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PHONOGRAPH TRIGGER MECHANISMS

Original Filed March 1, 1955

4 Sheets-Sheet 1

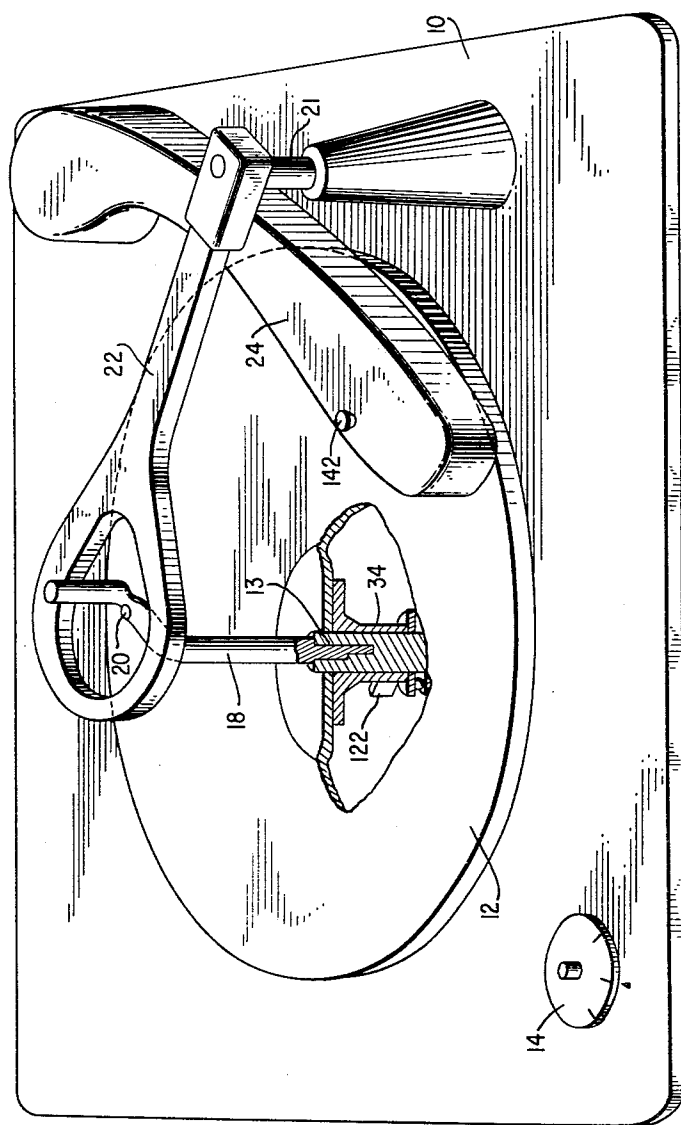


FIG. 1

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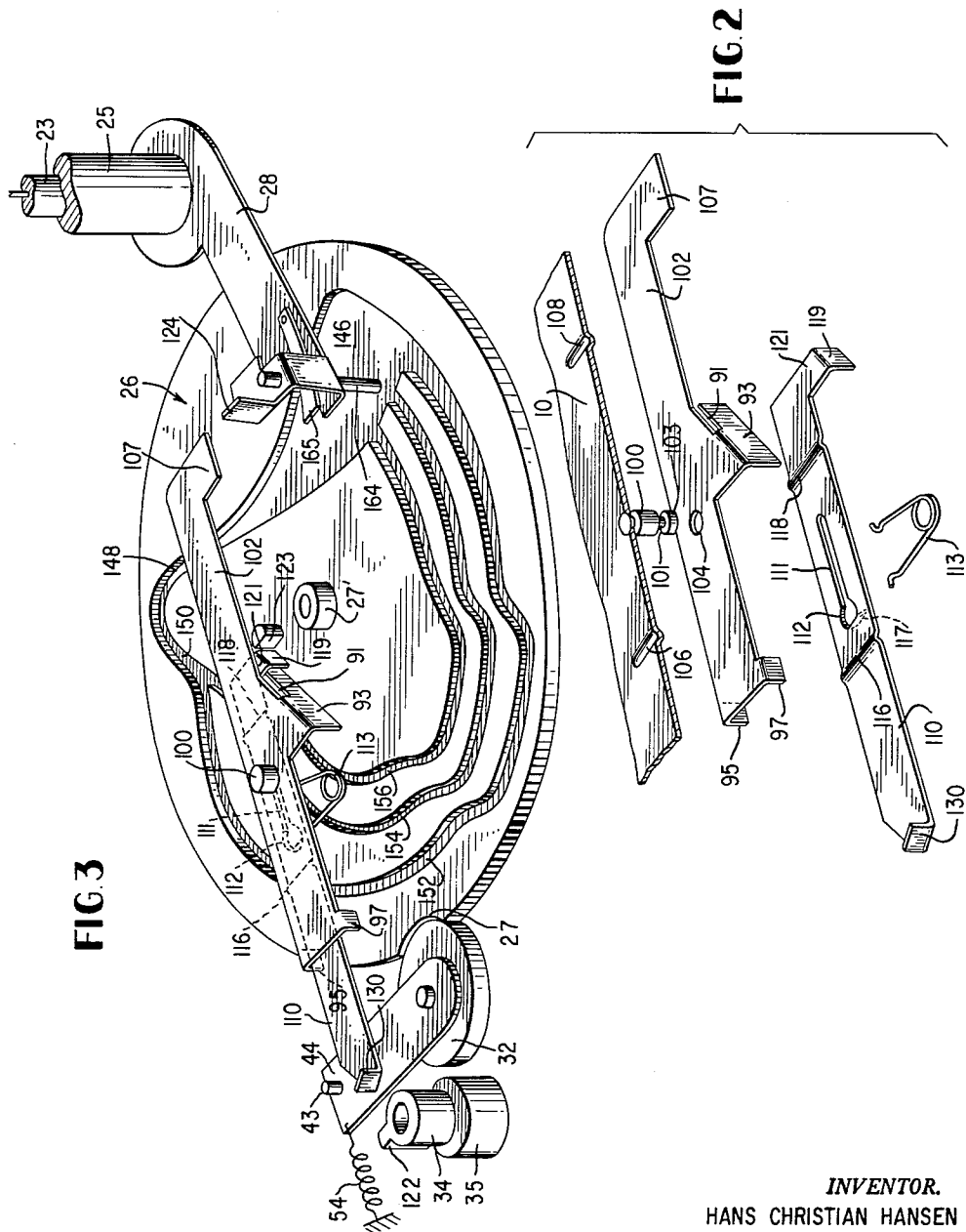
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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

