TRIPPING MECHANISM FOR RECORD-CHANGING APPARATUS

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This application is a continuation-in-part of my application Serial No. 332,292 filed April 22,
1940, now Patent No. 2,286,496, issued June 16,
1932, relates to record-changing apparatus and
more particularly to control mechanism adapted
to be used with automatic record-changing appa-
ratus.

The object of the invention is to provide an
improved and simplified control mechanism for
use with a tripping mechanism adapted to ini-
tiate a record-changing operation in a record-
changing apparatus.

In accordance with the present invention, there is provided in a record-changing apparatus,
including a continuously rotating means, an
initiating member and a movable pickup arm, a
control mechanism. The control mechanism
comprises a connecting member frictionally as-
sociated with the pickup arm to move therewith
and adapted to be moved relative to the pickup
arm against the force imparted thereby, a freely
movable element responsive to the movement of
said connecting member upon movement of the
latter with the pickup arm and responsive to the
movement of the rotating means, and control
means operatively associated with the freely
movable element, the initiating member, and the
rotating member. Normally, the control means
is movable a predetermined distance during each
revolution of the rotating means, without disengag-
ing the initiating member, by the freely mov-
able element, upon movement of the latter a
first distance by said connecting means and said
pickup arm. Also, the control means is movable
the predetermined distance in a reverse direc-
tion during each revolution of the rotating means,
by the rotating means. When the freely movable
element is moved more than the first distance by
the connecting member and the pickup arm, the
control means is moved more than the prede-
termined distance to effect the release of the in-
itiating member into the path of said rotating means,
wherby said rotating means moves said in-
itiating member to initiate a record-changing opera-
tion.

In accordance with another feature of the
present invention, there is provided in a record-
changing apparatus, including a rotatable turn-
table, means for moving records to said turn-
table and a movable pickup arm to cooperate
with a record on said turntable, a control mecha-
nism. The pickup arm, when in engagement
with a playing groove of a record, is adapted to
move a predetermined distance during each revo-
lution of the turntable. Also, the pickup arm,
when in engagement with a tripping groove of a
record, is adapted to move more than the pre-
determined distance during each revolution of
the turntable. The control mechanism com-
prises a clutch member connected to the pickup
arm in a predetermined position to move ther-
ewith, a spring, an element frictionally associ-
ed with the clutch member and being con-
ected thereto by the spring, and connecting
means frictionally associated with the element
and the clutch member to move therewith. The
connecting means is adapted to be interrupted
intermittently in its movement with the clutch
member and the pickup arm to change its posi-
tion relative to the element and the clutch
member to bring the connecting means into en-
gagement with the element before the pickup
arm enters a tripping groove of a record on the
turntable. The control mechanism also includes
control means operatively associated with the
connecting member and adapted to be moved
thereby, an initiating member adapted normally
to be held out of operative position by the control
means, and continuously rotating means.
The rotating means is adapted to move the initi-
ating member when the latter is released by the
control means. The rotating means, also, is
adapted to interrupt intermittently the move-
ment of the control means and the connecting
means with the clutch member and the pickup
arm. When the pickup arm moves into a tripp-
ing groove of a record and the rotating member
interrupts the movement of the control means
and the connecting member with the clutch
member and the pickup arm, the connecting
member develops tension in the spring so that,
when the rotating means releases the control
means, the tension of the spring moves the ele-
ment and therewith the connecting means and
the control means sufficiently far to release the
initiating member into operative position with
the rotating means to initiate a record-changing
operation.

For a better understanding of the invention,
together with other and further objects thereof,
reference is made to the following description,
taken in connection with the accompanying
drawings, and its scope will be pointed out in
the appended claims.
In the accompanying drawings:

Fig. 1 is a side elevation of the record-changing apparatus showing a group of records supported over the turntable and two records on the turntable in playing position;

Fig. 2 is a rear elevation of the record-changing apparatus, showing the cam and lever arrangement for raising and lowering the pickup arm;

Fig. 3 is a bottom plan view of the underside of the record-changing apparatus;

Fig. 4 is a partial side elevation, showing a stack of records in supported position with a larger record in position to be released;

Figs. 5 and 6 show two fragmentary views of a stack of records supported on a record-supporting spindle with the lowermost record in two different positions as it is being moved from the spindle to the turntable;

Fig. 7 is a perspective view of the peripheral supporting means for a stack of intermixed records and means for releasing the supported records one at a time to playing position upon the turntable;

Fig. 8 is an exploded perspective view of the friction clutch assembly used with the tripping mechanism shown in Fig. 3;

Fig. 9 is an exploded perspective view showing a modified clutch mechanism adapted to operate the tripping mechanism shown in Fig. 3; and

Fig. 10 is a view of the clutch mechanism shown in Fig. 9 as it appears when it is assembled for operating purposes.

Referring now more particularly to Fig. 1 of the drawings, the invention here illustrated embodies a record-changing and reproducing apparatus including a base plate 10 supporting a horizontally rotatable turntable 11, upon which is shown records 12 in position for reproduction. A pickup or reproducer 13 is supported at the end of a pickup arm 14, which is pivoted at its opposite end about the vertical axis of shaft 15 (Figs. 1 and 2) to permit the reproducer to move across the face of the top record (on the turntable 11) as the needle 16 of the reproducer 14 tracks the playing groove of the top record.

