

UNITED STATES PATENT OFFICE.

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PHONOGRAPH.

No. 831,630.

Specification of Letters Patent.

Patented Sept. 25, 1906.

Application filed July 23, 1903. Renewed July 2, 1904. Serial No. 215,180.

To all whom it may concern:

Be it known that I, WILLIAM W. ROSENFELD, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented an Improvement in Phonographs, of which the following is a specification.

This invention relates to automatic return mechanisms for phonographs.

A full understanding of the invention can best be given by a detailed description of a preferred construction embodying the various features thereof, and such description will now be given in connection with the accompanying drawings, showing such a preferred construction.

In said drawings, Figure 1 is a plan view of a phonograph provided with automatic return mechanism embodying my invention. Fig. 2 is an elevation of the return mechanism with the auxiliary or return feed-shaft broken away, so as to more clearly show other parts. Fig. 3 is a section taken on the line $x-x$ of Fig. 1 looking toward the left, and Fig. 4 is a section taken on the line $y-y$ of Fig. 1 looking toward the left, parts being omitted from Fig. 3 for clearness which are shown in Fig. 4.

a represents the usual bed of a phonograph or similar machine; b , the threaded feed-shaft; b' , the mandrel, which is shown as carried by the feed-shaft; b^2 , bearings for the feed-shaft and mandrel, and 2 the driving-pulley for the feed-shaft. The back frame a' carries a sliding sleeve d of usual construction, to the right-hand end of which is secured the reproducer arm or carrier e , and 5 is a rest for the free end of the reproducer-arm for supporting the same as it makes its reproducing movement. In the drawings I have not shown the reproducer proper, but only the annular carrier adapted to receive the same. The sleeve d also carries a feed-arm d' , provided with a threaded block of usual construction to mesh with the thread of the feed-shaft b , so that in the usual manner movement is communicated from the shaft b through the feed-arm d' to the sleeve d and to the reproducer-arm e , causing the same to move longitudinally of the record on the mandrel b' . The parts above described are or may be of usual construction. c is a swinging arm of usual form.

An auxiliary shaft f , which serves as a return feed-shaft, is provided with a spiral groove or screw-thread 7 and has a portion of its surface between the convolutions of the

spiral groove at or near its right-hand end provided with teeth 8 and is mounted in bearings $f^2 f^3$ on an auxiliary bed or plate f' , adapted to rest upon and be secured to the bed a . The right-hand end of the shaft f is reduced to pass into the bearing f^2 , but the left-hand end of the shaft is of full size and passes through the bearing f^3 , and upon the end of the shaft adjacent to this latter bearing is a gear 4, meshing with a gear 3 on the feed-shaft b . To prevent the auxiliary shaft f from moving out of its bearing, the left-hand bearing f^3 is provided with a screw-stud 19, which carries a disk 20, which overlaps the gear 4 to prevent longitudinal movement of the auxiliary shaft. An eccentric cam g , having a spiral rib or shoulder, is mounted on the auxiliary shaft, so as to be adjustable longitudinally thereof, being secured in position by means of a set-screw, as shown in Fig. 2. Fig. 4 shows the eccentric shape of the cam, and Figs. 1 and 2 show the spiral form thereof.

A bracket h is secured to the sleeve d , as by means of an arm h' , split and clamped to the sleeve by means of a screw, as shown in Fig. 3. The bracket h carries a bar 9, having a flat face, said bar extending through an opening in the bracket and parallel with the auxiliary shaft f , being adjustable lengthwise and secured in any desired position of its lengthwise adjustment by means of a screw 15. An eccentric segment i is rotatably mounted on the right-hand end of the bar 9, its rotary movement being limited, as by means of the pin 14, which engages the cut-away end of the hub of the segment, and the segment is normally held in the position shown in the drawings by means of a helical spring 11, one end of which is secured to the segment and the other end to a collar or hub 10, fast on the bar 9. The greater portion of the periphery of the eccentric segment is provided with teeth 12, and the portion of the periphery beyond the teeth at the end of greatest radius forms a tail-rib 13. Extending from the face of the eccentric segment is a cam-plate i' , the outer edge of which is at an inclination to the axis of the bar 9. This cam-plate is adapted to engage an abutment formed, as shown, by a post 6, having a horizontal portion which passes through a part of the bearing f^2 and is adjustably secured by means of a set-screw to provide for adjustment of the post longitudinally of the direction of movement of the segment i . The