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FIG. 6

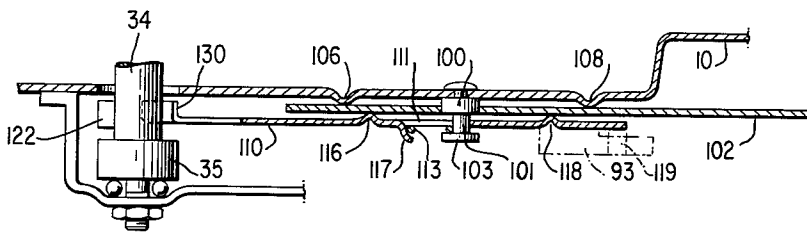
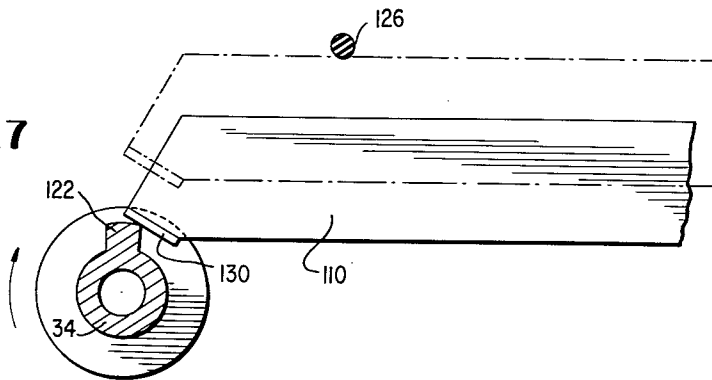
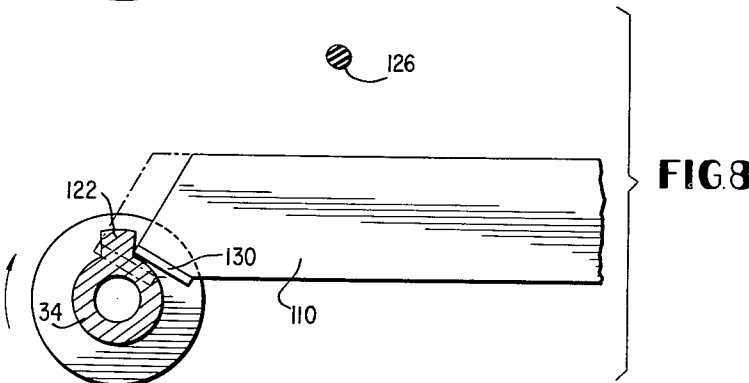


FIG. 7



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PHONOGRAPH TRIGGER MECHANISMS

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Continuation of application Ser. No. 491,422, Mar. 1, 1955. This application Dec. 29, 1960, Ser. No. 74,419
Claims priority, application Denmark Feb. 27, 1954
18 Claims. (Cl. 274-10)

This is a continuation of my copending application Ser. No. 491,422, filed March 1, 1955, relating to phonograph trigger mechanisms and a continuation-in-part application of my copending application Serial No. 425,949, filed April 27, 1954, entitled "Automatic Phonographs."

It is a purpose of the invention to provide a trigger mechanism for selectively actuating a control device of the phonograph upon passage of the stylus means on the tone arm in the outlet groove of the record played which is simple in construction and reliable in operation.

It is a further purpose of the invention to provide a trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means and including a control device operable upon completion of playing of a record in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record which includes two levers and in which the frictional connection between the levers is relatively smaller than the frictional support of one lever on a stationary part.

It is a further purpose of the invention to provide a trigger mechanism having two levers as mentioned hereinabove in which the difference in friction is realized in a simple manner which enables low needle pressure.

It is still a further purpose of the invention to provide a trigger mechanism having levers as hereinbefore mentioned which is simple in design and to easy to assemble.

It is a further object of the invention to provide a structure in which said two levers are in engagement or coupled with each other merely by engagement of respective surface portions effectively providing the desired frictional effect.

Further purposes and advantages of my invention will appear from the following description in connection with the accompanying drawings, in which

FIGURE 1 is a general perspective view of a phonograph according to the invention,

FIGURE 2 is an exploded view of the parts of the trigger mechanism of the phonograph shown in FIGURE 1,

FIGURE 3 is a perspective view of the trigger mechanism and part of the control mechanism,

FIGURE 4 is a plan view of the parts shown in FIGURE 3, in one position,

FIGURE 5 is a similar plan view showing the parts in another position,

FIGURE 6 is a sectional side view of the parts of the trigger mechanism on an enlarged scale,

FIGURE 7 is a plan view of the parts of the trigger mechanism on an enlarged scale, showing the parts in two different positions, and

FIGURE 8 is a corresponding plan view showing the parts in two other different positions.

According to one aspect of the invention to be described in the following, the trigger mechanism is for use in connection with actuation of a cam disc controlling the movements of the tone arm to initiate the rotation of the cam disc for the purpose of causing a new control cycle to take place. It will be understood, however, that the invention is not limited to this specific use of the trigger mechanism and that the same within the scope of the invention can also be used to control any other device intended to be controlled upon completion of playing of a record.

In brief terms my invention relates to a trigger mecha-

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nism for selectively actuating a control device such as the cycle control cam disc generally designated by reference numeral 26 of a phonograph having a relatively stationary part, such as a mounting base or chassis plate 10 (FIGURES 1 and 6). The phonograph further comprises a tone arm 24 adapted to carry a stylus.

The trigger mechanism constitutes a control mechanism which is operative to render the control device, i.e. the cam disc 26, effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time the tone arm is swung inwardly at a faster rate than during playing of the record, because the playing groove has relatively low pitch while the outlet groove is of relatively increased pitch.

The trigger mechanism includes a first lever 102 (FIGURES 2, 3, 4, 5 and 6) provided with first support means. In the embodiment illustrated a stationary pin 100 is provided operable to support the lever 102 to enable swinging movement thereof against a friction. The trigger mechanism further includes a second lever 110 which has a portion defining an abutment 130 (FIGURES 2, 3 and 6). Means is provided exemplified by ribs 116 and 118 supporting the second lever 110 on a surface portion of the first lever 102 to enable relative movements between the two levers against a friction which is smaller than the friction between the first lever 102 and the chassis 10.

Means is further provided in said trigger mechanism enabling longitudinal movement of the second lever 110, and means exemplified by an arm 28 associated with the tone arm is provided for swinging the first lever 102 in a predetermined direction. On the turntable spindle 34 a rotatable abutment 122 is provided operative to engage with the abutment 130 on the second lever 110. Said rotatable abutment 122 is operable upon such engagement during passage of the tone arm stylus in the playing grooves of a record having normal pitch to swing the second lever 110 in a direction which is opposite to the swinging of the first lever 102 by overcoming the friction between said two levers. The rotatable abutment 122 is further operable to engage the abutment 130 of the lever 110 to displace said second lever 110 essentially longitudinally upon engagement of the rotatable abutment 122 with the abutment 130 in response to passage of the tone arm stylus in the outlet groove of a record having increased pitch. Eventually means is provided operably associated with the second lever 110 exemplified by an abutment 119 thereon to actuate the control means such as the cam disc upon such longitudinal movement of the lever 110.

