

Oct. 20, 1942.

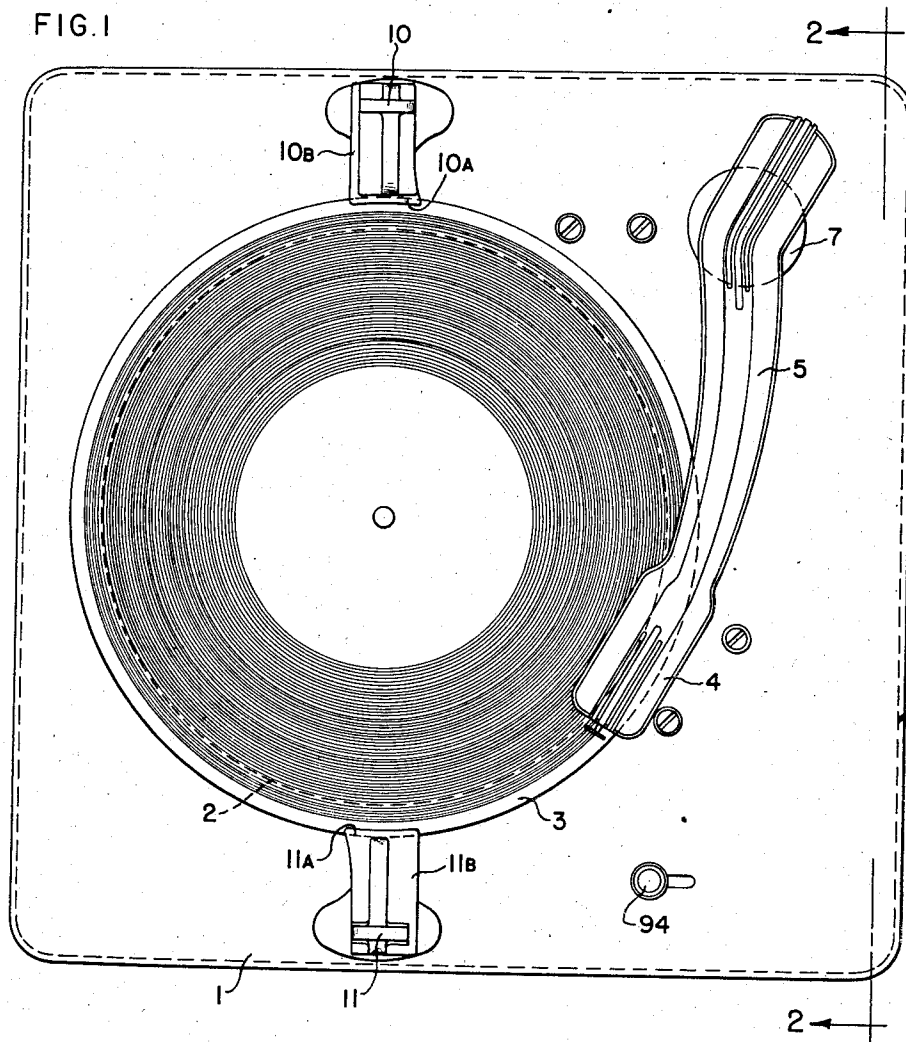
A. L. KNOX ET AL

2,299,633

AUTOMATIC RECORD CHANGING APPARATUS

Filed Aug. 16, 1940

4 Sheets-Sheet 1



INVENTORS
ARTHUR L. KNOX
FRITZ KAHL
BY *Arthur L. Knox*
ATTORNEY

Oct. 20, 1942.

A. L. KNOX ET AL

2,299,633

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FIG. 2

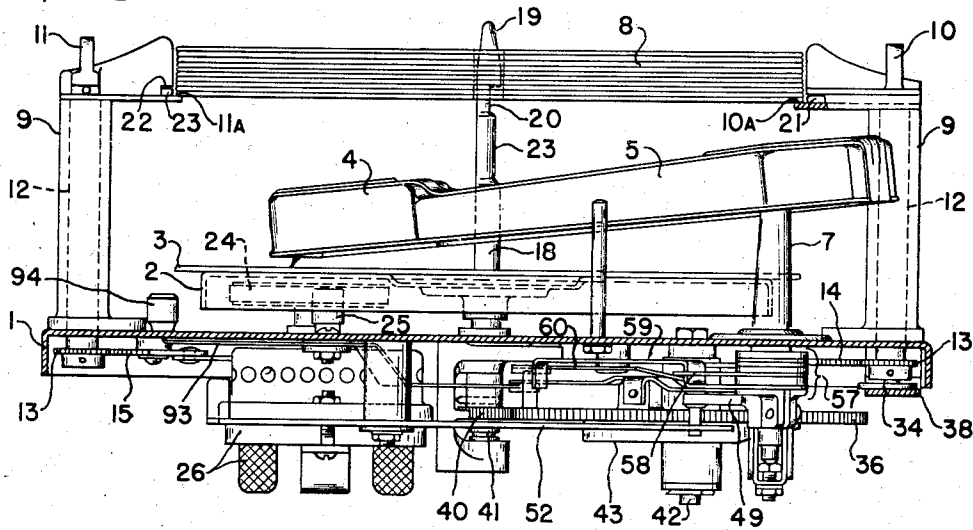
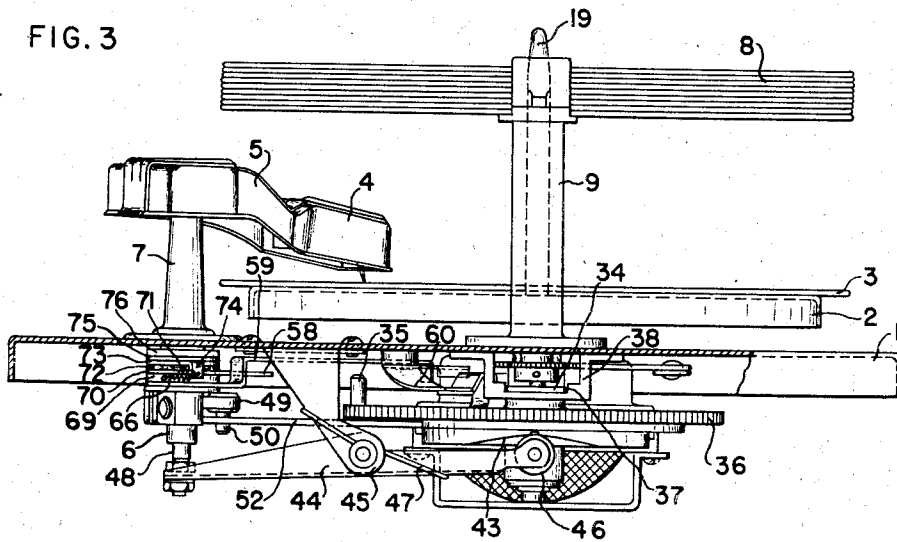