bracket *h* also carries an arm *k*, which is pivoted to the under side of the bracket, as by means of a stud 16, secured in a recess in the bracket, which recess also serves to receive a spiral spring 17, one end of which is secured to the arm *k* and the other end to the stud 16, the office of said spring being to apply tension to the arm *k* and to hold the arm normally in position with a rearward extension thereof against a stop-pin 18. The forward end of the arm *k* is provided with a downwardly-projecting stud *k'* for engaging the eccentric spiral cam *g*.

The operation is as follows: The bracket *h*, carrying the eccentric segment *i* and arm *k*, moves with the sleeve *d* and reproducer-arm *e* as the reproducer makes its reproducing movement, the eccentric segment being at this time held by the spring 11 in its normal position, as shown in the drawings. As the reproducer draws near the end of the record the cam-plate *i'* comes into engagement with the post 6, so that as the movement continues the eccentric segment *i* is turned to bring its teeth 12 into engagement with the teeth 8 of the auxiliary or return feed-shaft. The segment is then further turned or rotated by the rotation of the auxiliary shaft and its toothed periphery caused to progressively engage the toothed surface of the shaft until the tail-rib 13 is brought into position to enter the groove 7 of the auxiliary shaft. This turning movement of the eccentric segment because of the eccentric or cam form of the segment raises the bracket *h*, and thereby rocks the sleeve *d* and elevates the reproducer-arm *e* to move the point of the reproducer off the record and elevates the feed-arm *d'* to disengage its threaded block from the shaft *b*, thereby interrupting the forward or reproducing movement of said parts. The tail-rib 13 being then brought into position to enter the groove of the auxiliary shaft and the rotation of the auxiliary shaft continuing, a reverse movement is imparted to the bracket *h*, sleeve *d*, reproducer-arm, and feed-arm, said parts then moving toward the left in Fig. 1, and this movement is secured without necessitating any stoppage or change in direction of rotation of the feed-shaft *b*. The rotation of the auxiliary shaft *f* is in a direction opposite to the direction in which the spring 11 tends to move the eccentric segment *i* to return it to the position shown in Fig. 3. Consequently the rotation of the auxiliary shaft, while causing the return movement of the parts, tends to keep the eccentric segment in position with its tail-rib 13 in the groove of the shaft, the weight of the reproducer-arm and feed-arm being at this time supported by the eccentric segment and tending to increase the friction between the tail-rib 13 and the auxiliary shaft. As the parts approach the extreme left-hand end of their return movement, the stud *k'* of the arm *k* comes into engagement

with the eccentric spiral cam *g*, and if a high part of the cam is uppermost the arm *k* yields until a low point of the cam *g*—that is, a point near the surface of the auxiliary shaft—comes opposite the stud *k'*. When such low point of the cam is opposite the stud *k'*, the stud moves over the surface of the cam, and as the cam continues its rotary movement it will by engagement with the stud *k'* cause a further elevation of the bracket *h*, whereby the eccentric segment will be raised to clear the auxiliary shaft. When the eccentric segment is thus raised out of engagement with the auxiliary shaft, it will be returned by the action of the spring 11 to its normal position, (shown in the drawings,) and then by the continued rotation of the cam *g* the bracket *h* will again be lowered, and at the same time stud *k'*, coming into engagement with the spiral shoulder or rib of the cam, will be run off the cam and the parts will return to position, with the threaded block of the feed-arm *d'* in engagement with the feed-shaft *b* and with the reproducer again in reproducing position, and the parts will be in position for another reproducing movement. The coaction of the cam-plate *i'* and post 6 and of the teeth 12 of the eccentric segment with the teeth 8 of the auxiliary shaft effect a gradual operation upon and raising of the reproducer-arm *e* and the parts connected therewith, gradually bringing the tail-rib 13 into the groove 7 for the return movement, and the coaction of the arm *k* and its stud *k'* under the control of the spring 11 with the eccentric spiral cam *g* effects a stopping of this return movement and a gradual lowering of the reproducer-arm and feed-arm into position for another reproducing movement. The adjustment provided for the eccentric spiral cam *g* longitudinally of the auxiliary shaft *f* and the adjustment provided for the bar 9, carrying the eccentric segment *i*, and for the bar 6 in the bearing *f'* is to adapt the mechanism for records of varying lengths, so that the reproducing devices may operate only over the length of the actual record, and so that there may be no time wasted or unnecessary distance traveled by the parts.