Now with more specific reference to FIGURE 1 of the drawing, reference numeral 10 designates therein a mounting base or chassis plate of a phonograph having a rotatable turntable 12. The turntable is supported on a bushing 34 which surrounds a stationary hollow spindle 13 the top end of which extends slightly above the top surface of the turntable 12 and is adapted to receive the lower end of a center spindle 18 which has an upwardly facing shoulder 20 adapted to support a stack of records to be supplied in sequence to the turntable for the purpose of being played when supported thereon. A ballast arm 22 is swingingly supported on a spindle 21 and can be swung into a position to engage the top side of the records supported on the shoulder 20 so as to keep the records in horizontal position.

The turntable is driven from a power means, such as an electric motor, preferably at a plurality of speeds to be selected by means of a selector knob 14 shown at the front left hand corner of the chassis 10. The turntable drive mechanism and the speed selector means do not form part of the present invention and will therefore not be shown in any detail.

The phonograph further comprises a tone arm 24 adapted to carry a stylus means to engage with the

grooves of a record supported on the turntable for playing the records during passage of the stylus in the sound grooves of the record, as well as for rendering a control device effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time the tone arm is swung inwardly at a faster rate than during playing of the record.

In the specific embodiment of the phonograph to be described in the following the tone arm further carries a feeler abutment 142 adapted to engage the edge of the next record supported on the center spindle 18 to gauge the size of said record, and by such engagement to select the further travel of the tone arm to eventually land the tone arm in the correct start-of-play position on the record engaged after it has been supplied to the turntable.

In the embodiment shown and described in the following the control device mentioned hereinabove is in the form of a cam disc 26 which is designed to control the movements of the tone arm through a cycle after each playing of a record.

The cam disc per se does not form part of the present invention and will in the following only be explained in such detail as is necessary for the understanding of the present invention. It will be understood, however, that within the scope of the invention the cam disc may be modified in various respects such as exemplified by the disclosure of my copending applications Serial No. 425,949, filed April 27, 1954, Ser. No. 602,589, filed August 7, 1956 or Ser. No. 705,703, filed December 27, 1957.

The cam disc has a lifting cam section, not shown, which through a lever system, not shown, controls the raising and lowering of the tone arm 24.

The cam disc is by means of a central bearing 27 mounted for rotation on a pin secured to and extending below the underside of the chassis plate 10. The rotation of the cam disc is controlled by an idler wheel 32 which is mounted on an arm 44 (FIGURE 3). The arm 44 is pivotally arranged about a pin 43 or the like. The idler wheel 32 is for the purpose of rotating the cam disc adapted to be engaged with a portion 35 of the turntable bushing 34 and the disengagement of the drive between the portion 35 and the idler wheel is caused by allowing the idler wheel 32 to enter a peripheral recess 27 in the cam disc 26 when it has performed one complete revolution. A spring 54 causes the arm 44 to swing so as to bring the idler wheel 32 into engagement with the recess 27 and thereby disengage the drive.

The tone arm 24 is a part of the tone arm structure comprising a hollow tone arm spindle or bushing 25 which is swingingly supported on a stationary hollow spindle 23. For the purpose of controlling the swinging of the tone arm a track follower 164 is operatively associated with the tone arm spindle 25 and connected therewith by suitable connecting means such as a track follower arm 28. In the specific embodiment shown the track follower 164, which is in the form of a pin adapted to follow tracks or grooves at the top surface of the cam disc 26, is yieldingly supported relatively to the surface of the cam disc against the action of a spring 165.

The present invention specifically relates to the trigger mechanism which defines a control mechanism operative to render the control device, as exemplified by the cam disc, effective upon termination of the playing of a record when the stylus means on the tone arm passes through the outlet groove of the played record.

As shown in FIGURES 2-6, the trigger mechanism includes a first lever 102 and a second lever 110. The first lever 102 is in the form of a substantially flat lever or arm having a hole which fits on a pin 100 secured to and extending below the chassis plate 10, whereby the lever 102 when mounted on the pin 100 can swing relatively to the stationary chassis plate against a predetermined friction. In order to provide for a well-defined friction between the lever 102 and the stationary part of the phonograph a pair of ribs 106 and 108 (FIGURES

2 and 6) are provided extending below the underside of the chassis plate 10 on each side of the pin 100 so as to cause the lever 102 to bear against the surfaces of these ribs only. It will be understood that the equivalence of the arrangement of the ribs on the chassis plate will be ribs provided extending above the surface of the lever 102 bearing against a plane underside of the chassis plate, or alternatively a predetermined friction could be obtained by providing the top of the pin 100 with a collar having a downwardly facing shoulder against which the top surface of the lever 102 bears adjacent its hole 103.

The second lever is also in the form of a substantially flat lever adapted to be frictionally supported on the first lever 102 and simultaneously mounted for relative longitudinal movement. To this purpose the second lever 110 has a key-hole like aperture including a narrow portion 111 and a substantially circular portion 112. The narrow portion 111 of the key-hole like aperture is adapted to fit on a portion 101 (FIGURE 2) of the pin 100 of reduced diameter and the substantially circular portion of the key-hole like aperture enables the lever 110 to be mounted on the pin by providing passage for the lower end 103 of the pin 100.

In order to provide for the relative friction between the second lever 110 and the first lever 102, ribs 116 and 118 are provided, in the embodiment shown on the lever 110, whereby the second lever is supported on a surface portion of the first lever 102 to enable relative movements between the two levers.

As shown in the sectional view of FIGURE 6, the ribs 116 and 118 are located nearer the pin 100 than the ribs 106 and 108, whereby the friction between the second lever 110 and the first lever 102 is smaller than the friction between the first lever 102 and the stationary part 10.

The second lever 110 is at its front end provided with a flap 130 which extends upwardly and defines an abutment. As seen in FIGURE 2 the flap 130 is arranged at an angle with the longitudinal direction of the lever 110 for reasons which will be more fully understood from the following description of the mode of operation.

The normal position of the lever 110 is a projecting position in which the abutment 130 at the front end of the second lever 110 is in position to engage with a rotatable abutment 122 on the turntable bushing 34. In this position the end of the narrow portion 111 of the key-hole aperture engages with the portion 101 of reduced diameter of the pin 100 and is retained in such projecting position by means of a wire spring 113 which engages with the narrow pin portion 101 below the underside of the second lever 110 and a flap 117 (FIGURE 6) on the second lever 110 which extends below the underside thereof. It will be understood that the length of the narrow pin portion 101 is so adapted that when the parts are mounted in the position shown in the section FIGURE 6, the levers 102 and 110 should not be subjected to any tension in the direction of the axis of the pin 100 so that they bear against the surface portions as defined by the ribs 106, 108 and 116, 118, respectively with a very light friction only.

