned in the outermost convolution in the record 12, or, in other words, at the beginning of the record, and the stop is adjusted on the track rail 13 to engage the bracket 23. The needle 10 is then shifted into the innermost convolution of the record, or, in other words, at the end of the record, and the contact 31 is adjusted on the track rail 13 to engage the roller 25. While this adjustment is going on, the manually operated switch 46 must be open. After these adjustments are made, the switch 46 is closed and the turntable 11 started in the customary manner.

At the completion of the playing of the record, the roller 25 engages the contact 31 and completes the starting circuit, which starts the motor 32, thus causing the driven shaft 41 to rotate in the direction of the arrow marked on Fig. 4. Under the rotation of the driven shaft 41, the cam wheel 20 raises the track rail 13, by means of the shaft 19. This movement of the track rail 13 engages the roller 25 and lifts the sound box 8, which carries the needle 10 out of engagement with the record 12. The inclination of the track rail 13 is such as to cause the roller 25 to travel thereon until stopped by the engagement of the bracket 23 with the stop pin 30, thus positioning the needle 10 at the beginning of the record. During the latter part of the return movement of the roller 25 on the track rail 13, the cam wheel 20 starts to recede, and before it has made a complete rotation to allow the track rail 13 to assume its lowermost position, the starting circuit is broken by the movement of the track rail 13 out of engagement with the roller 25 after the needle 10 has been positioned on the record.

After the starting circuit is broken, the running circuit continues to operate the cam wheel 20 until it has just about completed its rotation. This running circuit is then broken by the movement of the contact element 52 out of engagement with the spring finger 49. After the running circuit is broken, the momentum of the motor 32 will continue to move the cam 20 to complete its rotation and to also closely position the starting point on the contact element 52 in respect to the spring finger 49.

It is, of course, understood that the stop 30 and contact 31 may be adjusted on the track rail 13 so as to play not only the entire record, but any part thereof which may be repeated any number of times.

What I claim is:

1. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record with freedom for raising and lowering movements, in combination with an endwise movable shaft, of an inclined track rail secured to the shaft, and means operative on the shaft to raise the track rail and thereby cause the sound box to return thereon to a starting position and then lower said track rail to release the sound box.

2. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record with freedom for raising and lowering movements, in combination with an endwise movable shaft,

of an inclined track rail secured to the shaft, a cam operative on the shaft, and motor-actuated connections to the cam to raise the track rail and thereby cause the sound box to return thereon to its starting position and then lower said track rail to release the sound box.

3. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record with freedom for raising and lowering movements, in combination with a cam, of an endwise movable shaft supported on the cam, an inclined track rail secured to the shaft, and motor-actuated connections for operating the cam to raise the track rail and thereby cause the sound box to return thereon to its starting position and then lower said track rail to release the sound box.

4. The structure defined in claim 3 in further combination with yielding means for holding the shaft on the cam.

5. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record with freedom for raising and lowering movements, in combination with an endwise movable shaft, of an inclined track rail secured to the shaft, a stop on the track rail for positioning the sound box over the starting point on the record, a contact on the track rail arranged to be engaged by a part movable with the sound box, and means operative on the shaft to raise the track rail and thereby cause the sound box to return thereon until arrested by said stop and then lower said track rail to release the sound box, said means including a motor circuit of which said contact, track rail, and sound box form a part.

6. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record, in combination with mechanical means for returning the sound box to its starting position, of electrical means including a starting circuit and a running circuit for actuating said mechanical means, said starting circuit having a contact arranged to be engaged by a part movable with the sound box to complete the circuit, said running circuit having a normally open switch arranged to be automatically closed under the action of the starting circuit.

7. The structure defined in claim 6 in which the switch in the running circuit is automatically broken.

8. The structure defined in claim 6 in which the contact in the starting circuit is adjustable for records of different sizes and lengths.

9. A repeater for a sound-reproducing instrument having a sound box arranged to traverse a revoluble record, in combination with mechanical means for returning the sound box to its starting position and including front and rear stops for positioning the sound box at the beginning of a record and at the end thereof, respectively, of electrical means including a starting circuit and a running circuit for actuating said mechanical means, said starting circuit including said rear stop as a contact which when engaged by the sound box completes the starting circuit, said running circuit having a normally open switch arranged to be closed under the action of the starting circuit and automatically broken.

In testimony whereof I affix my signature.

ROY E. LAGERQUIST.