FIG. 3



INVENTORS
ARTHUR L. KNOX
FRITZ KAHL

BY *Charles H. Martin*
ATTORNEY

Oct. 20, 1942.

A. L. KNOX ET AL

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FIG. 6

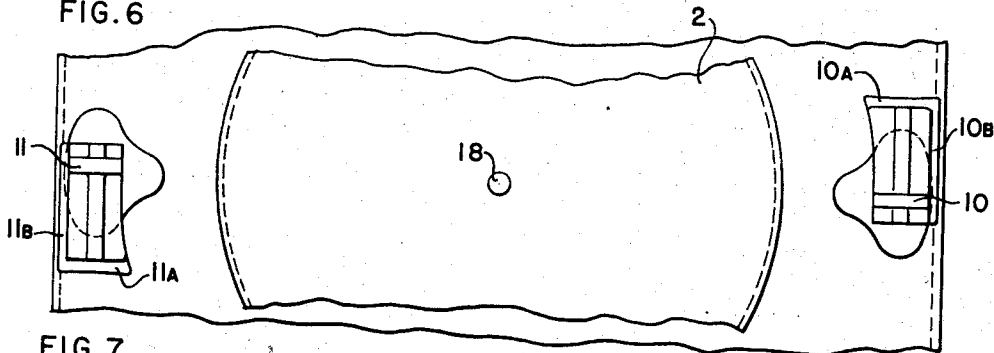


FIG. 7

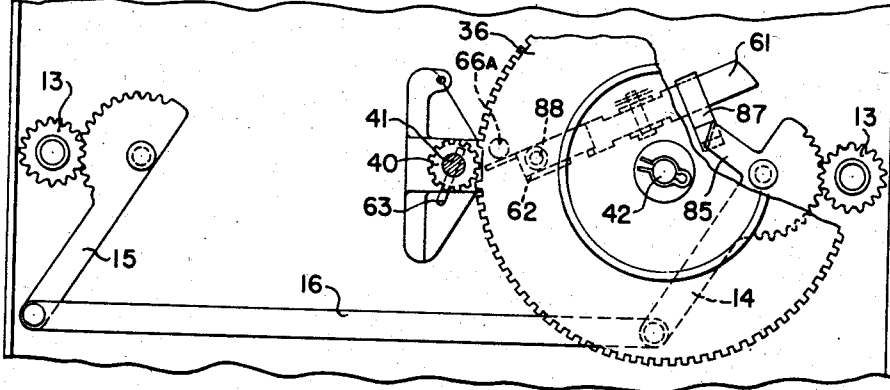


FIG. 9

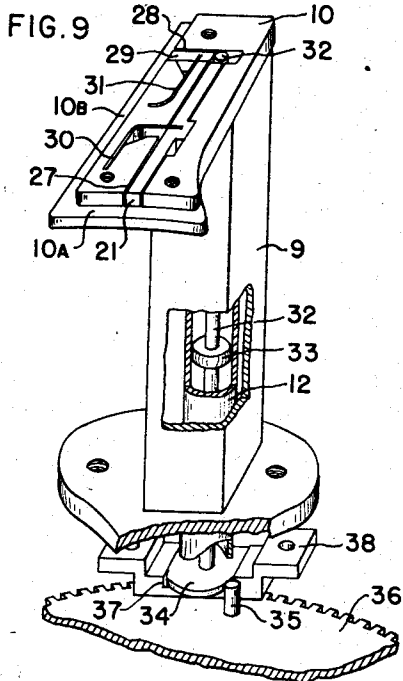


FIG. 8

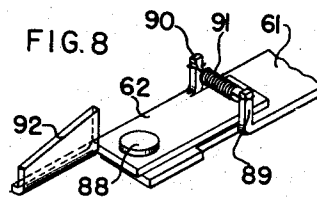
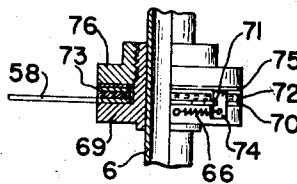


FIG. 10



INVENTORS
ARTHUR L. KNOX
FRITZ KAHL
BY *Arthur L. Knox*
ATTORNEY

UNITED STATES PATENT OFFICE

2,299,633

AUTOMATIC RECORD CHANGING
APPARATUSArthur L. Knox and Fritz Kahl, Fort Wayne,
Ind., assignors to Farnsworth Television and
Radio Corporation, a corporation of Delaware

Application August 16, 1940, Serial No. 352,836

10 Claims. (Cl. 274—10)

This invention relates to phonograph apparatus, and more particularly to apparatus adaptable for use with improved automatic record-changing apparatus of improved and simplified construction.

An object of the present invention is to provide a compact record-changing apparatus of improved and simplified construction.

A further object of the invention is to provide phonograph apparatus with improved automatic record-changing mechanism which will not jam, regardless of what direction the turntable is rotated in. A further object of the invention is to provide a record-changing apparatus in which the tripping mechanism is prevented from operating when the record-supporting means are moved to non-supporting position.