In the embodiment shown and described, the longitudinal movement of the second lever as caused by engagement between the rotating abutment 122 on the turntable spindle and the front end of the abutment 130 on the second lever 110 operates to start the rotation of the cam disc by transmitting the power from the turntable spindle 34 to the cam disc 26 through the second lever 110. It will be understood, however, that it is possible within the scope of the invention to control the start of the cam disc in any other manner such as for example to allow the cam disc to be arrested by a latch mechanism, which is unlatched in response to the longitudinal movement of the second lever 110.

In the present embodiment, however, the longitudinal movement of the second lever 110 gives the cam disc 26

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an initial push whereby the idler wheel 32 is moved to its position of engagement with the turntable spindle portion 35 whereby the idler wheel 32 will drive the cam disc 26 a complete rotation until it drops into the recess 27 again.

In order to provide for the transmission of a push to the cam disc 26 the second lever 110 has a sidewardly directed extension 121 (FIGURES 2 and 3) with a downwardly extending flap 119 defining an abutment, while on the cam disc a pin 120 is provided having a flat surface 123 facing the abutment flap 119.

In order to swing the two levers in a direction to cause such engagement between the rotating abutment 122 and the abutment 130 on the second lever 110 which causes the actuation of the control device by the longitudinal movements of the second lever 110, means in the form of an abutment 124 on the arm 28 is associated with the tone arm for swinging the first lever 102 in the counter-clockwise direction by engagement with a sidewardly extending abutment 107 at the rear end of the first lever 102.

The operation of the trigger mechanism to cause the actuation of the cam disc must not take place until the tone arm stylus passes in the outlet groove of a record having an increased pitch. During the passage of the stylus in the playing grooves of a record having normal pitch the engagement between the rotating abutment 122 and the front end of the second lever 110 must only result in swinging of the second lever 110 in the direction opposite to the swinging of the first lever 102 by overcoming the friction between the two levers. This effect is in the embodiment shown obtained by the inclined extension of the flap 130 on the front end of the second lever 110.

It is desired, however, to delay any engagement between the rotating abutment 122 and the abutment on the second lever 110 until near the end of playing of any record. Therefore, the invention also provides for means for presetting the position of the two levers to a position in which the front end of the second lever 110 is radially spaced from the turntable spindle as much as possible within the practical design of the mechanism.

To this purpose the first lever 102 has a downwardly extending flap 93 which defines a cam surface to be engaged by the abutment pin 120 on the cam disc during the last part of the rotation of the cam disc 26 until it comes to its position of rest. The rear end of the cam flap 93 is separated from the body portion of the lever 102 by means of a slot 91 through which the sidewardly directed extension 121 with the flap 119 of the second lever 110 extends, as shown in the assembly drawing in the perspective view of FIGURE 3. Furthermore, two downwardly extending flaps 95 and 97 are provided adjacent the front end of the first lever 102, the flap 97 being operable to engage with the front edge of the second lever 110 during the presetting of the mutual position of the two levers, and the flap 95 being operable to safeguard against excessive relative movements between the two levers. In order to limit swinging movement of the second lever 110 during the presetting of the parts of the trigger mechanism a stationary resilient abutment 126, such as a rubber knob, shown in phantom lines in FIGURES 4 and 5, is secured below the underside of the chassis plate 10.

Before explaining the mode of operation of the mechanism, a brief reference will be made to the various tracks in the surface of the cam disc. In the surface of the cam disc a broad track 146 or playing recess is provided in which the track follower 164 can move freely during the playing of a record. From one end of this recess, in the following referred to as the playing recess, an outwardly leading track 148 is provided followed by an inwardly leading track 150, from which three tracks 152, 154 and 156 respectively are branched

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off, each of these tracks representing a track operable to guide the track follower to control movement of the tone arm in response to engagement between the tone arm feeler abutment 142 with a record of one of the three predetermined sizes. All three tracks 152, 154 and 156 merge into the playing recess 146 to cause eventual landing of the tone arm in the start-of-play position on a record of the respective size, and furthermore the tracks are provided with portions operable to impart a sideward push on the record engages so as to release it from the shoulder 20 to its playing position on the turntable, such as described in my copending application Ser. No. 705,703, filed December 27, 1957, and/or with respect to the record release system as described in my copending application Ser. No. 440,487, filed June 30, 1954.

Mode of operation

When the playing of a record is initiated and the tone arm 24 has been landed in the start-of-play position thereof on the record, the parts of the trigger mechanism are preset in the mutual position, as shown in FIGURES 4 and 7, with the front end of the second lever 110 radially spaced from the turntable spindle as much as possible, i.e. as defined by the location of the resilient abutment 126. Furthermore, the abutment 124 associated with the track follower arm 28 of the tone arm assembly is so displaced relatively to the abutment 107 on the first lever 102 that the abutment 124 will not come into engagement with the abutment 107 until sometime during playing of a record, for example when $\frac{2}{3}$ of the record has been played. Thereafter, the abutment 124 will cause the first lever 102 and therewith the second lever 110 to swing counter-clockwise from the position shown in dotted lines in FIGURE 7 to the position shown in full lines, i.e. the front end of the second lever 110, which participates in the swinging of the first lever, will approach the rotating abutment 122 from the position shown in dotted lines to the position shown in full lines. As long as the stylus of the tone arm passes in the sound grooves of the record having normal pitch, the rotating abutment 122 will engage with the inclined flap 130, as shown in FIGURE 7, and such engagement will cause the second lever 110 to swing clockwise by overcoming the friction between the second lever 110 and the first lever 102. Because this friction is smaller than the friction between the first lever 102 and the stationary part of the phonograph, the movement of the second lever 110 in the clockwise direction will not cause any force to be transmitted back through the first lever 102 to the tone arm 24 which is desirable because such transmission of a force back to the tone arm will also be transmitted through the tone arm stylus to the sound grooves of the record and cause wear of the sound grooves.

When, however, the tone arm stylus passes through the outlet grooves of a record having increased pitch, the inward swinging of the tone arm takes place at a faster speed with the result that during one revolution of the turntable the two levers 102 and 110 are both swung counter-clockwise at so fast a speed that when the turntable has made one complete revolution, the rotatable abutment 122 will be operable to engage the second lever 110 at its front end, as shown in FIGURE 8, and thereby displace the second lever essentially longitudinally upon the engagement with the abutment 122 from the position shown in dotted lines to the position shown in full lines. Such longitudinal movements will be transmitted through the second lever 110 and its abutment 119 to the abutment surface 123 of the abutment pin 120 whereby the cam disc 26 will be started to rotate.

