

Jan. 26, 1943.

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2,309,352

PICK-UP CONTROL MECHANISM FOR AUTOMATIC PHONOGRAPHS

Filed July 22, 1941

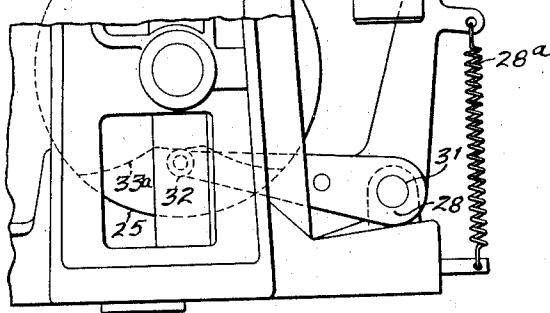
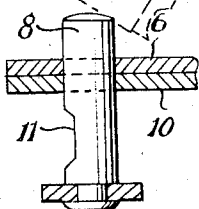


Fig. 2.



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UNITED STATES PATENT OFFICE

2,309,352

PICKUP CONTROL MECHANISM FOR
AUTOMATIC PHONOGRAPHS

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Application July 22, 1941, Serial No. 403,466
In Great Britain May 9, 1940

5 Claims. (Cl. 274-15)

This invention relates to pick-up arm control mechanisms, in automatic phonographs, such as set forth in my co-pending application, filed September 19, 1939, Serial No. 295,561, on which Letters Patent No. 2,263,643, issued November 25, 1941, and is directed to certain modifications or improvements in the structure disclosed in my said application, to increase the range of utility of the invention.

In my aforesaid application, the inward swinging movement of the pick-up arm is arrested, as the needle is poised over the blank marginal portion of a record supported upon the turntable of the apparatus, and lowered into contact therewith, for entry into the outermost sound groove of the record, in response to the displacement of the movement arresting means, which permits of the requisite movement of the pick-up arm. However, during the interval between the disposition of the needle upon the record margin and the release of the movement arresting means, for the entry of the needle into the sound groove, the arm is rigidly or positively held against lateral or swinging movement. While this has been found to be entirely satisfactory in operating with records having the conventional blank marginal portion, difficulties are presented where it is desired to use records in which a so-called lead-in groove is incorporated in the margin, thus somewhat limiting the scope of utility of my invention.

Therefore, the primary object of the present invention is to increase the range of usefulness of my pick-up control mechanism, so that in addition to operating with records having blank marginal portion, it will function equally well with those types of records which embody a lead-in groove in their marginal portions.

More specifically, it is the object of this invention to provide means in a pick-up arm control mechanism corresponding generally to that of my aforesaid application, whereby the pick-up arm will be capable of a limited lateral or rotative movement, during the interval or period in which the components of the mechanism that function to control the lateral movement of the arm are held inactive, induced by the entry of the needle into the lead-in groove of the record, the arm control mechanism subsequently becoming operative to permit the needle to progress into the sound groove and traverse the record to the point of take-off, on the completion of the reproduction. By providing for this needle induced movement of the pick-up arm, it will be obvious that records of the blank margin type or those having

a lead-in groove, may be promiscuously stacked in an automatic apparatus, my improved pick-up arm control mechanism providing for efficient operation with either type of record.

In order that the invention may be clearly understood and carried into effect an example of a holding means according to the above embodiment will now be described in connection with pick-up control mechanism substantially as illustrated in the specification of patent application No. 295,561 and by the aid of the accompanying drawing in which—

Fig. 1 is a side elevation of the mechanism.

Fig. 2 is a top plan view of the same.

Fig. 3 is a top plan view of the impulse lever.

Figs. 4 and 5 are details showing the two operative positions of the pin in relation to the aligned holes or slots in the impulse lever and stop plate.

In the drawing the pick-up arm 1 is pivotally mounted at 2 on the outer end of the arm 3 which by its inner end is affixed to the upper end of a sleeve 4. Through this sleeve extends a rod 5 the upper end of which is attached to the pick-up arm on the inner side of the pivotal mounting 2. By means of the above construction the outer end of the pick-up arm is capable of being swung in a horizontal plane by partially rotating the sleeve and the rod and of being raised and lowered vertically about the pivotal mounting 2 by depressing and raising respectively the rod 5 through the sleeve 4.