Fig. 1, which is a side elevation of the record-changing apparatus, shows the manner in which a number of unplayed records 17 are supported in a stack above the turntable by means of a spindle 18 which extends above the turntable 11. The spindle 18 is provided with an offset end 19 which is formed a suitable distance above the turntable 11 and which forms a left shoulder 20. The shoulder 20 engages the lowermost supported record at the peripheral edge of the centering aperture in the manner shown in Fig. 1. The offset portion 19 of the spindle 18 terminates in a tapered portion 21 which facilitates the loading of the records upon the shoulder 20. The offset portion 19 of the spindle 18 has a right shoulder 22 at its lower end and at such elevation that only the lowermost supported record can be moved under it. The mechanism for moving records will be described hereafter.

The supported records 17 are balanced upon the shoulder 23 of the centering spindle 18 in a substantially horizontal position by a suitable weight 24 slidably mounted on the offset portion 19 of the centering spindle 18 (Figs. 1 and 4). The turntable 11 is driven by a frictional wheel 27 (shown in dotted lines under the turntable in Fig. 1) which operatively engages the friction wheel 28, which is driven by the motor 29.

The detailed construction of the record-moving mechanism is shown in Fig. 7. In a housing 25, there is provided an opening 30. A spring-biased channel-shaped lever 31, which is pivotally connected and its lower end is pinned to the housing 25 by a pin 32, is adapted to move in and out of the opening 30. A lever 33 is pivotally secured to the upper end of the lever 31 and is biased by a spring 32 to the horizontal position shown in Figs. 1 and 7 of the drawings. A toggle member 24 is pivotally connected intermediate its ends to the lever 31 and cam 35. Tips 35 and 36 at each end of the toggle member 24 are adapted to extend through openings or slots 33 and 34 provided in the lever 23. The mass of the toggle member 24 is so distributed that, when the toggle member 24 is in its normal position, the tip 35 extends through the opening 33 and, when a force is applied downwardly on the tip 35, then the toggle member 24 pivots to a position where the tip 35 extends through the opening 35.

Secure to the lower end of the lever 31 is a cam 38 normally biased by a spring 39 (Fig. 1) to a forward position in the path of a pin 40, which is connected to a mutilated gear 41 and moves therewith. When the pin 40, in moving with the mutilated gear 41, engages the cam 38, the lever 31 is pivoted about the axis of the pin 37. The pivotal movement of the lever 31 moves the lever 23 and therewith the toggle member 24 toward the spindle (Figs. 1 and 4) to move the lowermost supported record out of engagement with its supports, so that it may move into playing position on the turntable.

When the lowermost supported record is a 10-inch record, the tip 35 of the toggle member 24 is adapted to engage the peripheral edge of the 10-inch record to move it free of its supports. When the lowermost supported record is a 12-inch record, it forces the tip 35 downwardly and the tip 36 is raised to a position as shown in Fig. 4 where it is adapted to engage the peripheral edge of the 12-inch record to free it from its supports.

When the lowest supported record is disengaged from its supports, it exerts a downward force on the lever 23 as it moves into playing position on the turntable. The force of the record applied to the lever 23 pivots the lever 23 about its connection to the lever 31 in a counterclockwise direction and against the biasing action of the spring 32. Immediately after the first edge of the record drops past the lever 23 in its pivoted position, the lever is returned to its normal horizontal position, shown in Fig. 7, by the biasing spring 32.

The mutilated gear 41, partially shown in Fig. 7, is shown completely in Fig. 3. A mutilated portion 42 of the gear 41 is shown opposite a pinion gear 43 which is fixed to the shaft 44. The purpose of the mutilation 42 is to break the driving connection between the gear 41 and the pinion 43 after the gear 41 is driven through one revolution. One complete revolution of the mutilated gear 41 defines one cycle of record-changing operation, as will be evident later.

When a record on the turntable has been completely played, and the pickup arm reaches the tripping groove on the record, the movement of the pickup arm initiates the operation of a tripping mechanism presently to be described, and causes the mutilated gear 41 to be moved sufficiently far so that its teeth mesh with the teeth of the pinion gear 43. The mutilated gear 41 thereupon is driven through one revolution about the axis of a shaft 45 and comes to rest in the position shown in Fig. 3.
During the revolution of the cam gear 41, several operations are performed. The pickup arm is raised out of engagement with the top record on the turntable, and is moved to the center of the record to its outwardmost position. The lowermost supported record is moved to playing position on the turntable, as has just been described. The pickup arm is swung inwardly over the initial playing groove of the record recently moved to the turntable and thereafter lowered into engagement therewith.