In accordance with the present invention, there is provided a record-changing apparatus which comprises a turntable and movable record-supporting means. The record-supporting means is adapted to be moved into a non-supporting position. The record-changing apparatus also includes driving means, means for moving the record from the supporting means to playing position on the turntable, a movable coupling member operatively associated with the record-moving means, and a tripping mechanism for normally holding the coupling member out of the path of the driving means. The record-moving means is normally out of engagement with the driving means and is adapted to be moved into driving engagement therewith when the tripping mechanism is actuated to release the coupling member. When the coupling member is released by the tripping mechanism, it moves into the path of the driving means and cooperates with the driving means to move the record-moving means into driving engagement with the driving means. A member which is operatively associated with the supporting means is adapted to be moved to lock the coupling member in its normal position when the record-supporting means is moved to non-supporting position.

In accordance with another feature of the invention, there is provided an automatic phonograph which includes driving means, movable actuating means adapted to be moved into driving relationship with the driving means, and a movable initiating member operatively associated with the actuating means. The initiating member is normally in an inoperative position and is adapted to be moved into an operative position for moving therewith the actuating means. A projecting member is pivotally connected to the

initiating member and is adapted to be in the path of the driving means when the initiating member is in its operative position. A stop which is provided on the initiating member is adapted to limit the movement of the projecting member relative to the initiating member when the driving member moves the projecting member in a first direction. The stopping action of the stop permits the projecting member and the initiating member to cooperate in moving the actuating means into driving relationship with the driving means.

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 top plan view of the apparatus with the unplayed records removed;

Fig. 2 is a side elevation of the apparatus in Fig. 1, showing a group of records supported over the turntable and the record on the turntable in playing position, as viewed from line 2—2 of Fig. 1;

Fig. 3 is a rear elevation of the apparatus in Fig. 1, showing the cam arrangement for raising and lowering the pickup arm;

Fig. 4 is a bottom plan view of the underside of the apparatus;

Fig. 5 is a fragmentary view showing the non-trip mechanism or intercepting device, as viewed from line 5—5 of Fig. 4;

Fig. 6 is a partial top plan view of the apparatus with the records removed and the record supports in the non-supporting position;

Fig. 7 is a partial bottom plan view of the apparatus, showing the record supports in non-supporting position with the intercepting mechanism in engagement with the starting member of the tripping mechanism;

Fig. 8 is a fragmentary view of the device which prevents jamming of the record-changing mechanism; and

Fig. 9 is a perspective view of one of the record supports with the cover removed, and with the pedestal partially in section.

Fig. 10 is a view partly in section of the friction clutch assembly mounted on the pickup arm shaft of the record-changing apparatus.

Referring now more particularly to Fig. 1 of the drawings, the invention here illustrated embodies a phonograph apparatus including a base plate 1 supporting a horizontally rotatable turn-

table 2, upon which is shown a record 3 in position to be reproduced. A reproducer 4 is supported at the end of a pickup arm 5 which is pivoted at its opposite end about a vertical axis of a shaft 6 (shown in Fig. 3), which is rotatable within a pedestal 7 to permit the reproducer to move across the face of the record as the needle of the reproducer follows the groove of the record.

Fig. 2 shows in greater detail the supporting means by which a stack of unplayed records 8 is supported above the turntable by diametrically opposite record supports 9—9. These record supports extend upwardly from the base plate 1 to which they are fixedly secured. Supporting brackets 10 and 11 are fixed to the upper ends of the record supports 9—9. Shelf portions 10A and 11A on the brackets 10 and 11 engage opposite peripheral edge portions of the lowermost record of a stack when said stack is composed of ten-inch or smaller records. When the brackets 10 and 11 are rotated 90 degrees in a manner presently to be described, shelf portions 10B and 11B (see Figs. 1 and 6) on these brackets support the twelve-inch or larger records.

Each one of the brackets 10 and 11 is mounted upon the upper end of a tubular shaft 12 which is rotatable about a vertical axis within the supports 9—9. Secured to the lower end of each one of the shafts 12 is a sprocket wheel 13, more clearly shown in Figs. 4 and 7. The sprocket wheels 13 engage a connecting means comprising a pair of toothed members 14 and 15, preferably in the form of levers, which are joined by a bar 16. This connecting means or lever mechanism allows the record supports to be moved in unison to any one of three positions: supporting position for the smaller records, supporting position for the larger records, and non-supporting position. This is accomplished by manually moving either one of the brackets 10 and 11. When the brackets are in supporting position for a stack of either small or large records, they may be locked in a manner hereinafter to be described in greater detail.

As shown in Fig. 2, the turntable 2 is provided with a centering spindle 18 which extends upwardly and terminates in a tapered portion 19, which extends from the top to a point slightly above the upper plane of the second lowermost record. The tapered portion greatly facilitates loading records upon the shelf portions of the brackets 10 and 11.

The spindle 18 is notched at 20, from a point below the plane of the lowermost record to a point slightly below the plane of the third lowermost record. It is emphasized that, while the upper end of the spindle is tapered and notched as described above and shown in the drawings, the rotation of the spindle will insure that the centering apertures of the records will remain aligned properly to position the records upon the supporting brackets 10 and 11. The movement of the notched spindle about its axis is timed with the reciprocatory movement of a plunger 21 on the bracket 10, presently to be described in greater detail. The plunger 21 is arranged to engage the edge of the lowermost supported record and move it laterally so that the centering aperture of the record moves into the notch 20 of the spindle 18 and the opposite peripheral edge moves into a notch 22 provided in the bracket 11. The notches 22 and 20 permit the lowermost supported record to move sufficiently far to the left so that the right-hand edge of the record drops off the shelf portion of bracket 10.