In the present showing, the vertical movement of the rod 5 and the resulting lowering of the needle-end of the pick-up arm occurs in response to the weight of the arm, while the arm is raised through the medium of means comprising a lever 20 mounted on the horizontal axis 21, one end of which is forked, as at 22, for engagement with the complementary portion of the plate 23, fixed to the lower end of said rod 5, the opposite end of said lever carrying a pin or roller 24 adapted to engage with the edge cam 25, the low portion of which is indicated at 25a.

The rotative movement of the sleeve 4 is effected by the alternate engagement of the nose 26 on the upright arm 27 of the bell-crank lever 28, with the dependent pins 29 and 30, of the impulse lever 6, in the manner hereinafter set forth, the latter lever being supported from the aforesaid sleeve 4, for relative rotative movement. As will be noted, the bell-crank lever 28 is fulcrumed at 31, its lower arm carrying a cam roller 32, adapted to traverse the cam 33, having a low portion, indicated at 33a.

When the pick-up arm 1 is in its outermost non-operative position, the nose 26 of said bell-crank lever will be in contact with the pin 29 on the lever 6, while its cam follower 32 will be in engagement with the high or circular portion of the cam 25. As a record is positioned upon the turntable *t*, the rotation of the cam 25, clockwise, brings its low portion into position for the entry of the cam roller 32 therein. Thus, under the influence of its spring 28a, the bell-crank lever 28 is actuated for engagement of its nose with the pin 30 of the lever 6.

Fixed to sleeve 4, immediately below the lever 6 is a stop plate 10, which functions to support said lever, said plate and said lever being provided with registering holes or apertures 9a and 9, as clearly shown in Figure 5, for the reception of a pin 8, rigidly supported from the crank 7, fixed to the lower end of said rod 5, for movement therewith, upwardly, when the needle 1a of the pick-up arm is being lowered toward the record, and downwardly, when the needle is being raised. This pin 8 serves to couple the lever 6 to the plate 10, when in the position shown in Figure 4, for rotative movement as a unit, so that the pick-up arm may be rotated into position over the marginal portion of the record, in response to the engagement of the bell-crank lever nose with the pin 30 of said lever 6. As will be apparent, a part of the periphery of the pin 8 is cut away, adjacent the crank 7, as at 11, so that when the pin is in the position shown in Figure 5, said lever and said stop plate are relatively rotatable, as hereinafter described, to permit of a limited rotative movement of the pick-up arm, in response to an impulse induced by the entry of the needle into the lead-in groove of a record. The extent of the relative movement between the lever and the stop plate, may be determined by the depth of the undercut portion 11 of the pin 8 and the dimensions and shape of the apertures 9 and 9a.

As will be manifest from the foregoing, the pick-up arm is rotated inwardly from its outermost non-operative position by the engagement of the nose of the bell-crank lever 28 with the pin 30 of the lever 6, coupled to the plate 10 by the pin 8, the sleeve 4, which carries the pick-up arm, and said stop plate and the interconnected lever 6 rotating as a unit, to locate the needle 1a above the marginal portion of the record, as indicated at *m*. The needle is lowered into contact with the surface of the marginal portion, as the rear end of the pick-up arm is raised in response to the cam induced movement of the rod 5, through the medium of the lever 20, as described. This upward movement of the rod 5 produces a corresponding movement of the crank 7 fixed thereto, the pin 8 carried by said crank, being elevated to dispose its undercut portion 11 within the area of the apertures 9 and 9a, in the lever 6 and plate 10, respectively, as shown in Figure 5, whereby said lever and said plate will be capable of limited relative rotative movement, in opposition to the light spring 12, the ends of which are respectively attached to said lever and said stop plate. Since, the pick-up arm is carried by the sleeve 4 to which the plate 10 is fixed, it will be evident that the pick-up arm may rotate within the limits defined by the opposed coating surfaces of the apertures 9, 9a and the undercut portion 11 of the pin 8, irrespective of the fact that the lever 6 may be held immovable in engagement with the nose of the bell-crank lever.

Previous to the inward rotative movement of the pick-up arm, as just described, and following the disposition of a record upon the turntable, a feeler arm 34, carrying a roller 35 at its end, is actuated to bring said roller into contact with the edge of the record. This serves to "detect" the diameter of the record and by its movement, to control the extent of the inward positioning movement of the pick-up arm, as will become evident.