The mechanism for raising and lowering the pickup arm 14 includes a cam surface 45 provided on the mutilated gear 41. An arm 47, pivoted intermediate its ends on a bracket, 48 fixed to the bottom of a base plate 10, carries a roller 49 at one end and is biased by a spring 50 so that the roller 49 is in continual engagement with the cam surface 46. This is clearly shown in Figs. 2 and 3 of the drawings. The movement of the cam surface 46 pivots the arm 47 in a vertical plane. The upward movement of the left-hand end (Fig. 2) of the arm 47 raises the pin 51 in the hollow shaft 15. The upper end of the pin 51 engages the under side of the pickup arm 14 and raises the needle of the pickup arm 14 from the surface of a record on the turntable. The pickup arm 14 is fixed to the upper end of the hollow shaft 15, which is rotatable within a pedestal 52 fixed to the base plate 10. A lever 53 is fixed to the lower end of the hollow shaft 15. Referring particularly to Fig. 3 of the drawings, it is seen that the free end of the lever 53 supports a pin 54, which moves within an aperture 55 in the heel of an L-shaped lever 56. The aperture 55 is sufficiently large so that the pin 54, under the control of the pickup arm 14, may freely move over the full playing surface of a record on the turntable. The L-shaped lever 56 is pivotally connected to the base plate 10 at 57. A toe 56A of the L-shaped lever 56 engages the surface of a cam 58, also provided on the mutilated gear 41. The toe 56A is biased into continual engagement with the cam surface 59 by a biasing spring 59. After the needle of the pickup arm has been raised out of engagement with the surface of the record on the turntable, as previously described, and as the mutilated gear 41 continues to rotate, the cam 58 moves the L-shaped lever 56 in a counterclockwise direction about the pivot connection 57 and causes the lever 56 to move upward as the pin 54 engages the aperture 55 to engage a record on the turntable. As the pickup arm 14 moves to a radial direction away from the center of the record, the cam 58 is shaped so that it moves the L-shaped lever 56 in a counterclockwise direction immediately after the needle of the reproducer has been raised out of engagement with a record on the turntable. After the pickup arm 4 is swung to its outwardmost position, the lowermost supported record is moved to playing position on the record in a manner previously described. Shortly thereafter, the cam 58 moves to a point where the toe 56A of the L-shaped lever 56 begins to move to the right under the action of the spring 59. When this occurs, the left-hand edge of the aperture 55 engages the pin 54 and moves the pin, the lever 53 and the shaft 15, whereby the pickup arm 14 is moved to a position where the needle of the pickup arm is over the initial playing groove of the record moved to the turntable.

By this time, the cam surface 46 has rotated to the position shown in Fig. 2. In reaching this position, the contour of the cam surface 46 permits the spring 50 to pivot the pin 51 in a vertical plane so as to permit the pin 51 to move downwardly, thereby lowering the needle of the pickup arm 14 in engagement with the initial playing groove of the top record on the turntable.

The automatic record changing cycle, effected by a complete revolution of the mutilated gear 41, is initiated by the automatic tripping mechanism previously mentioned. If the tripping mechanism incorporates a clutch such as that shown in Figs. 3 and 8 of the drawings, its operation depends upon the movement of the pickup arm, either an abnormal radial distance during a revolution of the turntable relative to the radial distance it moves during a revolution of the turntable while it is playing the playing groove of a record on the turntable, or to a predetermined distance from the center of the turntable. If the tripping mechanism incorporates the clutch shown in Figs. 9 and 10, which is the same clutch which is shown in Figs. 3 and 8 except that the spring 58 is removed and made inoperative, then the operation of the tripping mechanism will be initiated only on the abnormal movement of the pickup arm.

The tripping mechanism will now be described, after which the detailed construction of the clutch mechanism will be described. The pickup arm 14, whose stylus is in engagement with a record on the turntable, tracks inwardly towards the center of the record a predetermined distance during each revolution of the turntable as the record is being reproduced. In moving toward the center of the record, the pickup arm moves with it the hollow shaft 15. The hollow shaft has secured to it a clutch 69 shown in Figs. 3 and 8 or a clutch such as is illustrated in Figs. 9 and 10. The detailed construction of these clutches will be described hereafter. As the shaft 15 rotates in response to the inward movement of the pickup arm 14, a member 61, which is a part of both clutch mechanisms, is moved in a counterclockwise direction (Fig. 3). When the lever 61 is moved in a counterclockwise direction (Fig. 3), it is adapted to engage and move therewith a lever 62 before the pickup arm reaches the tripping groove of a record on the turntable. The lever 62 is supported the clutch 69 and the member 53 to rotate freely about the axis of the shaft 15. The free end of the lever 62 is bent downwardly as shown in Fig. 2, to engage one end of the lever 63 (Fig. 3) (which is pivoted intermediate its ends on the bottom side of the base plate 10). The opposite end of the lever 63 (Fig. 3) normally engages one end of the lever 64 which is pivotally mounted intermediate its ends on the cam gear 41 to pivot in a vertical plane or in a plane substantially parallel to the axis of the continuously rotating shaft 41. The lever 64 is so connected to the mutilated gear 41 that, when it is moved in a horizontal plane or in a plane substantially normal to the axis of the mutilated gear, it will move therewith the mutilated gear 41. The movement of the lever 63 is so distributed that, when the lever 63 is moved out of engagement therewith, the opposite end of the lever 64 moves downwardly into the path of the continuously rotating pin 65 which is fixed to the shaft 44 which also supports the pinion 43.

