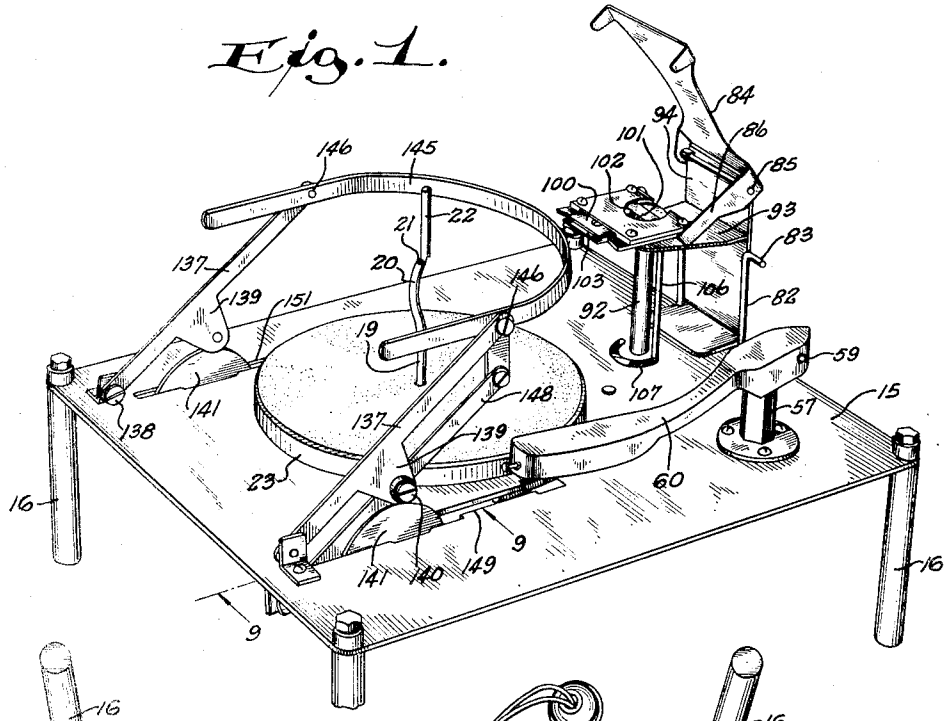
March 20, 1951 A. E. RISTAU ET AL 2,546,136

AUTOMATIC RECORD CHANGING PHONOGRAPH

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Fig. 1.



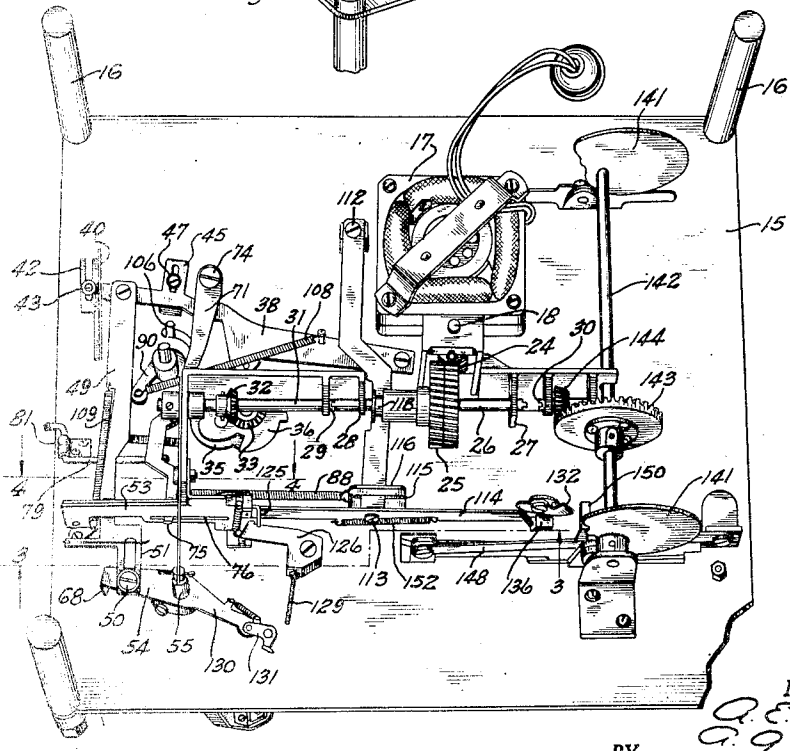




Fig. 2.

INVENTOR.
A. E. Ristau
A. J. Ristau
BY
Mosell & Mosell
ATTORNEYS.

March 20, 1951 A. E. RISTAU ET AL 2,546,136

AUTOMATIC RECORD CHANGING PHONOGRAPH

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Fig. 3.