The feeler arm 34 is mounted upon a spindle 36 carrying a lever 37 at its lower end, which is provided with a roller 38, adapted for engagement with the drum cam 39, cut away, as at 39a, to form the low part of the cam. When the feeler arm is in its normal inoperative position, the roller 38 on the lever 37 is in engagement with the circumferential edge or high part of the cam, while in "detecting" the size of a record, the cam rotates until the low portion 39a is brought into registration with said roller. This permits the feeler arm to move inwardly, under the influence of its spring 40, until its roller 35 makes contact with the edge of the record.

Also mounted on the aforesaid spindle 36, below the feeler arm, is a member 41, which is herein referred to as a bias lever. This lever is provided with relatively spaced dependent pins 13 and 14 at its free end, the disposition of these pins being predetermined so that the pin 13 functions with 12" records and the pin 14 for 10" records. If records of other sizes are to be used, an appropriately located pin must be provided for each additional size.

Pivotaly mounted on the underside of the lever 6 as at 42, is a small lever 43, which is biased to the forward or normal position by a spring 44, and embodies an upstanding abutment 45 at its free end, which is predeterminedly located relatively to the upstanding stop 15 on the contiguous edge of the lever 6, while both the abutment 45 and stop 15 are also predeterminedly situated in relation to the pins 13 and 14 on the bias lever 41. Co-action between the pin 13 and the stop 15, serves to limit the inward positioning movement of the pick-up arm for 12" records, while similar conjoint action of the pin 14 and said stop, limits the inward movement of the arm for 10" records. The selection of the pin for limiting the arm movement is effected automatically, as a result of the inward actuation of the feeler arm, when "detecting" the size of a record in position upon the turntable.

Assuming that a 12" record is disposed upon the turntable, the feeler arm, on completing its inward or "detecting" movement, together with the bias lever 41, will be in the positions shown in Figure 2 of the drawing. With these two levers in such positions and the pick-up arm in its outermost non-operative position, as shown in dotted lines in said Figure 2, the pin 13 will be in advance of and opposite to the stop 15 on said lever 6, the cam follower of the bell-crank lever traversing the high part of the cam 33. The movement of the cam now brings the cam follower into engagement with the low portion of the cam, whereby the movement of the bell-crank lever, under the influence of its spring 28a, will cause the nose 26 thereof to engage with the dependent pin 30, the continuing movement of the bell-crank lever causing the pick-up arm to swing inwardly until its needle is above the margin of the record, the pick-up arm, through its supporting sleeve 4, being connected to said

lever 6, from which the pin 30 depends, for conjoint movement, through the medium of the plate 10 and the pin 8, whereby the lever 6 is coupled to the latter, as heretofore explained. (See Figure 4.). In the movement of the pick-up arm to the position in which the needle is poised above the margin of the record, a corresponding arcuate movement of the lever 6 causes the stop 15 to abut upon the pin 13 to arrest further inward movement of the pick-up arm by the bell-crank lever 28. The pick-up arm is now lowered to bring the needle to bear upon the record margin.

As the pick-up arm is lowered, the resulting upward movement of the rod 5, carrying the crank 7, produces a corresponding movement of the crank-carried pin 8, to locate the latter in the position shown in Figure 5, relatively to the lever 6 and the stop plate 10, in which position, it will be noted, the reduced diameter portion 11 of the pin is located within the area of the holes or slots 9 and 9a of said lever and plate respectively, to permit limited rotative movement of the pick-up arm, positively connected to said plate 10, with relation to the lever 6, which is held in arrested position by the inter-engagement of the stop 15 and pin 13, as previously described. By providing for this limited movement of the pick-up arm relative to the lever 6, if the pick-up arm is lowered upon a record having a lead-in groove incorporated in its marginal portion, as the needle engages or enters the groove, the arm is immediately movable, irrespective of the lock imposed by the stop means which arrest the inward positioning movement of the arm under the control of the feeler arm, so that the needle may be guided into the playing groove by the lead-in groove.