As the pickup arm approaches the tripping groove of the record, the members 61, 62 and 63...
are moved thereby in a counter-clockwise direction (Fig. 3). The lower end of the lever 69 carries the leaf spring 66 which is adapted to be moved in the path of a cam 67, which is fixed to rotate with the shaft 64. When the spring 66 is in the path of the cam 67, it is struck correspondingly thereby to move the members 62 and 61 in a clockwise direction (Fig. 3). This clockwise movement transmitted to the member 61 permits it to change its position with respect to the pickup arm. Where a clutch such as that shown in Figs. 3 and 6 is embodied in the tripping mechanism, the clockwise movement (Fig. 3) of the lever 61 causes an ear 73 thereon to move toward an ear 76. When the pickup arm reaches the tripping groove of a record on the turntable, the lever 61, and therewith the members 62 and 63, are moved by the pickup arm 14 during a revolution of the turntable, more than the distance that they are moved by the pickup arm when the pickup arm is tracking the playing groove of a record on the turntable. The abnormal movement of the members 61, 62 and 63 is sufficient to release the member 64 from engagement with the lever 63. Thereupon the lower end of the lever 64 under the force of gravity moves into the path of the pin 65. As the pin 65 rotates it engages the lower end of the lever 64 and member 63. Thereby the counter geared 41 in a horizontal plane sufficiently far so that the teeth of the counter geared 41 mesh with the teeth of the pinion gear 43, after which the pinion drives the member 64 through the gear 41 into the horizontal plane, the member 64 being moved by the pickup arm 14. This action causes the member 64 to initiate a record changing cycle. The fixed stop 69 is secured to the bottom of the base plate 10. With the lever 61 extended therefrom is mounted in frictional relationship with the upper surface of the flanged portion of the member 61. A suitable frictional washer 74, preferably of a fibrous material, is slipped over the plate 72 and around the sleeve of the member 61. A plate 75 with the turned-down ear 76 is placed over the fibre washer 74 and around the sleeve of the member 71. The ear 73 and the ear 76 are so related that the clockwise movement (Fig. 3) of the lever 61 will bring the ear 73 into engagement with the ear 76. A spring washer 71 is placed over the plate 75 and around the sleeve of the member 71. A flanged cover member 78 is screwed on the sleeve of the member 71 so that the flanged portion of the cover member 78 rests on the spring washer 78. The pressure which is applied to the rest of the members of the clutch is adjustable so that the spring washer 71 maintains an even frictional engagement between the plate 75 and the fibre washer 74. The spring 68 has one end connected to a pin 79 provided on the outer flange of the fixed member 11. The other end of the spring is connected to the turned-down ear 76 on the plate 75. Thus, it will be readily seen that when the ear 73 engages and moves the ear 76, a frictional tension will be created in the spring 68. As has been explained before, the tension created in the spring 68 will initiate the operation of the tripping mechanism when the pickup arm reaches a predetermined position from the center of the turntable.

The tripping mechanism shown in Fig. 3 and described above, can also be operated by the clutch members in a clockwise direction (Fig. 3). Immediately after the cam 67 passes out of engagement with the spring 66, the members 62 and 61 are returned in a counterclockwise direction by the tension on the spring 68. The return movement is sufficiently great so that the lever 63 is moved out of engagement with the lever 64 to initiate a record changing cycle.

The fixed stop 69 is secured to the bottom of the base plate 10. The stop 69 has an end 70 turned at right angles thereto and is positioned in the path of movement of the member 61. As the pickup arm 14 is swung to its outwardmost position, during the record-changing cycle, it moves the member 61 in a clockwise direction (Fig. 3) into engagement with the stop 69. The engagement of these elements occurs before the pickup arm 14 is swung to its outwardmost position. Thus, after the member 61 and the stop 69 are in engagement, and the pickup arm 14 continues to move outwardly, the member 61 adjusts its angular position relative to the pickup arm through the slipping connection provided by the clutch member 61. As the pickup arm reaches a predetermined distance from the center of the turntable, the pickup arm 14 is also fixed to the shaft 15 to move therewith. A plate 72 with the member 61 and the ear 73 extending therefrom is placed over the fibre washer 74. The return movement is sufficiently great so that the member 61 is positioned well forward on the pickup arm as the latter is returned to the playing groove of the record and insures positive engagement of the members 61, 62 and 63 prior to the time when the needle 16 on the pickup arm 14 reaches the tripping groove of the record on the turntable.