During the rotation of the cam disc 26, the tone arm 24 is initially raised by a mechanism, not shown, and swung outwards during passage of the track follower 164 in the outwardly leading track 148, whereafter the tone arm is swung inwards to engage its feeler abutment 142

with the edge of the next record to be supplied to the turntable. Governed by the size of this record the track follower 164 is guided into one of the tracks 152, 154 or 156 and after supply of the record to the turntable the tone arm is eventually landed in the correct start-of-play position on the record.

It will be understood that the longitudinal movement of the second lever 110 takes place against the action of the wire spring 113 and that immediately upon release of the front end of the second lever 110 the wire spring 113 will cause the lever 110 to be moved to its projecting position whereby the inclined front portion flap 130 will engage with a part of the turntable bushing. By such engagement the inclined flap 130 will also act as a cam surface causing the second lever 110 to be thrown away from the turntable spindle in a clockwise direction so as to thereby avoid repeated reciprocation of the second lever 110.

During the last part of the movement of the cam disc 26 before it comes to its position of rest again, the abutment pin 120 on the cam disc will come into engagement with the interior side of the cam flap 93 and thereby swing the first lever 102 clockwise. Due to the frictional engagement between the first lever 102 and the second lever 110 the second lever will participate in this clockwise swinging movement until it engages the resilient flap 126, whereby its swinging will be interrupted. The parts are, however, so designed that during the passage of the pin 120 along the flap 93 the abutment flap 97 on the first lever 102 will come into engagement with the front edge of the lever 110 and press it against the resilient abutment 126 which thereby will yield sufficiently to allow the pin 120 to pass along the last part of the cam flap 93. Furthermore, the resiliency of the abutment 126 is so adapted that when the lever system is released the resiliency of the abutment 126 will cause both levers to be swung slightly back to the position in which the abutment 119 is in its operative position opposite the abutment 123.

As will be appreciated the presetting of the levers and the cooperation between the lever 110 and the abutment 126 also causes a relative presetting of the position between the two levers 102 and 110 with the lever 110 closest to the abutment 97 whereby a swinging of the second lever 110 relatively to the first lever 102 is allowed without causing the rear edge of the lever 110 to engage with the second abutment flap 95 which is located only for the purpose of preventing the two levers from assuming a relative position in which the further operation of the mechanism would fail.

It will be appreciated that the mechanism described is not only safe in operation but also simple in construction since the parts can be mounted without use of any tools.

The mounting of the parts only requires mounting of the first lever 102 on the pin 100 in engagement with the ribs 106 and 108 and subsequent mounting of the second lever 110 by putting the lower end 103 of the pin through the hole 112 and pushing the lever 110 in the direction to engage the narrow portion 111 of the key-hole aperture into engagement with the narrow portion 101 of the pin, and eventually mounting of the spring 113.

It will also be appreciated that the parts are simple in design and that the two levers are in the form of substantially flap members which can be made by simple tools on a stamping press.

I have found that in practice the two levers of the trigger mechanism can be made from stainless steel of thin sheets, such as of a thickness between $\frac{1}{32}$ and $\frac{1}{64}$ ", depending on the structure of the phonograph and whether the reciprocation of the second lever 110 should cause transmission of a force to start the cam disc or merely unlatch a latching mechanism, keeping the cam disc in its position of rest.

While I have shown and described one specific em-

bodiment in accordance with the present invention, it is understood that the same is not limited to the details shown and described herein, but is susceptible of many changes and modifications within the spirit and scope of the present invention.

For example, the physical layout of the various parts may be modified in any suitable manner as long as the basic functioning thereof is maintained. One such modified physical layout of a trigger mechanism operating essentially on the same principle is illustrated in FIGURE 3 of my copending application Ser. No. 688,950, filed October 8, 1957, and entitled "Record Changing Phonographs."

Additionally, while the trigger mechanism according to the present invention is shown and described in connection with the actuation of the cam disc operable to initiate rotation thereof for purposes of causing a new control cycle to take place, it is also understood that the actuating action obtainable by the longitudinal displacement of the lever arm could be used to control any other control device intended to be controlled by the trigger mechanism, such as for example an electric switch or similar other well known conventional device.

Thus, it is quite obvious that the present invention is not limited to the details shown and described herein, but is susceptible of many changes within the spirit and scope thereof, and I, therefore, do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means in a record including a control device operable, upon completion of playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a first lever, pivot means operable to support said first lever to enable swinging movement thereof against a friction, a second lever having a portion defining abutment means, means supporting said second lever on a surface portion of said first lever to enable relative movements between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said pivot means, means in said trigger mechanism enabling longitudinal movement of said second lever, means associated with said tone arm for swinging said first lever in a predetermined direction, a rotatable abutment operative to engage with said abutment means on said second lever and operable upon such engagement during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said first and said second lever, said rotatable abutment being further operable to engage said abutment means of said second lever to displace said second lever essentially longitudinally upon engagement of said abutment with said abutment means in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to actuate said control means upon longitudinal movement of said second lever.

2. A trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means in a record including a control device operable, upon completion of playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a first lever, stationary pivot means operable to support said first lever to enable swinging movement thereof against a predetermined friction, a second lever having a portion defining abutment means, at least one rib on one of said levers operable to support

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said second lever on said first lever to participate in the swinging movement thereof, as well as to enable relative movements between said levers against a friction which is smaller than the friction between said first lever and said pivot means, means in said trigger mechanism enabling longitudinal movement of said second lever, a rotatable abutment, means associated with said tone arm for swinging said first lever in a direction operable, with the participation of said second lever in said swinging movement, to bring said abutment means on said second lever into the path of said rotating abutment to be engaged with said abutment means on said second lever, and operable upon such engagement during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said supporting rib and said second lever, said rotatable abutment being further operable to engage said abutment means of said second lever to displace said second lever essentially longitudinally upon engagement of said abutment with said abutment means in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to actuate said control means upon longitudinal movement of said second lever.

3. A trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means in a record including a control device operable, upon completion of playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a first lever, pivot means operable to support said first lever to enable swinging movement thereof against a predetermined friction, a second lever having a portion defining abutment means, at least one rib on said first lever engaging a surface portion of said second lever to support the same and to enable relative movements between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said pivot means, means in said trigger mechanism enabling longitudinal movement of said second lever, means associated with said tone arm for swinging said first lever in a predetermined direction and thereby swing said second lever in the same direction due to the frictional engagement between said second lever and said rib on said first lever, a rotatable abutment operative to engage with said abutment means on said second lever and operable upon such engagement during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said rib on said first lever and said second lever, said rotatable abutment being further operable to engage said abutment means of said second lever to displace said second lever essentially longitudinally upon engagement of said abutment with said abutment means in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to actuate said control means upon longitudinal movement of said second lever.