Coincident with the lowering of the pick-up arm, the operation of the cam 39 serves to effect an outward movement of the feeler arm 34, with a corresponding radial movement of the bias lever 41, in which the pin 13 thereof, is drawn sideways out of engagement with the stop 15 on the lever 6 and past the outer face of the abutment 45 on the lever 43 which is displaced in opposition to the spring 44 which reacts on a similar displacement of the lever 6, the movement continuing until the needle of the pick-up arm enters the playing groove, either from the blank marginal portion or from the lead-in groove, as the case may be. Any further displacement of the abutment 45 takes place as movement relative to the lever 6, in opposition to the spring 44.

During the just described biasing action, the inward movement of the pick-up arm, under the yielding pressure applied by the co-acting pin of the lever 6 and the abutment 45 is slightly supplemented by the contraction of the spring 28a, as the drop in the cam 33 is sufficient to afford clearance to the cam-roller 32 for either the 12" or 10" record. However, the supplemental spring action is not sufficient to overcome the frictional engagement between the point of the needle and the plane surface of the record margin, until augmented by the application of the yielding biasing pressure.

Following the inward movement of the pick-up arm under the guidance of the playing groove, a distance sufficient to rotate the pin 30 out of contact with the nose of the bell-crank lever, the further inward movement of said arm is effected solely by the guidance afforded by the record playing groove. When the needle has

reached the inner end of the playing groove, the lever 6 assumes its extreme outward position, with its pin 30 out of engagement with the bell-crank lever nose and the feeler arm and biasing lever, likewise, at their limit of outward radial movement, relative to the edge of the record. The mechanism then functions to transfer the parts back to the position in which the pin 29 of the lever 6 is engaged by the nose of the bell-crank lever, the lever 6 having been rocked inwardly to locate the stop 15 in juxtaposition to the pins 13 and 14 of the bias lever 41 which has moved inwardly with the movement of the feeler arm to "detecting" position, with its roller 35 contacting the edge of the record.

In order that the pick-up arm may be held with the needle poised above the record margin, preparatory to and in the lowering of the needle onto the record, a light blade type of spring, indicated at 16, is mounted on the lever 6, between which and the cooperating stop 15, the pin 13 or 14, as may be, becomes wedged, when in the stop position, the yieldable frictional pressure exerted by the spring, being overcome by the outward turning movement of the bias lever in the concomitant movement of the feeler arm.

The release of the pick-up arm from the hold afforded by the aforesaid stop means is effected in consequence of the return movement of the feeler arm and as this return movement is not intended to take place until the needle has come into contact with the record it will be seen that without the limited freedom of movement which is afforded by the means of the present invention, the pick-up arm would be held against any quick acting urge to move the same laterally such as is produced by a lead-in groove in a record.

What I claim is:

1. In an automatic phonograph for playing records of different diameters, in combination with a turntable upon which is positioned a tablet record for rotation therewith, a feeler device mounted for movement between an initial position distant from and a position in abutment with the edge of the record, periodically operable means for moving said feeler device towards and into abutment with the edge of the record whereby the movement of the feeler device is arrested and the diameter of the record is measured thereby, a pick-up unit movable between an initial position distant from and a position in the outermost sound groove of the record, a member connected to said pick-up unit for relative angular movement, displaceable means normally interlocking said member to said pick-up unit for conjoint angular movement, periodically operable means for moving said member and thereby said pick-up unit when the same are interlocked, towards the outermost sound groove of the record and into abutment with the arrested feeler device thereby arresting the movement of said member and positioning the pick-up unit on the record adjacent the outermost sound groove thereof, and means operable to displace said interlocking means to permit angular movement of said pick-up unit relative to said arrested member and towards the sound groove, in response to an impulse received by said pick-up unit in engagement with the record as the latter is rotated.

2. In an automatic phonograph for playing records of different diameters, in combination with a turntable upon which is positioned for rotation therewith a tablet record having a lead-

in groove in the marginal portion between its edge and its outermost sound groove, a feeler device mounted for movement between an initial position from and a position in abutment with the edge of the record, periodically operable means for moving said feeler device towards and into abutment with the edge of the record whereby the movement of the feeler device is arrested and the diameter of the record is measured thereby, a pick-up unit movable between an initial position distant from and a position in the outermost sound groove of the record, a member connected to said pick-up unit for relative angular movement, displaceable means for normally interlocking said member to said pick-up unit for conjoint angular movement, periodically operable means for moving said member and thereby said pick-up unit when the same are interlocked towards the outermost sound groove of the record and into abutment with the arrested feeler device thereby arresting the movement of said member and positioning the pick-up unit in the marginal portion of the record adjacent the outermost sound groove thereof, means operable to displace said interlocking means to permit angular movement of said pick-up unit relatively to said arrested member and towards the sound groove, in response to an impulse received by said pick-up unit in engagement with the lead-in groove of the record as the latter is rotated.