The various parts of the clutch 60 are shown in detail in Fig. 8. A flanged sleeve 71 is fixed to the shaft 15 in a suitable manner so that the ear 73 engages the ear 76 when the pickup arm reaches a predetermined distance from the center of the turntable. The pickup arm 14 is also fixed to the shaft 15 to move therewith. A plate 72 with the member 61 and the ear 73 extending therefrom is mounted in frictional relationship with the upper surface of the flanged portion of the member 71. A suitable frictional washer 74, preferably of a fibrous material, is slipped over the plate 72 and around the sleeve of the member 71. A plate 75 with the turned-down ear 76 is placed over the fibre washer 74 and around the sleeve of the member 71. The ear 73 and the ear 76 are so related that the clockwise movement (Fig. 3) of the lever 61 will bring the ear 73 into engagement with the ear 76. A spring washer 71 is placed over the plate 75 and around the sleeve of the member 71. A flanged cover member 78 is screwed on the sleeve of the member 71 so that the flanged portion of the cover member 78 rests on the spring washer 78. The pressure which is applied to the rest of the members of the clutch is adjustable so that the spring washer 71 maintains an even frictional engagement between the plate 75 and the fibre washer 74. The spring 68 has one end connected to a pin 79 provided on the outer flange of the fixed member 11. The other end of the spring is connected to the turned-down ear 76 on the plate 75. Thus, it will be readily seen that when the ear 73 engages and moves the ear 76, a frictional tension will be created in the spring 68. As has been explained before, the tension created in the spring 68 will initiate the operation of the tripping mechanism when the pickup arm reaches a predetermined position from the center of the turntable.
61 in a counterclockwise direction (Fig. 3). The members 61, 62 and 63 are brought into engagement with each other, as shown in Fig. 3, before the pickup arm 14 enters the tripping groove of the record on the turntable. After the members 61, 62 and 63 are in engagement with each other and while the pickup arm 14 is still tracking the playing groove of the record on the turntable, the cam member 67 periodically strikes the element 66 thereby interrupting and moving the members 63, 62 and 61 a corresponding distance in a clockwise direction (Fig. 3). When the pickup arm moves into the tripping groove of the record on the turntable, the members 61, 62 and 63 are moved a relatively greater distance in a counter-clockwise direction (Fig. 3) during a revolution of the turntable than they moved when the stylus of the pickup arm was tracking the playing grooves of a record on the turntable. This relatively greater movement in both speed and distance of the members 61, 62 and 63, when the stylus of the pickup arm is in the tripping groove of a record on the turntable, permits the disengagement of the lever 64 from the lever 63 before the lever 67 interrupts the counter-clockwise movement (Fig. 3) of the lever 63. The disengagement of the levers 63 and 64 initiates a record changing cycle as has been previously explained.

The advantage of the clutch shown in Figs. 3 and 8 over the clutch shown in Figs. 9 and 10 is that, if for some reason the abnormal movement of the pickup arm does not initiate the operation of the tripping mechanism, the tension created in the spring 63 of the clutch 69, when the pickup arm reaches a position which is a predetermined distance from the center of the turntable, will positively initiate the operation of the tripping mechanism.

When a twelve-inch or larger record is released from its support to drop into playing position on the turntable in the manner previously described, the peripheral edge of the twelve-inch record engages a lever 83 (Figs. 3 and 5) which is pivotally connected to the housing 25. One end of the lever 83 is operatively associated with a pin 81, preferably by resting in a notch cut in the pin 81, shown in Figs. 3 and 7 of the drawings. When the lever 83 is actuated to pivot in a counterclockwise direction (Fig. 5), the pin 81 is moved vertically upward. In the upper portion of Fig. 3, there is shown a spring-biased lever 83 which is pivotally connected intermediate its ends to the base plate 10. A spring 84, connected to the lever 83 and some suitable fixed member such as the bracket 68, normally biases the lever 83 into continuous engagement with the pin 81, as shown in Fig. 3.

A fixed stop 85 is secured to the base plate 10 with its upturned end 86 positioned in the path of movement of the right hand end 83 of the lever 83. When the pin 81 is raised, which movement occurs after the L-shaped lever 56 has been moved to its outermost position during a record-changing cycle, the lever 83 is moved in a counterclockwise direction about its axis by the spring 84. The movement of the lever 83, as described, causes the right hand end of the lever to engage the stop 85, and the lower end of the lever to move into the path of movement of the upper end of the L-shaped lever 56. When the lever 83 is in the latter position, the pin 81 rests on the upper surface of the right-hand end of the lever 83.

It will be noted that a plate 87, which is fixedly secured to the upper end of the L-shaped lever 56, is provided with a pivoted spring-biased lever 88 which is capable of moving in a counterclockwise direction when it is resting against a stop 88A. As the L-shaped lever 56 moves in a clockwise direction under action of the biasing spring 89 to move the pickup arm 14 toward the initial playing groove of a record, the lever 86 moves about its axis as it comes into engagement with the lower end of the lever 83.

After the lever 83 is no longer in engagement with the lever 86, the lever 86 is returned by a biasing spring 89 to the position shown in Fig. 3. The continued movement of the L-shaped lever 56 in a counterclockwise direction brings its heel portion and the upper end of the plate 87 into engagement with the lower end of the lever 83. This engagement limits the inward movement of the L-shaped lever 56 and therewith the pickup arm 14. At this point, the pickup arm 14 is accurately positioned over the initial playing groove of a twelve-inch record.