When the lowermost supported record has been moved laterally in the manner described, the record is freed from the shelf portion of the right-hand supporting bracket 10 and begins to fall at an angle to the turntable. The spindle 18 is provided with a reduced portion 23 which permits the released record to drop at an angle. When the record is at such an angle, the rotation of the spindle pulls the left-hand edge of the record from its supporting bracket, thus allowing it to be guided by the spindle 18 into playing position upon the turntable.

The left-hand supporting bracket 11 has a small spring-biased pin 23, which prevents the lowermost record from moving laterally by vibration or otherwise into releasing position prior to the time when the record is moved by the action of the plunger 21 provided in the bracket 10.

As shown in Fig. 2, the turntable 2 is driven by a friction wheel 24, shown by dotted lines under the left-hand flange of the turntable, said friction wheel being operatively connected through a shaft 25 with an electric motor 26.

The detailed construction of the right-hand support is shown in Fig. 9 to illustrate clearly the record-moving means. The bracket 10 is provided with a pair of channels 27 and 28, the channel 27 guiding the reciprocatory plunger 21 and the channel 28 guiding a reciprocatory plunger 29. Each of the plungers is biased by respective springs 30 and 31 to the positions shown in Fig. 9. Each plunger is actuated and moved against the bias of its spring by a pin 32 which extends through the hollow shaft 12, and is arranged to be moved within the shaft 12 on a pivotal bearing 33 positioned near the mid-point of the pin 32. Fixedly secured to the lower end of the pin 32 is a cam 34, normally biased by the action of one of the springs 30 or 31, into the path of movement of a pin 35 provided on an actuating member 36, preferably in the form of a cam gear 36. The motion of the cam 34 is guided by a channel 37 provided in a supporting bracket 38. The reciprocatory motion of the cam 34 is produced by engagement of the cam with pin 35 on the cam gear 36, this reciprocatory motion being transmitted by pin 32 and pivotal bearing 33 to one of the plungers 21 or 29. When the bracket 10 is in the position shown in Fig. 9, the spring-biased plunger 21 is moved in response to the reciprocatory motion of the cam 34 and disengages ten-inch or smaller records from the shelf portion 10A; rotation of the bracket 10 through an angle of 90 degrees places the plunger 29 in position to be actuated by the pin 32 and cam 34 to disengage twelve-inch or larger records from the shelf portion 10B.

The cam gear 36 of Fig. 9 is shown completely in the upper portion of Fig. 4. Several teeth have been removed from the cam gear at 39, the purpose of the mutilation being to break the driving connection between the cam gear 36 and a driving member preferably in the form of a pinion gear 40, fixedly secured to a shaft 41 which also supports the turntable 2. After each complete revolution of the cam gear 36, the driving connection with the pinion gear 40 is broken by the mutilated portion 39 and the cam gear 36 comes to a stop. One complete revolution of the cam gear 36 defines one complete cycle of record-changing operation, as will be evident later.

When a record on the turntable has been completely played, the movement of the pickup arm initiates the operation of an automatic tripping

mechanism, presently to be described, and causes the cam gear 36 to be moved sufficiently far so that its teeth mesh with the teeth of the pinion gear 40. The cam gear 36 thereupon is driven through one complete revolution about its axis 42 and comes to rest in the position shown in Fig. 4. As the cam gear 36 rotates, the pin 35 (see Figs. 3 and 4) on the gear engages the cam 34 (see Fig. 9) and, as a result, a record moves from the supports to playing position on the turntable in the manner heretofore described.

The cam gear 36 is provided with a cam surface 43 shown in Figs. 3 and 4. An arm 44, pivoted intermediate its ends on a bracket 45 which is fixed to the plate 1, carries a roller 46 at one end which is biased by a spring 47 into engagement with the cam surface 43. As the roller 46 follows the cam surface 43, it moves the left-hand end of the arm 44 upward. This movement raises a pin 48 vertically in the hollow shaft 6. The upper end of the pin 48 engages the underside of the pickup arm 5 and raises the reproducer 4 from the surface of the record 3.

As appears in Figs. 3 and 4, a lever 49 is affixed to the lower end of the hollow shaft 6, to the upper end of which is attached the pickup arm 5. A horizontal movement of the lever 49 effects a corresponding movement of the pickup arm 5 and vice versa. The free end of the lever 49 supports a pin 50 which moves within an aperture 51 in the heel of an L-shaped lever 52 (Fig. 4). The aperture 51 is sufficiently large so that the pin 50 may move freely with the lever 49 over a wide arc corresponding to the movement of the pickup arm while playing a record. The L-shaped lever 52 is pivoted at 53. A toe 54 of the L-shaped lever 52 engages a cam surface 55 provided on the cam gear 36. This toe 54 is continuously biased toward the cam surface 55 by a spring 56. After the reproducer on the pickup arm has been raised from the surface of the record in the manner previously described, and as the cam gear 36 continues to rotate, the cam surface 55 moves the L-shaped lever 52 in a counterclockwise direction about its axis 53 and causes the right-hand side of the aperture 51 to engage and drive before it the pin 50. The pin moves the lever 49, and therewith the pickup arm, in a radial direction away from the center of the record. The cam surface 55 is so shaped that the L-shaped lever 52 ceases its counterclockwise rotation at a time when the pickup arm has been moved beyond the edge of the turntable and the records thereon.

After the pickup arm has been moved beyond the peripheral edge of the turntable and the records thereon, the cam gear 36 continues to rotate and pin 35 thereon engages the cam 34 (see Fig. 9) to cause the bottom supported record to be dropped into playing position upon the turntable in the manner previously described. Shortly thereafter, the cam surface 55 has moved to a point where the toe 54 of the L-shaped lever 52 begins to move to the right (looking at Fig. 4) under the action of the spring 56. When this occurs, the left-hand edge of the aperture 51 engages the pin 50 and moves the pin, the lever 49 and the pickup arm to a position where the reproducer needle at the end of the pickup arm is over the initial groove of the record about to be played, on the turntable.