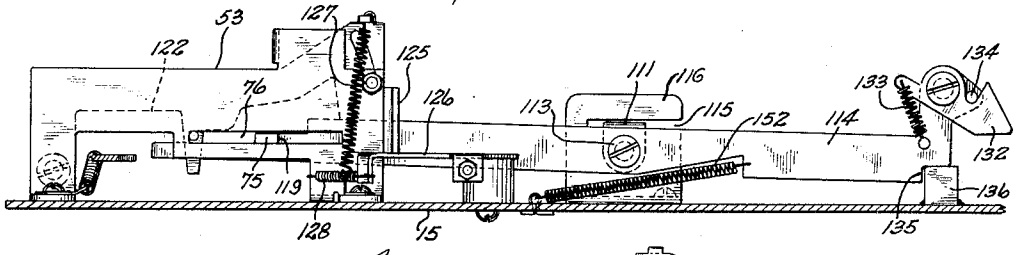
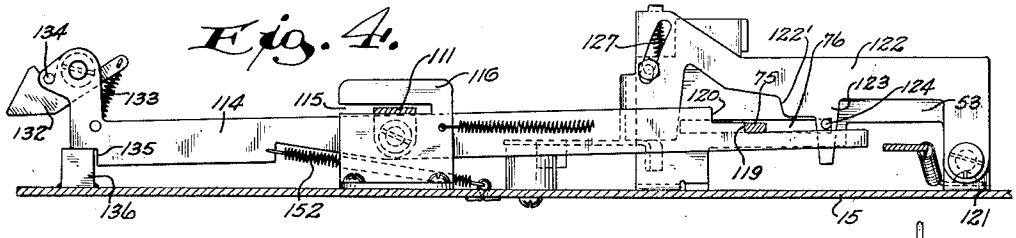



Fig. 4.



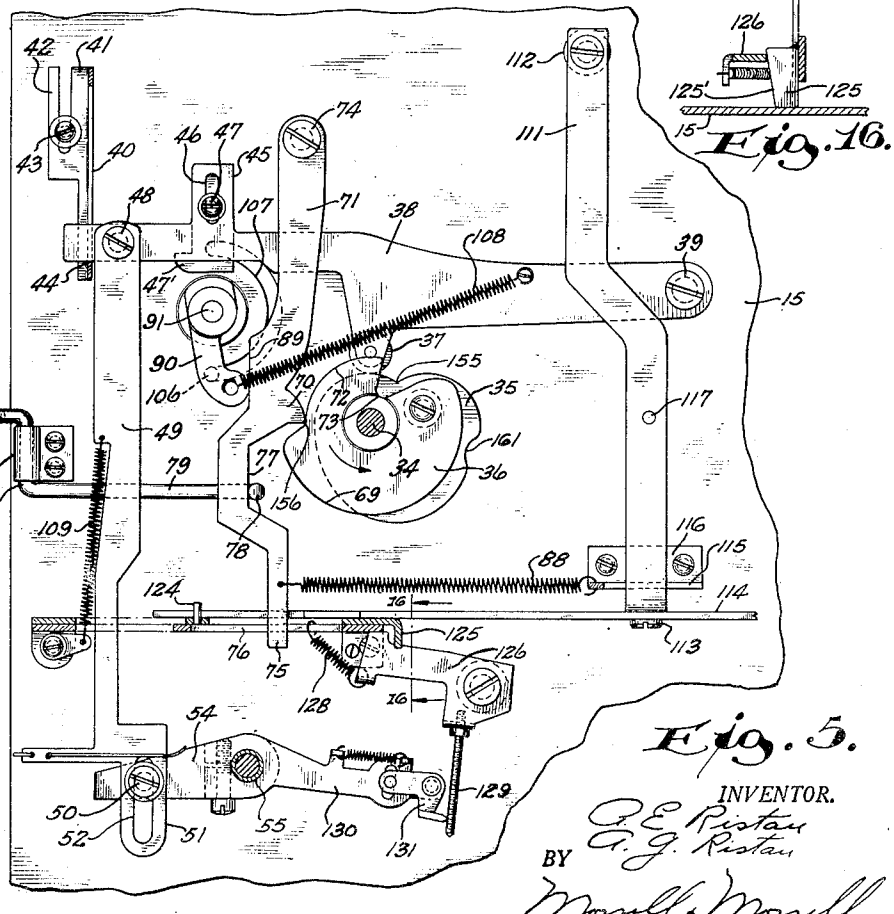







Fig. 16.

Fig. 5.

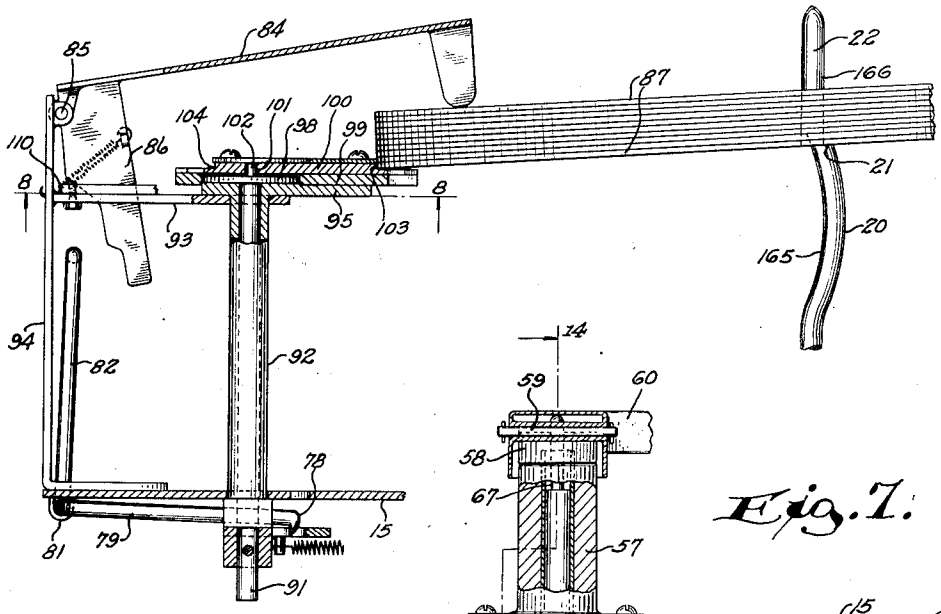
INVENTOR.
A. E. Ristau
A. J. Ristau
BY
Morsell & Morsell
ATTORNEYS.