After the twelve-inch record is played, a record-changing cycle is initiated, during which cycle the L-shaped lever 56, by moving the lever 86 in a counterclockwise direction, moves the pickup arm 14 to its outwardmost position. During this counterclockwise movement of the L-shaped lever 56, the lever 86, fixed against counterclockwise movement by the stop 88A, engages the lever 83 and moves it in a clockwise direction back to the position shown in Fig. 3. With the lever 83 again locked by the pin 81 in the position shown in Fig. 3, the L-shaped lever 56, when it again moves in a clockwise direction, under the action of the spring 55, will not be impeded by the lever 83 and will be guided far enough inward by the cam surface 58 to position the needle of the pickup arm over the initial playing groove of a 10-inch record. From this description of the pickup arm control means, it is evident that the pickup arm 14 is automatically positioned over the initial playing groove of a 10-inch or 12-inch record, depending upon which size record was last moved to the turntable.

In addition to the automatic operation of the tripping mechanism described above, there is also provided manual means for actuating the tripping mechanism shown in Fig. 3. This means includes a spring-biased tripping lever 93 which is pivotally connected to the bottom of the base plate 10, as shown in Fig. 3. One end of the lever 90 is bent to extend upwardly through a slotted aperture in the base plate 10 (Fig. 3). The bent end of the lever 90 has affixed thereto a knob 51, shown in Fig. 1. The other end of the lever 90 is adapted to be moved into engagement with the lever 63 by the manual movement of the upturned end of the lever 90. The lever 90 is normally held out of engagement with the lever 64 by the spring 52 which is connected to the lever 90 and some suitable fixed member, as shown in Fig. 3. When the lever 90 is manually moved to engage and move the lever 93, the lever 63 is moved far enough to disengage the lever 64, which disengagement initiates a record-changing cycle.

In addition to the record-supporting spindle 18 for a stack of intermixed records, there is provided peripheral supports for the stack of intermixed records. The detailed construction of these peripheral record supports is illustrated in
detail in Fig. 7. The peripheral supports for 10-inch records include arms 93 and 94 which extend through a pair of rectangular apertures 102 and 103 in the housing 25 (Fig. 7) and are connected together by a shaft 95 which is journaled in the housing 25. The connection of the arms 93 and 94 by the shaft 95 permits the arms 93 and 94 to move in unison in a vertical plane. The arms 93 and 94 are held in a horizontal position by a locking member 100 which is pivotally connected to the arm 93 and which is adapted to engage the upper end of a plate 101 which is fixed to the housing 25 in a suitable manner, such as that shown in Fig. 7. One end of the locking member 100 is adapted to extend above the top surface of the arm 93 in such a position that it may be actuated to move into a non-locking position by a 12-inch supported record but not by a 10-inch supported record. Fixed supports 104 and 105, provided on the housing 28, serve to engage peripheral edge portions of the lowest record when the lowest record is a 12-inch record. Means are also provided for moving the arms 93 and 94 out of the path of a 12-inch record when such a record is in the lowest supported position. This means includes a pin or a rod 96 which is arranged to engage the arm 93, as shown in Fig. 7. The other end of the pin 96 rests on one end of a lever 97 which is pivotally connected intermediate its ends to the shaft 45, as shown in Fig. 3. The other end of the lever 97 is biased by the weight of the pin 96 into engagement with the surface of the cam 98. The cam 98 is provided on the bottom surface of the cam gear 41 and has a cutout portion 99, which is shown clearly in Fig. 1. When the lowest supported record is a 12-inch record, its engagement with the upper end of the locking member 100 moves the locking member out of locking position, as described above. As the cam gear 41 is rotating during a record-changing cycle to move the 12-inch record to playing position on the turntable, the cutout portion 99 of the cam surface 98 moves to allow one end of the lever 97 to come into engagement therewith, thus allowing the lever 97 to pivot about its connection to the shaft 45. The pivotal movement of the lever 97 permits the pin 96 to drop, which, in turn, allows the arms 93, 94 to move from the position shown in Fig. 7 to the position shown in Fig. 4. Thereafter, the 12-inch record, which is in the lowest supported position, is released from the supporting surfaces of the shoulder 20 and the members 104 and 105 and drops unimpeded into playing position on the turntable. By this time, the cam 99 on the cam gear 41 has rotated so that the cutout portion 99 is no longer in engagement with one end of the lever 97. The movement of the cam gear 41, which brings one end of the lever 97 out of engagement with the cam surface 98, pivots the lever 97 so that the pin 96 is raised. The raising of the pin raises the arm 93 and 94 back to the position shown in Fig. 7. The locking member 100, connected to the arm 93, is so shaped and its mass is so distributed that, when the arm 93 is raised back to its supporting position, the locking member 100 rotates into engagement with the plate 100 to lock the arm 93. It is thus evident that the disengaged peripheral supports 93 and 94 automatically dropped out of the path of a 12-inch record, and, after the 12-inch record has been released and drops upon the turntable, the supports 93 and 94 are properly returned to a locked supporting position before the record-changing cycle is completed.