By this time the cam surface 43 on the cam gear has rotated to the position shown in Fig. 3, when the contour of the cam permits the left-hand end of the lever 44 to drop vertically, there-

by returning the needle into playing engagement with the record on the turntable to be played.

The automatic record-changing cycle effected by a complete revolution of the cam gear 36 is initiated by the automatic trip mechanism, previously mentioned, which will now be described in greater detail. The pickup arm 5, which has been lowered to engage the phonograph needle with the initial groove of a record on the turntable, is moved inwardly by the spiral groove on the record. In moving toward the center of the record, the pickup arm moves with it the hollow shaft 6 which has secured to it a clutch 57 (Figs. 3 and 10), the detailed construction of which will be described hereinafter, which frictionally engages a lever 58.

Referring particularly to Fig. 4, a lever 59 is pivotally supported at one end for rotation about the shaft 6. Thus, as reproduction goes on and the pickup arm moves toward the center of the record, the clutch 57 moves the lever 58 in a counterclockwise direction (Fig. 4). The lever 58 engages the side of the lever 59 (more clearly shown in Fig. 3), moving said lever in a counterclockwise direction. The free end of the lever 59 preferably is turned downwardly at a right angle and engages the lower end of a lever or latch 60 which is pivotally mounted intermediate its ends to base plate 1. The upper end of the lever 60 engages the upper end of an initiating or coupling member, preferably in the form of a lever 61, which also is pivotally mounted intermediate its ends to the cam gear 36, as shown in Figs. 2 and 4. The upper end (Fig. 4) of lever 61 tends to move away from the cam gear 36 and the lower end tends to move toward the mutilated gear 36, so as to position a non-jamming or projecting member which is preferably in the form of a spring-biased catch 62, presently to be described in greater detail, into the path of movement of an extending member preferably in the form of a pin 63 which is fixed to the same shaft that supports the small pinion 40 and the turntable 2.

Each time the cam gear 36 makes a complete revolution, the upper end of the lever 61 engages the upper end of lever 60, which is so shaped that its engagement with the lever 61 causes the upper end of the lever 61 to move toward the surface of the cam gear 36 and the lower end of the lever 61 to move out of the path of the pin 63.

As the pickup arm approaches the inner groove of a record, it moves the levers 58, 59 and 60 in a counterclockwise direction (Fig. 4). The lower end of the lever 60 carries a leaf spring 64 which lies in the path of a cam 65 which is fixed to the shaft 41. The cam 65 periodically strikes the spring 64 and moves the lever 60, and with it the levers 59 and 58, in a clockwise direction (Fig. 4), the lever 58 changing its position with respect to the pickup arm by virtue of the clutch 57. When the needle at the end of the pickup arm moves into the eccentric groove customarily provided as the inner groove of the record, the lever 58 can be moved by the cam 65 in a clockwise direction (Fig. 4) only against the biasing action of a spring 66, as will presently be shown in greater detail when the construction of the clutch 57 is considered. When this occurs, the cam 65 temporarily may move the levers 60, 59 and 58 clockwise (Fig. 4), but these levers immediately thereafter are returned in a counterclockwise direction by the action of the spring 66 on the lever 58. The return movement is sufficiently great so that the lever 60 is moved out of engagement with the lever 61. The latter lever thereupon moves in a

vertical plane to position the spring-biased catch 62 adjacent a boss 66A formed on the top surface of the cam gear 36 and into the path of the pin 63. The boss 66A serves the purpose of getting a firmer engagement between the pin 63 and the catch 62 on the lever 61 when the connection between lever 61 of the cam gear 36 is loose. As the pin 63 rotates, it engages the catch 62 and moves it and the lever 61 in a horizontal plane, whereby the cam gear 36 is rotated sufficiently far so that the teeth of the cam gear 36 mesh with the teeth of the pinion gear 40, after which the pinion continues to drive the cam gear 36 through a complete revolution to effect the cycle of automatic record changing heretofore described.

As appears in Fig. 4, fixed stop 67 is secured to the base plate 1, with an upturned end 68 positioned in the path of movement of the lever 58. As the pickup arm is swung beyond the edge of the turntable and the records thereon during a record-changing cycle, it moves the lever 58 in a clockwise direction (Fig. 4) into engagement with the stop 67. The engagement between the lever 58 and the stop 67 is effected, however, before the pickup arm has swung to its outermost position. The lever 58 changes its angular position relative to the pickup arm through the slipping connection of clutch 57. This positions the lever 58 well forward of the pickup arm as the pickup arm is returned toward the center of the record and insures positive engagement of the elements 58, 59 and 60 prior to the time when the needle of the reproducer is in the innermost groove of the record.

The details of construction of the clutch 57, previously referred to in connection with Figs. 3 and 10, now will be described. A flanged sleeve 69 is affixed to the hollow shaft 6 which also supports the pickup arm 5. A plate 70, to which are fixed the lever 58 and an ear 71, is mounted in frictional relationship with the flange portion of the sleeve 69. A suitable fiber washer 72 is slipped over the plate 70. A plate 73 with a turned-down ear 74 is placed over the fiber washer 72. A spring washer 75 is placed over the plate 73. A flanged cover member 76 is screwed on the sleeve member 69 sufficiently far so that the bottom of the flanged portion of cover 76 rests upon the spring washer 75. The spring washer 75 maintains an even frictional engagement between the plate 70 and the fiber washer 72 when the members 69 and 76 are screwed together. The spring 66 is connected to the outer flange of the member 69 and the turned-down ear 74 of the plate 73. The turned-down ear 74 and the ear 71 are in such relationship that when the pickup arm reaches the inner groove of the record, the movement of the levers 58, 59 and 60 is reversed by the cam 65 and the ears 71 and 74 are moved in a clockwise direction (Fig. 4) against the tension of the spring 66. When the cam 65 moves out of relationship with the levers 58, 59 and 60, the tension of spring 66 moves levers 58, 59 and 60 with enough force to release the upper end of the lever 61 from engagement with lever 60, thus initiating a record-changing cycle.