The invention provides an exceedingly simple mechanism positive in its action and efficient and having no parts liable to get out of order.

It will be understood that the invention is not to be limited to the exact constructions and arrangements of parts shown, and to which the foregoing description has been mainly confined, but that it includes changes and modifications thereof within the claims. For example, I do not herein limit myself to the employment of the spring-controlled arm *k* or the particular parts associated therewith, as the stud 16 may be tightened and said arm be thus caused to occupy a fixed

position and the eccentric cam *g* be placed in accordance with such a change of the arm.

Furthermore, some equivalent structure may be used in lieu thereof without departing from my invention. It will be understood also that the term "phonograph" is used herein as a broad term to include all sound-reproducing machines to which the invention is or may be found applicable.

10 I claim as my invention—

1. In a phonograph, the combination with a threaded feed-shaft, the reproducer-arm and parts connecting the same to the feed-shaft, of a threaded return feed-shaft, a revoluble lifting device whose axis is substantially parallel with the axis of the return-feed shaft so that the device turns at substantially right angles to the line of the return feed-shaft, said revoluble device being adapted to be turned by engagement of successive peripheral portions thereof with the surface of the return feed-shaft for lifting the reproducer-arm.

2. In a phonograph, the combination with a threaded feed-shaft, the reproducer-arm and parts connecting the same to the feed-shaft, of a threaded return feed-shaft, a revoluble eccentric lifting device whose axis is substantially parallel with the axis of the return-feed shaft so that the device turns at substantially right angles to the line of the return feed-shaft, said revoluble device being adapted to be turned by engagement of successive portions of its eccentric peripheral surface with the surface of the return feed-shaft for lifting the reproducer-arm.

3. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a revoluble lifting device mounted to move with the reproducer-carrier and whose axis is substantially parallel with the axis of the return feed-shaft so that the device turns at substantially right angles to the line of the return feed-shaft, said revoluble device being adapted to be turned by engagement of successive peripheral portions thereof with the surface of the return feed-shaft for lifting the reproducer from the record and having a part for engaging the thread of said shaft for imparting a return movement to the reproducer-carrier.

4. The combination with the reproducer-carrier of a phonograph, of a threaded return feed shaft, a revoluble eccentric lifting device mounted to move with the reproducer-carrier and whose axis is substantially parallel with the axis of the return feed-shaft so that the device turns at substantially right angles to the line of the return feed-shaft, said revoluble device being adapted to be turned by engagement of successive portions of its eccentric peripheral surface with the surface of the return feed-shaft for lifting the reproducer from the record and having a part for engaging the thread of said shaft for im-

parting a return movement to the reproducer-carrier.

5. In a phonograph, the combination with the reproducer-arm, the sleeve to which the same is connected, a threaded feed-shaft, the mandrel, and the feed-arm connected to the sleeve of the reproducer-arm and adapted for operating the instrument in the usual manner, of a threaded return feed-shaft parallel with the feed-shaft, a revoluble member mounted to move with the reproducer-arm and having an eccentric or cam periphery, means for causing said member to engage the return feed-shaft at the end of the reproducing movement of the reproducer-arm, said member being adapted to be turned by engagement of successive portions of its cam-periphery with the return feed-shaft to raise the reproducer-arm and the feed-arm and having a part adapted to engage the thread of the return feed-shaft to impart a return movement to the reproducer-arm and the feed-arm, and means for again reconnecting the parts to repeat the original movements of the instrument.