3. In an automatic phonograph for playing records of different diameters, in combination with a turntable upon which is positioned for rotation therewith a tablet record having a lead-in groove in the marginal portion between its edge and its outermost sound groove, a feeler device mounted for movement between an initial position distant from and a position in abutment with the edge of the record, periodically operable means for moving said feeler device towards and into abutment with the edge of the record, whereby the movement of the feeler device is arrested and the diameter of the record is measured thereby, a pick-up unit movable between an initial position distant from and a position above the marginal portion of the record, a member connected to said pick-up unit for relative angular movement, displaceable means for interlocking said member to said pick-up unit for conjoint angular movement, periodically operable means for moving said member and thereby said pick-up unit when the same are interlocked towards the marginal portion of the record and into abutment with the arrested feeler device thereby arresting the movement of said member and positioning the pick-up unit above the marginal portion of the record, means operatively connected with the member and pick-up unit for the lowering of said pick-up unit into contact with the record surface and for simultaneously displacing said interlocking means, to permit of angular movement of said pick-up unit relatively to said arrested member and towards the sound groove, in response to an impulse received by said pick-up unit in engagement with the lead-in groove of the record as the latter is rotated.

4. In an automatic phonograph for playing records of different diameters, in combination with a turntable upon which is positioned a tablet record for rotation therewith, a feeler device mounted for movement between an initial position distant from and a position in abutment with the edge of the record, periodically operable means for moving said feeler device towards and into contact with the edge of the record, 75

whereby movement of the feeler device is arrested and the diameter of the record is measured thereby, a pick-up unit movable in a plane above the record and between an initial position distant from and a position adjacent the outermost sound groove of the record, and from a position above the playing surface of the record, a member connected to said pick-up unit for relative angular movement; means operatively connected with said pick-up unit for vertically moving the same, means movable with said last named means for interconnecting said member and said pick-up unit for conjoint angular movement when the pick-up unit is moved vertically upwards, periodically operable means for moving said member and thereby said pick-up unit when the same are interconnected above and towards the outermost sound groove of the record, and said member into abutment with the arrested feeler device thereby arresting the movement of said member and positioning the pick-up unit above and adjacent the outermost groove of the record, means periodically operable for actuating the means for vertically moving the pick-up unit to lower the same into contact with the record adjacent the sound groove and concurrently moving said interconnecting means to render said pick-up unit angularly movable relative to said member for movement towards the sound groove in response to an impulse received by the pick-up unit in engagement with the rotating record.

5. In an automatic phonograph for playing records of different diameters, in combination with a turntable upon which is positioned for rotation therewith a tablet record having a lead-in groove in the marginal portion between its edge and its outermost sound groove, a feeler device mounted for movement between an initial position distant from and a position in abutment with the edge of the record, periodically operable means for moving said feeler device towards and into abutment with the edge of the record, whereby the movement of the feeler device is arrested and the diameter of the record is measured thereby, a pick-up unit movable horizontally above the plane of the record playing face and between an initial position distant from and above the marginal portion of the record, and vertically between a position above and the playing face of the record, a member connected to said pick-up unit for relative angular movement, displaceable means for normally interlocking said pick-up unit and said member for conjoint angular movement when the pick-up unit is in a position above the record, periodically operable means for moving said member and thereby said pick-up unit when the latter is above the playing face of the record towards the playing margin of the record into abutment with the arrested feeler device thereby arresting the movement of said member and positioning the pick-up unit above the marginal portion of the record, periodically operable means for vertically lowering the arrested pick-up unit onto the marginal portion of the record and concurrently displacing said interlocking means relatively to said pick-up unit and said member to permit of limited horizontal rotative movement of said pick-up unit relative to said arrested member for movement towards the sound groove, in response to an impulse delivered to the pick-up unit in engagement with the lead-in groove of the record as the latter is rotated.

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