When the record-supporting brackets 10 and 11 are in the position shown in Fig. 1, the shelf portions 10A and 11A engage the peripheral edges of ten-inch or smaller records and support the records above the turntable 2. When the brackets 10 and 11 are rotated manually 90 degrees in a counterclockwise direction, the shelf

portions 10B and 11B engage the peripheral edges of twelve-inch or larger records and support the records above the turntable 2.

As shown in Fig. 4, the brackets 10 and 11 are locked in a selected position by the provision of a locking cam 77 secured to the lower end of the shaft 12 which supports on its upper end the bracket 11. The cam 77 is provided with notches 78, 79 and 80 which are engaged by a pin 81 fixedly secured to the right-hand end of a lever 82. The lever 82 is pivotally connected intermediate its ends to plate 1. A spring 83, which is affixed to the left-hand end of the lever 82, normally biases the pin 81 into continuous engagement with one of the notches 78, 79 and 80. When notch 78 engages the pin 81, the brackets 10 and 11 are in position to support the smaller records; when the notch 79 engages the pin 81, the brackets 10 and 11 are in position to support the larger records; and when the notch 80 engages the pin 81 the brackets 10 and 11 are out of supporting position for records, thus allowing the easy removal of the played records from the turntable.

It will be noted that the left-hand end of the lever 82 extends into engagement with a set screw 84 which is provided near the lower end of the lever 52. The contour of the cam 77 is such that the left-hand end of the lever 82 allows less clockwise movement of the lever 52 under the biasing action of the spring 56, when the apparatus is set to operate on larger rather than smaller records. This limited angular movement of the lever 52 insures that the pickup arm is returned properly to the initial groove of the large records. Thus it is evident that the manual positioning of the brackets 10 and 11 for supporting either a stack of smaller or larger records automatically sets of the mechanism for positioning the pickup arm and reproducer in proper position to engage the initial groove of the size record about to be played.

The detailed construction of the non-trip or intercepting mechanism is shown in Figs. 4, 5, 6, and 7 of the drawings. Referring particularly to Fig. 4 of the drawings, the intercepting device is shown to comprise a finger 85 provided on the toothed lever 14 shown in the upper portion of Fig. 4. The finger 85 is provided with a turned-up end 86 (Fig. 5) which is arranged to engage a member 87 provided on the lever 61 when the supporting brackets 10 and 11 are turned to the non-supporting position.

The engagement of the elements 85 and 87 is not effected when the supporting brackets 10 and 11 are moved to supporting position for either the smaller or larger records. When the supporting brackets are rotated manually to non-supporting position as shown in Fig. 6, the pin 81 on the lever 82 (Fig. 4) engages the notch 80 on the cam 77 and thus the brackets 10 and 11 are locked in the non-supporting position.

When the supporting brackets 10 and 11 are moved to the non-supporting position, the levers 14 and 15 are moved in a clockwise direction to the position shown in Fig. 7 and the finger 85 on the lever 14 is moved in a clockwise direction sufficiently far to engage the member 87 on the lever 61. The engagement of the elements 85 and 87 prevents the movement of the lever 61 in a vertical plane. This insures that the lever 61 will not be tripped when the pickup arm reaches the end of a record and the lever 60 is moved out of engagement of the lever 61 in the manner previously described. It is thus evident

that the manual positioning of the brackets 10 and 11 in non-supporting position automatically locks the starting lever 61 so that it will not initiate a record-changing cycle when the pickup arm reaches the inner groove of a record on the turntable. This allows for manual operation of the phonograph apparatus with any size records.

The spring-biased catch or non-jamming member 62, previously referred to in connection with Figs. 4 and 7, will be described now in greater detail. Referring particularly to Figs. 7 and 8 of the drawings, the member 62 is pivoted on the lever 61 at 88. An ear or stop 89 is formed on the lever 61, and an ear 90 is formed on the catch 62. The member 62 is normally biased by a spring 91 to the position shown in Fig. 8. When the tripping mechanism is initiated and the member 62 with lever 61 moves in a vertical plane toward the cam gear 36 as previously described, a turned-up end 92 on the member 62 moves into the path of the pin 63. When the pin 63 by rotation engages the turned-up end 92 on member 62, the opposite end of the member engages the ear 89. The engagement of the catch 62 with the ear 89 prevents the catch from moving about its pivotal point 88, and thereupon it engages the boss 66A which gives the lever 61 a stiffening action in transmitting motion to the cam gear 36. This gear is moved sufficiently far to cause its teeth to mesh with the teeth of the pinion gear 40 and thereupon is driven through one complete revolution about its axis 42 in the manner previously described.

The spring-biased catch 62 prevents the record-changing mechanism from jamming and from being damaged when the turntable is turned opposite its normal direction of rotation.

When the shaft 41 (Fig. 7) is rotated in a clockwise direction (Fig. 7) by movement of the turntable affixed thereto, as shown in Fig. 2, the pin 63 (Fig. 7), also fixed to the shaft 41, moves into engagement with the member 62. Continued movement of the pin 63 will cause the member 62 to move in a counterclockwise direction (Fig. 7) about its pivotal point 88 against the biasing action of the spring 91 (Fig. 8). When the pin 63 is rotated sufficiently far to move beyond the turned-up end 92 of the member 62, the member is thereupon moved by the biasing action of the spring 91 to the position shown in Fig. 8 of the drawings. This reverse movement of the member 62, as has been explained above, prevents the mechanism from jamming when the turntable 2 is manually rotating in a direction opposite its normal direction of rotation. It is thus evident that the member 62 may be moved in a clockwise direction (Fig. 7) and cause the lever 61 to move the cam gear 36 sufficiently far so that its teeth will mesh with the teeth of the pinion gear 40. It also is evident that member 62 may be moved in a counterclockwise (Fig. 7) direction against the biasing action of the spring 91 without tripping or jamming the mechanism.