4. A trigger mechanism for selectively actuating a control device of a phonograph having a relatively stationary part and a tone arm adapted to carry a stylus means, comprising a control mechanism operative to render said control device effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record including a first lever provided with first support means frictionally supporting said lever on said relatively stationary part, a second lever including second support means for frictionally supporting said second lever on said first lever while simultaneously enabling relative longitudinal move-

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ment of said second lever relative to said first lever, rotatable abutment means operative to engage with said second lever and operative to pivot the same and displace the same essentially in the direction of said longitudinal movement, and means operatively connecting said tone arm with said first lever to swing the latter during swing movement of the former, said first mentioned supporting means effectively providing a larger friction than said second supporting means so as to swing said second lever with said first lever during actuation of the latter by said connecting means while enabling said second lever to move relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means displaces said second lever in said longitudinal direction upon engagement of the stylus means in the outlet groove, and means operatively connecting said second lever with said control device to actuate the latter by the former upon passage of said stylus means in said outlet groove.

5. A trigger mechanism for selectively actuating a control device of a phonograph having a relatively stationary part and a tone arm adapted to carry a stylus means comprising a control mechanism operative to render said control device effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record including a first lever provided with first support means frictionally supporting said lever on said relatively stationary part, a second lever, at least one rib providing support means for frictionally supporting said second lever on said first lever, means enabling relative longitudinal movement of said second lever relative to said first lever, rotatable abutment means operative to engage with said second lever and operative to pivot the same and displace the same essentially in the direction of said longitudinal movement, and means operatively connecting said tone arm with said first lever to swing the latter during swinging movement of the former, said first mentioned supporting means effectively providing a larger friction than said rib means so as to swing said second lever with said first lever in one direction during actuation of the latter by said connecting means while enabling said second lever to move in the opposite direction relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means displaces said second lever in said longitudinal direction upon engagement of the stylus means in the outlet groove, and means operatively connecting said second lever with said control device to actuate the latter by the former upon passage of said stylus means in said outlet groove.

6. A trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means in a record including a control device operable, upon completion of playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a first lever, stationary pivot means operable to support said first lever to enable swinging movement thereof against a friction, a second lever having a tip and an inclined surface portion adjacent said tip, means supporting said second lever on a narrow surface portion of said first lever to enable said levers to swing together in one direction as well as to enable relative movements between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said pivot means, means in said trigger mechanism enabling longitudinal movement of said second lever, means associated with said tone arm for swinging said first lever in a predetermined direction, a rotatable abutment operative to engage with said inclined surface on said second lever during the swinging movement of said levers together when said tone arm stylus means passes in the playing grooves of a record having normal pitch to thereby swing said second lever

in the direction opposite to the swinging of said first lever by overcoming the friction between said first and said second lever, said rotatable abutment being further operable to engage said tip of said second lever to displace said second lever essentially longitudinally upon engagement of said abutment with said tip in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to actuate said control means upon longitudinal movement of said second lever.

7. A trigger mechanism for selectively actuating a control device of a phonograph having a relatively stationary part and a tone arm adapted to carry a stylus means, comprising a control mechanism operative to render said control device effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record, including a first lever provided with first support means frictionally supporting said lever on said relatively stationary part, a second lever including second support means for frictionally supporting said second lever on a narrow portion of said first lever while simultaneously enabling relative longitudinal movement of said second lever relative to said first lever, said second lever having a tip and an inclined portion adjacent said tip, rotatable abutment means operative to engage with said inclined portion of said second lever and to pivot the same in response to such engagement, as well as operative to engage with said tip of said second lever to displace the same essentially in the direction of said longitudinal movement in response to engagement with said tip, and means operatively connecting said tone arm with said first lever to swing the latter during swinging movement of the former, said first mentioned supporting means effectively providing a larger friction than said second supporting means so as to swing said second lever with said first lever during actuation of the latter by said connecting while enabling said second lever to move relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means displaces said second lever in said longitudinal direction upon engagement of the stylus means in the outlet groove, and means operatively connecting said second lever with said control device to actuate the latter by the former upon passage of said stylus means in said outlet groove.

8. A trigger mechanism for selectively actuating a control device of a phonograph having a relatively stationary part and a tone arm adapted to carry a stylus means, comprising a control mechanism operative to render said control device effective upon passage of the stylus means of the tone arm in the outlet groove of the played record after playing thereof during which time said tone arm is swung inwardly at a faster rate than during playing of the record, including rotatable abutment means, a first lever, stationary pivot means operable to support said first lever to enable swinging movement thereof against a predetermined friction, a second lever having a tip and an inclined portion adjacent said tip, means supporting said second lever on a narrow surface portion of said first lever operable to enable said second lever to participate in the swinging movement of said first lever as well as to enable said second lever to swing in the opposite direction with respect to said first lever against a friction which is smaller than the friction between said first lever and said stationary pivot means, means in said trigger mechanism to enable reciprocation of said second lever, means including resilient means operable to retain said second lever in a projecting position to bring said tip of said second lever into the path of said rotatable abutment means in response to swinging of said first and said second levers together in a predetermined direction, means associated with said tone arm for swinging said first lever in said predetermined direction whereby said rotatable abutment means during the passage of said tone arm stylus

means in the playing grooves of a record having normal pitch will engage said inclined portion of said second lever and in response to engagement therewith swing said second lever in said opposite direction with respect to said first lever until inward swinging of the tone arm at a faster speed during passage of said stylus means in the outlet grooves of said record will cause said rotatable abutment means to engage said tip of said second lever and in response to such engagement reciprocate said second lever against said resilient means, and means operatively connecting said second lever with said control device to actuate the latter in response to said reciprocation.

9. A trigger mechanism for selectively actuating a control device of a phonograph having a turntable structure including a turntable spindle and a tone arm adapted to carry a stylus means comprising: a control mechanism operative to render said control device effective upon passage of the stylus means of the tone arm in the outlet groove of the played record after playing thereof during which time said tone arm is swung inwardly at a faster rate than during playing of the record, including an abutment on said turntable spindle, a first lever, a stationary pin pivotally supporting said first lever to enable swinging thereof against a predetermined friction, a second lever having a tip and an inclined portion adjacent said tip, at least one rib on one of said levers supporting said second lever on a surface portion of said first lever operable to enable said second lever to participate in swinging movement of said first lever as well as to enable said second lever to swing in opposite direction of said first lever against a friction which is smaller than the friction between said first lever and said stationary pin, means in said trigger mechanism to enable reciprocation of said second lever, means including a spring means operable to keep said second lever in a projecting position to bring said tip of said second lever into the path of said abutment on said turntable spindle in response to swinging of said levers in unison, abutment means associated with said tone arm for engaging with said first lever to swing the same and said second lever in a direction to approach said tip of said second lever to said turntable spindle whereby said abutment thereon during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch will engage said inclined portion of said second lever and in response thereto will swing said second lever in the opposite direction with respect to said first lever while said turntable spindle abutment by inward swinging of the tone arm at a faster speed during passage of said stylus means in the outlet grooves of said record will engage said tip of said second lever and in response thereto will reciprocate said second lever against said spring, and means operatively connecting said second lever with said control device to actuate the latter in response to said reciprocation.