The complete operation of the record-changing apparatus may now be understood from the above detailed description of the operation of its component parts. After a record has been placed in playing position by Fig. 4, and a stack of records has been placed upon the shoulder support 20 of the spindle 18, the motor 27 is turned on, and the pickup arm 12 is manually moved to place the needle 16 of the reproducer 13 in the initial playing groove of the record on the turntable. The pickup arm 14 moves inwardly as the needle of the reproducer 13 tracks the playing groove of the top record on the turntable. As the pickup arm 14 moves inwardly, it moves therewith the members 61, 62 and 63. When the pickup arm 14 moves into the playing groove of the top record on the turntable, the lever 63 is moved far enough in a counterclockwise direction to disengage the lever 64. The disengagement of the lever 64 by the lever 63 permits the lever 64 to move into the path of the pin 65 provided on the shaft 44. The engagement of the rotating pin 65 with the lower end of the lever 64 moves the lever 64 and therewith the mutilated gear 41 so that the gear 41 engages the underside of the pinion 43, with which the mutilated gear 41 is driven through one revolution. As the mutilated gear 41 rotates, the surface of the cam 46 pivots the lever 47, which, in turn, raises the pin 45 on the pickup arm 14 out of engagement with the record. Continued movement of the mutilated gear 41 causes the surface of the cam 55 to move the L-shaped lever 56 and therewith the lever 53 to swing the pickup arm to its outwardmost position.

Shortly thereafter, the pin 45 on the mutilated gear 41 engages and moves the cam 28, which, in turn, transmits movement to the toggle member 24 connected to the lever 23. In its movement, the toggle member 24 engages the edge of the lowest supported record and moves this record in a direction normal to the axis of the spindle sufficiently far so that the record drops off the shoulder 20 to playing position on the turntable. The mutilated gear 41 by this time rotated sufficiently far so that the cam 99 allows the L-shaped lever 55 to move clockwise under the action of the biasing spring 58. The clockwise movement of the L-shaped lever 55, by means of the lever 57, returns the needle of the pickup arm 14 over the initial playing groove of the record moved to the turntable. After the stylus of the pickup arm 14 is moved over the initial playing groove of the top record on the turntable, the surface of the moving cam 46 permits the lever 47 to pivot in a counterclockwise direction, which permits the pin 51 to drop downwardly to bring the needle of the pickup arm 14 into engagement with the initial playing groove of the top record on the turntable.

While there has been heretofore described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a phonograph having a turntable and a movable pickup arm for cooperating with a rec-
ord on the turntable, an initiating mechanism comprising a spring element, a member frictionally associated with said pickup arm and connected thereto by said spring element, connecting means frictionally associated with the pickup arm and being movable thereby a first predetermined distance during each revolution of the turntable while said pickup arm is tracking the playing groove of a record on the turntable and more than said first predetermined distance during each revolution of the turntable while said pickup arm is tracking the tripping groove of the record on the turntable, and said control member movable by said connecting means, an extension rotatable with said turntable for moving said control member and said connecting means intermittently a corresponding first predetermined distance in the opposite direction relative to the movement imparted thereto by said pickup arm, a projection on said control member adapted to engage and move said member in response to the movement imparted to said connecting means by said extension to create a tension in said spring element after the pickup arm reaches a second predetermined distance from the center of the turntable, the tension in said spring element being sufficient to move said control member by said extension and releasing said control member and therewith said connecting means in an initiating member normally held out of the path of said extension by said control member, said control member being adapted to release said initiating member into the path of said extension by a movement greater than said first predetermined distance imparted thereto by said connecting means.

2. In a phonograph having a turntable and a movable pickup arm for cooperating with a record on the turntable, an initiating mechanism comprising a spring element, a member frictionally associated with said pickup arm and connected thereto by said spring element, connecting means frictionally associated with the pickup arm and being movable thereby a first predetermined distance during each revolution of the turntable while said pickup arm is tracking the playing groove of a record on the turntable, a control member movable by said connecting means, an extension rotatable with said turntable for moving said control member and said connecting means intermittently a corresponding first predetermined distance in the opposite direction relative to the movement imparted thereto by said pickup arm, a projection on said control member adapted to engage and move said member in response to the movement imparted to said connecting means by said extension to create a tension in said spring element after the pickup arm reaches a second predetermined distance from the center of the turntable, the tension in said spring element being sufficient to move said control member by said extension and releasing said control member and therewith said connecting means in an initiating member normally held out of the path of said extension by said control member, said control member being adapted to release said initiating member into the path of said extension by a movement greater than said first predetermined distance in said first direction relative to the movement imparted thereto by said connecting means.