In addition to the automatic trip mechanism previously described, there is also provided a manual trip mechanism which is operated by a spring-biased trip lever 93 (Fig. 4). The lower end of this lever is bent to extend upwardly through a slotted aperture in the base plate 1. To this bent end of the lever 93 is affixed a knob 94 (Fig. 1). The lever 93 is normally biased by a spring 95 out of engagement with the turned-over lower end of the lever 60, but the lever 93 may be manually moved about an axis 96 to engage the lower

end of lever 60, thereby moving the upper end of the lever 60 out of engagement with the lever 61 manually to trip the mechanism and initiate a record-changing cycle.

The general mode of operation of the record-changing apparatus will now be described. After a stack of records has been placed upon the brackets 10 and 11 (Fig. 2) and a record 3 has been placed in playing position upon the turntable 2, the pickup arm 5 is moved manually to place the needle of the reproducer 4 in the starting groove of the record.

The pickup arm 5 moves inwardly as the needle of the reproducer follows the spiral groove of the record and eventually reaches the inner groove where the automatic tripping mechanism is operated by the responsive movement of the levers 58, 59 and 60 (Fig. 4) to the pickup arm 5, whereby the levers 60 and 61 disengage and the member 62 moves in a vertical plane into the path of the pin 63 provided on the shaft 41 of the pinion gear 40.

Engagement of the pin 63 with the member 62 on the lever 61 causes the cam gear 36 to be rotated until the teeth of this gear mesh with the teeth of the pinion gear 40, after which the cam gear 36 is driven by the pinion 40 through a record-changing cycle.

As the cam gear 36 rotates, the cam surface 43 (Figs. 3 and 4) moves the lever 44 and raises the pickup arm off of the record.

Continued movement of the cam gear 36 causes the cam surface 55 (Fig. 4) to move the L-shaped lever 52 and therewith the lever 49 to swing the pickup arm beyond the edge of the records on the turntable.

Shortly thereafter, the pin 35 (Fig. 9) on the cam gear 36 engages the cam 34 and moves the latter to cause a corresponding movement of the plunger 21 (or 29, depending upon the setting of the brackets 10 and 11). The plunger 21 engages the edge of the lowermost supported record and moves this record in a direction normal to the axis of the spindle 18 (Fig. 2) sufficiently far so that the record drops off of one supporting bracket. The rotation of the spindle then pulls the opposite edge of the record off of the other supporting bracket. The completely released record is guided by the spindle 18 into playing position upon the turntable.

The cam gear 36 has by this time rotated sufficiently far so that the cam surface 55 (Fig. 4) allows the L-shaped lever 52 to move clockwise under the biasing action of the biasing spring 56, to return the pickup arm to a position where the needle is over the starting groove of the record placed upon the turntable.

At this time, the cam surface 43 (Fig. 3) has rotated to the point where the lever 44 permits the needle of the reproducer to descend into engagement with the record. Immediately thereafter, the cam gear 36 comes to rest in the position shown in Fig. 4 of the drawings and reproduction of the record just placed on the turntable takes place.

The next and following cycles of automatic operations are initiated by the automatic trip mechanism each time the reproducer needle moves to the inner groove of the record. After the last record of a stack is completely played, the mechanism is shut off and the pickup arm is moved manually away from above the records upon the turntable 2.

The brackets 10 and 11 then are moved manually to the unloading position, out of the way of

the reproduced records. The movement of the brackets 10 and 11 causes the finger 85 to move into engagement with the member 87 on the lever 61. By leaving the brackets 10 and 11 in the unloading position (as shown in Fig. 7), any size records may be played and the engagement of the finger 85 with the member 87 will prevent the trip lever 61 from lowering the catch 62 in the path of the pin 63. Thus, when the record supports are in a non-supporting position and the pickup arm reaches the inner groove that is being played, the tripping mechanism will not operate automatically. Instead, the pickup arm will have to be moved manually to beyond the edge of the record. This arrangement converts the automatic mechanism into a manually controlled mechanism.

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. An automatic record-changing apparatus comprising a turntable; movable record-supporting means for supporting a stack of records, said supporting means being adaptable to be moved manually into a non-supporting position; a rotatable shaft having a driving member and an extending member; means including a cam member for moving a record from said supporting means to playing position on said turntable, said cam member being adapted to be moved into driving relationship with said driving member; a pickup arm for cooperating with a record on said turntable; a tripping mechanism operatively associated with said pickup arm and said cam member, said tripping mechanism including a pivotal member connected to said cam member and adapted to be released into the path of said extending member when said pickup arm reaches the tripping groove of a record on said turntable for cooperating in moving said cam member into driving relationship with said driving member; and a member operatively associated with said supporting means and being adapted to lock said pivotal member from moving into operative position when said supporting means is moved to a non-supporting position.

2. An automatic record-changing apparatus comprising a rotatable shaft having a driving member and an extending member; a rotatable turntable; means adapted to be driven by said driving member for moving a record to playing position on said turntable; a pickup arm for playing a record on said turntable; a tripping mechanism operatively associated with said pickup arm; an initiating member operatively associated with said record-moving means, said initiating member being adapted to be held out of operative position by said tripping mechanism when a record is being played on said turntable and being adapted to be released by said tripping mechanism when said pickup arm reaches the tripping groove of a record on said turntable; a spring-biased projecting member pivotally mounted on said initiating member and being adapted to move into the path of said extending member when said initiating member is released by said tripping mechanism, said projecting member being pivoted when said extending mem-

ber is moving in a first direction; a stop on said initiating member for preventing said projecting member from pivoting when said extending member engages said projecting member while it is moving in a second direction whereby said initiating member is moved and said record-moving means is brought into driving relationship with said driving member.