10. A trigger mechanism for a phonograph having a tone arm capable of swinging during the passage of a stylus means in a record including a control device operable, upon completion of playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a substantially flat first lever, a stationary pivot pin operable to support said first lever to enable swinging movement thereof against a friction, a substantially flat second lever having a front portion defining abutment means, a pair of ribs on one of said levers in spaced relationship at each side of said pivot pin supporting said second lever on a narrow surface portion of said first lever to enable relative movements between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said stationary pivot pin, a slot in said second lever defining with said pivot pin a pin-and-slot connection enabling longitudinal movements of said second lever, a spring in engagement with said pivot pin and said second lever for retaining said second lever with its

front portion in the projecting position thereof, means associated with said tone arm for engaging said first lever to swing it in a predetermined direction, a rotatable abutment operative to engage with said abutment means on said second lever and operable upon such engagement during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said first and said second lever, said rotatable abutment being further operable to engage said abutment means of said second lever to displace said second lever essentially longitudinally against the action of said spring upon engagement of said rotatable abutment with said abutment means in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to actuate said control means upon longitudinal movement of said second lever.

11. A trigger mechanism for selectively actuating a control device of a phonograph having a relatively stationary part including a stationary pivot pin and a tone arm adapted to carry a stylus means, comprising a control mechanism operative to render said control device effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record including a first elongated lever swingingly supported on said stationary pivot pin, a first pair of ribs in said trigger mechanism extending substantially transversely to said first lever at each side of said pivot pin and defining a first support means frictionally supporting said lever on said stationary part, a second elongated lever having an elongated slot extending substantially in the longitudinal direction of said second lever and defining with said pivot pin a pin-and-slot connection enabling swinging movement of said second lever about said pin as well as reciprocation relatively thereto, a second pair of ribs on one of said levers on each side of said pin nearer thereto than said first pair of ribs defining a second support means for frictionally supporting said second lever on said first lever to effectively provide a smaller friction between said levers than between said first lever and said stationary part, rotatable abutment means operable to engage with said second lever and operative to swing the same as well as to reciprocate the same, and means connected with said tone arm operable to engage with said first lever to swing the latter during swinging movement of the tone arm whereby the larger friction provided by said first pair of ribs swings said second lever with said first lever during actuation of the latter by said tone arm while said lower friction provided by said second pair of ribs enables said second lever to move relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means reciprocates said second lever upon engagement of the stylus means in the outlet groove, and means operatively connecting said second lever with said control device to actuate the latter by the former upon passage of said stylus means in said outlet groove.

12. In a phonograph having a tone arm adapted to carry a stylus means and a control means including a rotatable cycling cam for moving said tone arm through a cycle: a trigger mechanism having a tone arm operable to control start-of-rotation of said cycling cam upon completion of the playing of a record, in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a first lever, stationary pivot means operable to support said first lever to enable swinging movement thereof against a friction, a second lever having a portion defining abutment means, means supporting said second lever on a surface portion of said first lever to enable relative movements between said second lever and said first lever against a friction which is smaller than the

friction between said first lever and said pivot means, means in said trigger mechanism enabling longitudinal movement of said second lever, means associated with said tone arm for swinging said first lever in a predetermined direction, a rotatable abutment operative to engage with said abutment means on said second lever and operable upon such engagement during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said first and said second lever, said rotatable abutment being further operable to engage said abutment means of said second lever to displace said second lever essentially longitudinally upon engagement of said abutment with said abutment means in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch, and means operably associated with said second lever to control start-of-rotation of said cycling cam in response to said longitudinal movement.

13. In a phonograph having a tone arm adapted to carry a stylus means and a control means including a rotatable cycling cam for moving said tone arm through a cycle: a trigger mechanism for selectively initiating start of rotation of said cycling cam upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record including a first lever, stationary support means frictionally supporting said lever, a second lever including second support means for frictionally supporting said second lever on said first lever while simultaneously enabling relative longitudinal movement of said second lever to said first lever, rotatable abutment means operative to engage with said second lever and operative to pivot the same and displace the same essentially in the direction of said longitudinal movement, and means operatively connecting said tone arm with said first lever to swing the latter during swinging movement of the former, said first mentioned supporting means effectively providing a larger friction than said second supporting means so as to swing said second lever with said first lever during actuation of the latter by said connecting means while enabling said second lever to move relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means displaces said second lever in said longitudinal direction upon engagement of the stylus means in the outlet groove, and means operatively connecting said second lever with said cycling cam to render the latter effective to move said tone arm through its cycle by said second lever upon passage of said stylus means in said outlet groove.

14. In a phonograph having a tone arm adapted to carry stylus means and control means including a rotatable cam for moving said tone arm through a cycle: a trigger mechanism for selectively rendering said cycling cam effective upon passage of the stylus means on the tone arm in the outlet groove of the played record during which time said tone arm is swung inwardly at a faster rate than during playing of the record including a relatively stationary part of said phonograph, a first lever provided with first support means frictionally supporting said lever on said relatively stationary part, a second lever having a front end and a rear end and including second support means for frictionally supporting said second lever on said first lever while simultaneously enabling reciprocation of said second lever relative to said first lever, rotatable abutment means operative to engage with said front end of said second lever and operative to pivot the same as well as to reciprocate the same, and means operatively connecting said tone arm with said first lever to swing the latter during swinging movement of the former, said first mentioned supporting means effectively providing a larger friction than said second supporting means so as to swing said second lever

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with said first lever during actuation of the latter by said connecting means while enabling said second lever to move relatively to said first lever during pivotal actuation of said second lever by said rotatable abutment means until said abutment means reciprocates said second lever upon passage of the stylus means in the outlet groove, and means operatively connecting said rear end of said second lever with said cycling cam to transmit said reciprocation of said second lever to said cycling cam to effectively give it a start impulse upon passage of said stylus means in said outlet groove.