3. In a phonograph having a turntable and a movable pickup arm for cooperating with a record on the turntable, and initiating mechanism comprising a spring element, a member frictionally associated with said pickup arm and connected thereto by said spring element, connecting member frictionally associated with the pickup arm and being movable thereby a first predetermined distance during each revolution of the turntable while said pickup arm is tracking the playing groove of a record on the turntable and more than said first predetermined distance during each revolution of the turntable while said pickup arm is tracking the tripping groove of the record on the turntable, and said control member movable by said freely movably element, an extension rotatable with said turntable for moving said control member, said freely movably element and said connecting means intermittently a corresponding first predetermined distance in the opposite direction relative to the movement imparted thereto by said pickup arm, a projection on said control member adapted to engage and move said member in response to the movement imparted to said connecting means by said extension to create a tension in said spring element after said pickup arm reaches a second predetermined distance from the center of the turntable, the tension in said spring element being sufficient to move said control member and therewith said freely movably element and said connecting means, and an initiating member normally held out of the path of said extension by said control member, said control member being adapted to release said initiating member into the path of said extension by a movement greater than said first predetermined distance imparted thereto by said freely movably element.

4. In a phonograph having a turntable and a movable pickup arm for cooperating with a record on the turntable, an initiating mechanism comprising a connecting means frictionally associated with the pickup arm and being movable thereby a predetermined distance during each revolution of the turntable while said pickup arm is tracking the playing groove of a record on the turntable, a control member movable by said connecting means, an extension rotatable with said turntable for moving said control member and said connecting means intermittently a corresponding first predetermined distance in the opposite direction relative to the movement imparted thereto by said pickup arm, a projection on said connecting means adapted to engage and move said member in response to the movement imparted to said connecting means by said extension to create a tension in said spring element after the pickup arm reaches a second predetermined distance from the center of the turntable, the tension in said spring element being sufficient to move said connecting means more than said first predetermined distance after said extension releases said control member and therewith said freely movably element and said connecting means, and an initiating member normally held out of the path of said extension by said control member, said control member being adapted to release said initiating member into the path of said extension by a movement greater than said predetermined distance in said first direction relative to the movement imparted thereto by said connecting means.

5. In an automatic phonograph having a turntable and a movable pickup arm for cooperating with a record on said turntable; an initiating apparatus comprising a driving member, said driving member having a turntable and said driving means slidably connected with said pickup arm and being movable thereby a predetermined distance in a first direction into the path of said driving means
during a revolution of said turntable when said pickup arm is tracking a playing groove of a record on said turntable and more than said predetermined distance in said first direction during a revolution of said turntable when said pickup arm is tracking a tripping groove of said record on said turntable, said driving means moving said connecting means relative to said pickup arm said predetermined distance opposite to said first direction after said connecting means is moved into the path of said driving means; means bias-connected to said pickup arm and associated with said connecting means for moving said connecting means in said first direction a distance greater than said predetermined distance when said pickup arm reaches a predetermined distance from the center of said turntable; and initiating means being adapted to release said initiating means into the path of said driving means. Said driving means being adapted to release said initiating means into the path of said driving means cooperate in moving said actuating means into driving engagement with said driving means.

8. In an automatic phonograph having a turntable and a movable pickup arm for cooperating with a record on said turntable; an initiating apparatus comprising driving means rotatable with said turntable; connecting means slidably connected with said pickup arm and being movable thereby a predetermined distance in a first direction into the path of said driving means during a revolution of said turntable when said pickup arm is tracking a playing groove of a record on said turntable, said driving means moving said connecting means relative to said pickup arm said predetermined distance opposite to said first direction after said connecting means is moved into the path of said driving means; means bias-connected to said pickup arm and associated with said connecting means for moving said connecting means in said first direction a distance greater than said predetermined distance when said pickup arm reaches a predetermined distance from the center of said turntable; and initiating means normally held out of the path of said driving means. Said driving means being adapted to release said initiating means into the path of said driving means cooperate in moving said actuating means into driving engagement with said driving means.

9. In a phonograph having a turntable and a movable pickup arm for cooperating with a record on said turntable; an initiating apparatus comprising connecting means slidably connected with said pickup arm and being movable thereby a predetermined distance during each revolution of said turntable when said pickup arm is tracking a tripping groove of a record on said turntable and more than said predetermined distance in said first direction during a revolution of said turntable when said pickup arm is tracking a tripping groove of a record on said turntable, said driving means moving said connecting means relative to said pickup arm said predetermined distance opposite to said first direction after said connecting means is moved into the path of said driving means; means bias-connected to said pickup arm and associated with said connecting means for moving said connecting means in said first direction a distance greater than said predetermined distance when said pickup arm reaches a predetermined distance from the center of said turntable; and initiating means being adapted to release said initiating means into the path of said driving means.
said connecting means is moved more than said predetermined distance in said first direction.

10. In a phonograph having a turntable and a movable pickup arm for cooperating with a record on said turntable; an initiating apparatus comprising connecting means slidably connected with said pickup arm and being movable thereby a predetermined distance during each revolution of said turntable while said pickup arm is tracking a playing groove of a record on said turntable and more than said predetermined distance during each revolution of said turntable while said pickup arm is tracking a tripping groove of a record on said turntable; driving means rotatable with said turntable for moving said connecting means intermittently a corresponding predetermined distance opposite to said first direction after it has been moved said predetermined distance in said first direction; and actuating means associated with said connecting means and adapted to be driven by said driving means after said connecting means is moved more than said predetermined distance in said first direction.

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