6. The combination with the reproducer-carrier of a phonograph, of a return feed-shaft provided with a spiral groove and with teeth on the surface at one end between the convolutions of the groove, an abutment, a device movable with the reproducer-carrier and adapted to be moved into engagement with the return feed-shaft by coming in contact with said abutment, said device having parts adapted thereafter to successively engage the teeth and the groove of said return feed-shaft to raise the reproducer from the record and return the reproducer-carrier by the rotation of the return feed-shaft to its initial position.

7. The combination with the reproducer-carrier of a phonograph, of a return feed-shaft provided with a spiral groove and with teeth on the surface at one end between the convolutions of the groove, an abutment, a device movable with the reproducer-carrier and adapted to be moved into engagement with the return feed-shaft by coming into contact with said abutment, said device having parts adapted thereafter to successively engage the teeth and the groove of said return feed-shaft to raise the reproducer from the record and return the reproducer-carrier by the rotation of the return feed-shaft to its initial position, and means for effecting the disengagement of said device from the return feed-shaft and the return of the operative parts of the phonograph to position for the next reproducing movement.

8. In a phonograph, the combination with a threaded feed-shaft and means operated thereby for reproducing a phonograph or other record, of a threaded return feed-shaft parallel with the feed-shaft and having peripheral teeth at one end, a part associated

with the reproducer portions of the phonograph, a spring-controlled eccentric segment revolubly mounted on said part and normally free from the return feed-shaft and having teeth on its periphery and a tail-rib on one end thereof, a cam-plate carried by said segment, an abutment adapted to engage said cam-plate to turn said segment and bring its toothed portions into engagement with the return feed-shaft, such engagement causing a turning of said segment to cause successive portions of its eccentric periphery to successively engage the return feed-shaft to gradually raise the reproducing devices of the instrument and to bring the tail-rib of the segment into engagement with the thread of the return feed-shaft for returning the reproducing devices to their initial position.

9. In a phonograph, the combination with a threaded feed-shaft and means operated thereby for reproducing the phonograph or other record, a threaded return feed-shaft parallel with the feed-shaft and having peripheral teeth at one end, a bracket-arm associated with the reproducer portions of the phonograph, an eccentric segment revolubly mounted on said bracket-arm and normally free from the return feed-shaft and having teeth on a portion of its periphery and a tail-rib on the same beyond the teeth, a return-spring acting on the segment, a cam-plate on the segment, means for limiting the swinging movement of said eccentric segment, an abutment adapted to engage said cam-plate to turn said segment and bring its toothed portion into engagement with the return feed-shaft, such engagement of the return feed-shaft with said segment causing a turning of said segment to cause successive portions of its eccentric periphery to successively engage the return feed-shaft to gradually raise the reproducing device of the instrument and to bring the tail-rib of the segment into engagement with the groove of the return feed-shaft for returning the reproducing devices to their initial position.

10. The combination with the reproducer-carrier of a phonograph, of a return feed-shaft, an abutment at one end of the return feed-shaft, an eccentric segment mounted to move with the reproducer-carrier, a device connected to the eccentric segment and adapted to come into contact with said abutment for moving said eccentric segment and causing a coaction of the same with the return feed-shaft for raising the reproducer from the record and returning the reproducer-carrier to its initial position.

11. The combination with the reproducer-carrier of a phonograph, of a return feed-shaft, an adjustable abutment, a spring controlled and returnable eccentric segment revolubly mounted to move with the reproducer-carrier, said segment being adapted to

coact with the return feed-shaft to raise the reproducer from the record and return the reproducer-carrier to an initial position, and a device connected to said eccentric segment and adapted to come in contact with said abutment for moving the eccentric segment into engagement with the return feed-shaft, substantially as set forth.

12. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, an abutment, a spring-controlled and returnable eccentric segment revolubly mounted to move with the reproducer-carrier and having a tail-rib formed at one end thereof, a cam-plate carried by the eccentric segment and adapted to engage said abutment at the extreme of the movement of the reproducer-carrier in one direction for turning the eccentric segment into engagement with the return feed-shaft, whereby the segment is then turned to raise the reproducer from the record and to cause the tail-rib thereof to engage with the return feed-shaft for returning the parts to their initial position.

13. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having teeth on its surface at one end, and a revoluble lifting device mounted to turn at substantially right angles to the line of the return feed-shaft and having teeth on a portion of its periphery adapted to engage with the teeth on the return feed-shaft whereby said device is turned for lifting the reproducer from the record.

14. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having teeth on its surface at one end, a revoluble eccentric segment mounted to turn at substantially right angles to the line of the return feed-shaft and having teeth on its periphery adapted to mesh with the teeth of the return feed-shaft and having a thread-engaging part at the end of the segment of greatest radius adapted to engage the thread of the return feed-shaft, and means for bringing the segment into engagement with the return feed-shaft whereby the segment is then turned to lift the reproducer from the record and to bring said thread-engaging part of the segment into engagement with the thread of the return feed-shaft for imparting return movement to the reproducer-carrier.

15. The combination with the reproducer-carrier of a phonograph, of a threaded return feed shaft, a part mounted to have reciprocating movements longitudinally of and toward and from the return feed-shaft to correspond with the reproducing and return movements of the reproducer-carrier and the movements of reproducer toward and from the record-carrier, a member revolubly mounted on said part and having an eccentric or cam periphery, means for holding said member in

position with a low portion of its cam periphery toward the return feed-shaft during the reproducing movement of the reproducer-carrier, and means for causing said member to engage the return feed-shaft at the end of the reproducing movement of the reproducer-carrier, such engagement of the return feed-shaft with said member causing first a turning of said member to cause successive portions of its cam periphery to successively engage the return feed-shaft to raise the reproducer from the record and then a movement of said member and said part longitudinally of the return feed-shaft to impart a return movement to the reproducer-carrier.

16. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a part mounted to have reciprocating movements longitudinally of and toward and from the return feed-shaft to correspond with the reproducing and return movements of the reproducer-carrier and the movements of the reproducer toward and from the record-carrier, a member revolvably mounted on said part and having an eccentric or cam periphery and adapted to be turned by engagement with the return feed-shaft at the end of the reproducing movement of the reproducer-carrier, such engagement of the return feed-shaft with said member causing first a turning of said member to cause successive portions of its cam periphery to successively engage the return feed-shaft to raise the reproducer from the record and then a movement of said member and said part longitudinally of the return feed-shaft to impart a return movement to the reproducer-carrier.

17. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a revoluble member mounted to move with the reproducer-carrier and having an eccentric or cam periphery, and means for causing said member to engage the return feed-shaft at the end of the reproducing movement of the reproducer-carrier, such engagement of the return feed-shaft with said member causing first a turning of said member to cause successive portions of its cam periphery to successively engage the return feed-shaft to raise the reproducer from the record and then a movement of said member longitudinally of the return feed-shaft to impart a return movement to the reproducer-carrier.

18. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having teeth on its surface at one end, a revoluble member mounted to move with the reproducer-carrier and having an eccentric or cam periphery and having teeth on a portion of its periphery and a thread-engaging part beyond the toothed portion, said member being adapted to engage the teeth of the return feed-shaft at the end of the reproducing movement of the reproducer-carrier,

whereby said member is then turned to raise the reproducer from the record and to bring its thread-engaging part into engagement with the thread of the return feed-shaft for imparting return movement to the reproducer-carrier.

19. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a revoluble member mounted to have a reciprocating movement longitudinally of the return feed-shaft to correspond with the reproducing and return movements of the reproducer-carrier, means whereby a turning of said member will cause the raising of the reproducer from the record, said member being adapted to be turned at the end of the reproducing movement of the reproducer-carrier by the progressive engagement of the return feed-shaft with successive peripheral portions of said member to raise the reproducer from the record and then to be moved longitudinally by the return feed-shaft to impart a return movement to the reproducer-carrier.

20. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having peripheral teeth at one end, and a device movable with the reproducer-carrier and adapted to engage the return feed-shaft at the end of the reproducing movement of the reproducer-carrier, said device having parts adapted thereafter to progressively engage the teeth and the thread of the return feed-shaft to raise the reproducer from the record and return the reproducer-carrier by the rotation of said shaft to its initial position.

21. The combination with the reproducer-carrier of a phonograph, of a revoluble member having an eccentric or cam periphery and mounted to have a reciprocating movement corresponding to the movement of the reproducer toward and from the record, actuating means for engaging the cam periphery of said member at the end of the reproducing movement of the reproducer-carrier to turn said member and cause successive portions of its cam periphery to successively engage said actuating means to raise the reproducer from the record.

22. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a revoluble member having an eccentric or cam periphery, one of which last-mentioned parts is mounted to move with the reproducer-carrier, and means for causing said parts to engage with each other at the end of the reproducing movement of the reproducer-carrier whereby the revoluble member is first turned to cause successive portions of its cam periphery to successively engage the return feed-shaft to raise the reproducer from the record and then a return movement is imparted to the reproducer-carrier.

23. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft, a revoluble member, one of which last-mentioned parts is mounted to have a reciprocating movement longitudinally of the return feed-shaft to correspond with the reproducing and return movements of the reproducer-carrier, means whereby the turning of said revoluble member will cause the raising of the reproducer from the record, and means for causing said parts to engage with each other at the end of the reproducing movement of the reproducer-carrier, whereby the revoluble member is first turned by the progressive engagement of the shaft with successive peripheral portions of said member to raise the reproducer from the record and then a return movement is imparted to the reproducer-carrier.

24. The combination with the reproducer-carrier of a phonograph, of a revoluble member mounted to have a reciprocating movement corresponding to the reproducing and return movements of the reproducer-carrier, means whereby the turning of said member will cause the raising of the reproducer from the record, and an actuating member for turning said revoluble member at the end of the reproducing movement of the reproducer-carrier by progressive engagement with successive portions of the revoluble member to raise the reproducer from the record.

25. The combination with the reproducer-carrier of a phonograph, of a revoluble member mounted to move with the reproducer-carrier, and an actuating member for turning the revoluble member at the end of the reproducing movement of the reproducer-carrier by progressive engagement with successive peripheral portions of the revoluble member, one of said members having an eccentric or cam form whereby the progressive engagement of successive portions of said members with each other will cause the revoluble member to be moved bodily to raise the reproducer from the record.

26. The combination with the reproducer-carrier of a phonograph, of a lifting member mounted to move with the reproducer-car-

rier and to reciprocate independently of its movement with the carrier, and an actuating member having an engaging face successive portions of which successively engage successive portions of the engaging face of the lifting member to reciprocate the lifting member at the end of the reproducing movement of the reproducer-carrier, one of said members being a revoluble member and the engaging face of one of said members being of cam form, whereby the reciprocation of the lifting member by the actuating member will cause the lifting member to be moved bodily in a direction transverse to such reciprocating movement thereby raising the reproducer from the record.

27. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having gear-teeth at or near one end thereof, and a device mounted to move with the reproducer-carrier and movable at substantially right angles to the line of the return feed-shaft and having a thread-engaging part for engaging the thread of the return feed-shaft to impart a return movement to the reproducer-carrier and to support the reproducer during its return movement and having a part to coact with the gear-teeth of the return feed-shaft for moving said device in a direction at substantially right angles to the line of the return feed-shaft to raise the reproducer from the record and to bring the thread-engaging part of said device into engagement with the thread of the return feed-shaft.

28. The combination with the reproducer-carrier of a phonograph, of a threaded return feed-shaft having gear-teeth at or near one end thereof, and a device for coöperating with the return feed-shaft for returning the reproducer-carrier to normal position, said device having a part for coacting with the gear-teeth of the return feed-shaft for raising the reproducer from the record.

Signed by me this 20th day of July, 1903.

WILLIAM W. ROSENFELD.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.