3. An automatic record-changing apparatus comprising a rotatable shaft having a driving member and an extending member; a rotatable turntable; movable record-supporting means for supporting a stack of records, said supporting means being adapted to be moved manually into a non-supporting position; means for moving a record from said supporting means to playing position on said turntable; a pickup arm for cooperating with a record on said turntable; tripping mechanism operatively associated with said pickup arm; an initiating member operatively associated with said record-moving means, said initiating member being adapted to be held out of operative position by said tripping mechanism when a record is being played and being adapted to be released by said tripping mechanism when said pickup arm reaches the tripping groove of a record on said turntable; a projecting member operatively associated with said initiating member and being adapted to move into the path of said extending member when said initiating member is released by said tripping mechanism, said projecting member being responsive to the movement in one direction of said extending member for moving said record-moving means into driving relationship with said driving means; and a member operatively associated with said record-supporting means and being adapted to be moved to lock said initiating member when said record-supporting means is moved to a non-supporting position.

4. An automatic record-changing apparatus comprising a turntable; movable record-supporting means for supporting a stack of records, said supporting means being adapted to be moved into non-supporting position; driving means; means for moving a record from said supporting means to playing position on said turntable and adapted to be moved into driving relationship with said driving means; a movable coupling member operatively associated with said record-moving means and normally being held out of the path of said driving means; a tripping mechanism for releasing said coupling member into the path of said driving means whereby said record-moving means is moved into driving engagement with said driving means; and a member operatively associated with said supporting means and being adapted to be moved to lock said coupling member in said normal position when said supporting means is moved to said non-supporting position.

5. An automatic record-changing apparatus comprising a turntable; movable record-supporting means for supporting a stack of records, said supporting means being adaptable to be moved into a non-supporting position; driving means; means including a cam member for moving a record from said supporting means to said turntable, said cam member being adapted to be moved into driving relationship with said driving means; a movable coupling member operatively associated with said cam member and being adapted to move into cooperative relationship with said driving means for moving said cam member into driving relationship with said driving means; a latch for holding said coupling

member out of cooperative relationship with said driving means; means for moving said latch out of engagement with said coupling member; and a member operatively associated with said supporting means and being adapted to lock said coupling member from moving into said cooperative relationship with said driving means when said supporting means is moved to non-supporting position.

6. An automatic record-changing apparatus comprising a turntable; a pickup arm for cooperating with a record on said turntable; movable record-supporting means for supporting a stack of records, said supporting means being adaptable to be moved into a non-supporting position; means for moving a record from said supporting means to said turntable; movable cam means operatively associated with said pickup arm and said record-moving means and being adapted to be moved to carry out a record-changing cycle; a tripping mechanism operatively associated with said pickup arm and including a coupling member, said coupling member being adapted to move to cooperate with said driving means when said pickup arm reaches the tripping groove of a record on said turntable for moving said cam means to carry out said record-changing cycle; and a member operatively associated with said supporting means and being adapted to lock said coupling member from moving into said cooperative position with said driving means when said supporting means is moved to a non-supporting position.

7. An automatic record-changing apparatus comprising a turntable; a plurality of movable record supports for supporting a stack of records; connecting means operatively associated with said plurality of record supports for permitting their movement in unison into and out of record-supporting positions; driving means; means including a cam member for moving a record from said supports to said turntable, said cam member being adapted to be moved into driving relationship with said driving means; a movable coupling member operatively associated with said cam member and being adapted to move into cooperative relationship with said driving means for moving said cam member into driving relationship with said driving means; a latch for holding said coupling member out of cooperative relationship with said driving means; means for moving said latch out of engagement with said coupling member; and a member operatively associated with said connecting means and being adapted to lock said coupling member from moving into said cooperative relationship with said driving means when said supports are moved to non-supporting position.

8. In an automatic phonograph the combination of driving means; movable actuating means adapted to be moved into driving relationship with said driving means; a movable initiating member operatively associated with said actuating means and being adapted, when in an operative position, to move said actuating means therewith, said initiating member normally being in an inoperative position; means for moving said initiating member into said operative

position; a projecting member pivotally connected to said initiating member and being adapted to be in the path of said driving means when said initiating member is in the operative position; a stop on said initiating member for limiting the pivotal movement of said projecting member relative to said initiating member when said driving member moves said projecting member in a first direction whereby said actuating means is moved into driving relationship with said driving means.

9. In an automatic phonograph the combination of driving means; movable cam means normally out of driving engagement with said driving means and adapted to be moved into driving engagement therewith; a movable initiating member operatively associated with said cam means and being adapted, when in an operative position, to move said cam means therewith, said initiating member normally being in an inoperative position; a projecting member connected to said initiating member to move relative thereto and being adapted to be in the path of said driving means when said initiating member is in the operative position; a stop on said initiating member for preventing the movement of said projecting member relative to said initiating member in one direction; a spring for normally holding said projecting member against said stop; a tripping mechanism for releasing said initiating member into said operative position to move said projecting member into the path of said driving means, the movement of said driving means in a first direction moving said projecting member against the tension of said spring and the movement of said driving means in a second direction moving said projecting member with said initiating member whereby said cam means is brought into driving engagement with said driving means.

10. In an automatic phonograph the combination of driving means; movable cam means normally out of driving engagement with said driving means and adapted to be moved into driving engagement therewith; a movable initiating member operatively associated with said cam means for moving relative thereto in a plane substantially parallel to the axis of said driving means from a first to a second position and for moving in a plane substantially normal to the axis of said driving means when in said second position for moving therewith said cam means; a stop on said initiating member; a movable projecting member connected to said initiating member for moving relative thereto and being adapted to be brought into the path of said driving member when said initiating member is moved to said second position, said projecting member when moved by said driving means relative to said initiating member in a first direction being adapted to move against said stop and thereafter move therewith said initiating member and said cam member whereby said cam member is moved into driving engagement with said driving means; a tripping mechanism for releasing said initiating member from said first to said second position.

FRITZ KAHL.
ARTHUR L. KNOX.