15. A trigger mechanism for selectively actuating a cycle control cam of a phonograph having a turntable structure including a turntable spindle and a tone arm adapted to carry a stylus means comprising: a control mechanism operative to render said control device effective upon passage of the stylus means of the tone arm in the outlet groove of the played record after playing thereof during which time said tone arm is swung inwardly at a faster rate than during playing of the record, including an abutment on said turntable spindle, a first lever, a stationary pin pivotally supporting said first lever to enable swinging thereof against a predetermined friction, a second lever having a tip and an inclined portion adjacent said tip, at least one rib on one of said levers supporting said second lever on a surface portion of said first lever operable to enable said second lever to participate in the swinging movements of said first lever as well as to enable said second lever to swing relative to said first lever against a friction which is smaller than the friction between said first lever and said stationary pin, means in said trigger mechanism to enable reciprocation of said second lever, means including spring means operable to keep said second lever in a projecting position to bring said tip of said second lever into the path of said abutment on said turntable spindle in response to swinging of said levers in unison, abutment means associated with said tone arm for engaging with said first lever to swing it in said direction to approach said tip of said second lever toward said turntable spindle whereby said abutment thereon during the passage of said tone arm stylus means in the playing grooves of a record having normal pitch will engage said inclined portion of said second lever and in response thereto will swing said second lever in the opposite direction with respect to said first lever while said turntable spindle abutment by inward swinging of the tone arm at a faster speed during passage of said stylus means in the outlet grooves of said record will engage said tip of said second lever and in response thereto will reciprocate said second lever against said spring, and abutment means on said second lever, and means on said cycling cam operatively connecting the latter with said abutment means on said second lever to control start-of-rotation of said cycling cam in response to said reciprocation.

16. In a phonograph having a tone arm adapted to carry stylus means and control means including a rotatable cycling cam for moving said tone arm through a cycle: a trigger mechanism operable to start rotation of said cycling cam upon completion of playing of a record in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a substantially flat elongated first lever, a stationary pivot pin operable to support said first lever to enable swinging movement thereof against a predetermined friction, a substantially flat elongated second layer having a front portion defining a first abutment and a rear portion defining a second abutment, a pair of ribs on one of said levers in spaced relationship at each side of said pivot pin supporting said second lever on narrow surface portions of said first lever to enable relative movement between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said stationary pivot pin, a slot in said second lever defining a

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pin-and-slot connection with said pivot pin to provide reciprocation of said second lever, a spring in engagement with said pivot pin and said second lever for retaining said second lever with its front portion in the projecting position thereof, means for retaining said cycling cam in a predetermined position of rest during playing of a record, an abutment on said cycling cam in a position thereon opposite said second abutment on said second lever in the position of rest of said cycling cam and operable to be engaged by said second abutment on said second lever in response to reciprocation thereof, means associated with said tone arm for engaging said first lever to swing it in a predetermined direction, a rotatable abutment operable to engage with said first abutment on said second lever and operable during passage of said tone arm stylus in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said ribs and said narrow surface portions supporting said second lever on said first lever, said rotatable abutment being further operable to engage said first abutment of said second lever to reciprocate the latter against the action of said spring in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch whereby said second abutment on said second lever engages with said abutment on said cycling cam and imparts a starting impulse thereto.

17. In a phonograph having a relatively stationary part, a tone arm adapted to carry a stylus means and a control means including a rotatable cycling cam for moving said tone arm through a cycle, a trigger mechanism operable to start rotation of said cycling cam upon completion of playing of a record in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a substantially flat elongated first lever having an inclined portion defining a cam surface extending out of the plane of said first lever, a stationary pivot pin operable to support said first lever to enable swinging movement thereof against a predetermined friction, a substantially flat elongated second lever having a front portion defining a first abutment and a rear portion defining a second abutment, a pair of ribs on one of said levers in spaced relationship at each side of said pivot pin supporting said second lever on narrow surface portions of said first lever to enable relative movement between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said stationary pivot pin, a slot in said second lever defining a pin-and-slot connection with said pivot pin to provide reciprocation of said second lever, a spring in engagement with said pivot pin and said second lever for retaining said second lever with its front portion in the projecting position thereof, means for retaining said cycling cam in a predetermined position of rest during playing of a record, an abutment on said cycling cam in a position opposite said second abutment on said second lever in the position of rest of said cycling cam and operable to be engaged by said second abutment on said second lever in response to reciprocation thereof, means associated with said tone arm for engaging said first lever to swing it in a predetermined direction, a rotatable abutment operable to engage with said first abutment on said second lever and operable during passage of said tone arm stylus in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said ribs and said narrow surface portions supporting said second lever on said first lever, said rotatable abutment being further operable to engage said first abutment of said second lever to reciprocate the latter against the action of said spring in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch whereby

said second abutment on said second lever engages with said abutment on said cycling cam and imparts a starting impulse thereto, abutment means on opposite sides of said first lever and on each side of said second lever for retaining said second lever generally in alignment with said first lever, said inclined cam surface of said first lever being located to be engaged by said abutment on said cycling cam during the rotation of said cycling cam for swinging said first lever in a direction opposite to said direction in which said first lever is swung by engagement with said means associated with said tone arm.

18. In a phonograph having a tone arm adapted to carry stylus means and control means including a rotatable cycling cam for moving said tone arm through a cycle, a trigger mechanism operable to start rotation of said cycling cam upon completion of playing of a record in response to inward swinging of the tone arm at a faster speed during passage of the stylus means in the outlet groove of the record, comprising a substantially flat elongated first lever having an inclined portion defining a cam surface extending out of the plane of said first lever, a stationary pivot pin operable to support said first lever to enable swinging movement thereof against a predetermined friction, a substantially flat elongated second lever having a front portion defining a first abutment and a rear portion defining a second abutment, a pair of ribs on one of said levers in spaced relationship at each side of said pivot pin supporting said second lever on narrow surface portions of said first lever to enable relative movement between said second lever and said first lever against a friction which is smaller than the friction between said first lever and said stationary pivot pin, a slot in said second lever defining a pin-and-slot connection with said pivot pin to provide reciprocation of said second lever, a spring in engagement with said pivot pin and said second lever for retaining said second lever with its front portion in the projecting

position thereof, means for retaining said cycling cam in a predetermined position of rest during playing of a record, an abutment on said cycling cam in a position opposite said second abutment on said second lever in said position of rest of the cycling cam and operable to be engaged by said second abutment on said second lever in response to reciprocation thereof, means associated with said tone arm for engaging said first lever to swing it in a predetermined direction, a rotatable abutment operable to engage with said first abutment on said second lever and operable during passage of said tone arm stylus in the playing grooves of a record having normal pitch to swing said second lever in a direction opposite to the swinging of said first lever by overcoming the friction between said ribs and said narrow portions supporting said second lever on said first lever, said rotatable abutment being further operable to engage said first abutment of said second lever to reciprocate the latter against the action of said spring in response to passage of said tone arm stylus in the outlet groove of a record having increased pitch whereby said second abutment on said second lever engages with said abutment on said cycling cam and imparts a starting impulse thereto, abutment means on opposite sides of said first lever and on each side of said second lever for retaining said second lever generally in alignment with said first lever, said inclined cam surface of said first lever being located to be engaged by said abutment on said cycling cam during the rotation of said cycling cam for swinging said first lever in a direction opposite to said direction in which said first lever is swung by engagement with said means associated with said tone arm, and a resilient stationary abutment operable to be engaged by said second lever during the swinging of said first lever in said opposite direction to preset said second lever in a predetermined position relatively to said first lever.

No references cited.