March 20, 1951 A. E. RISTAU ET AL 2,546,136

AUTOMATIC RECORD CHANGING PHONOGRAPH

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Fig. 6.



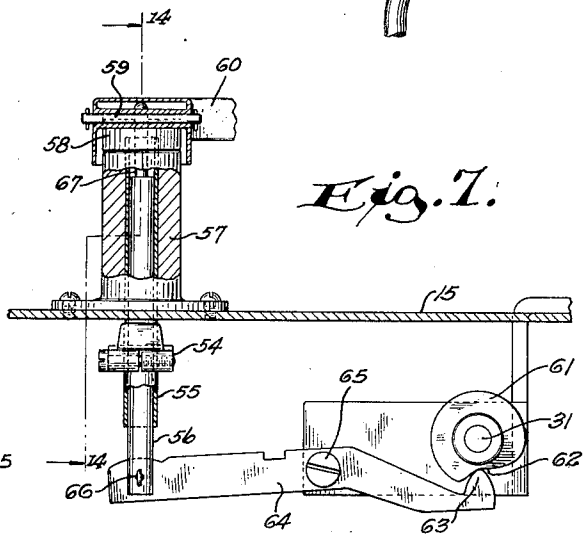




Fig. 7.

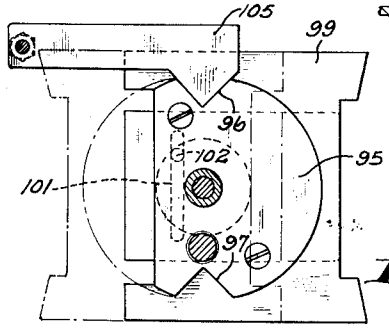



Fig. 8.

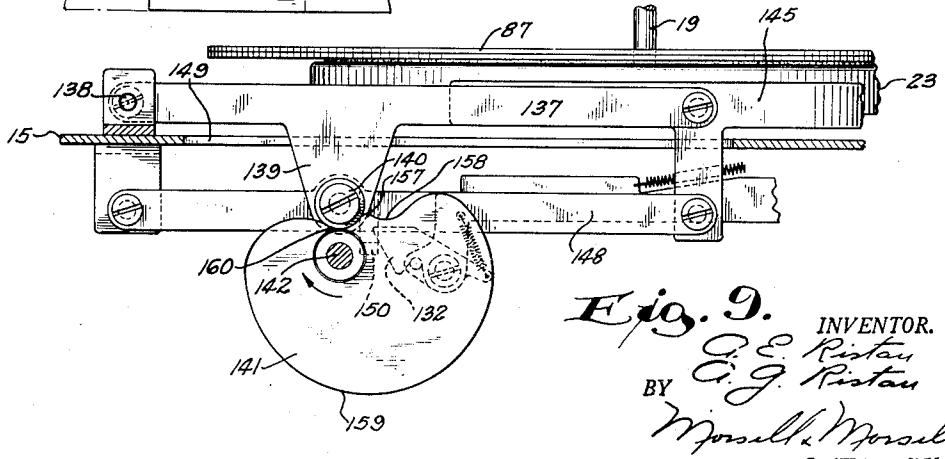



Fig. 9.

INVENTOR.
C. E. Ristau
C. J. Ristau
BY
Morsell & Morsell
ATTORNEYS.

March 20, 1951 A. E. RISTAU ET AL 2,546,136

AUTOMATIC RECORD CHANGING PHONOGRAPH

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Fig. 10.

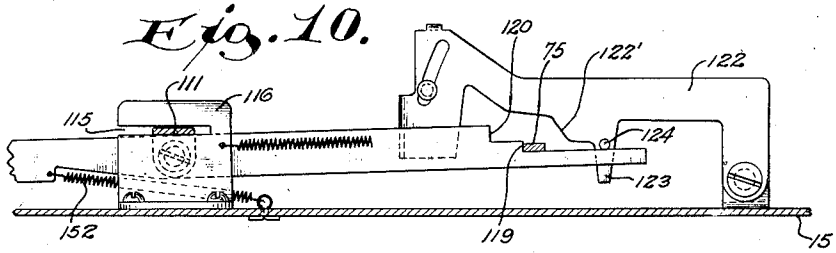
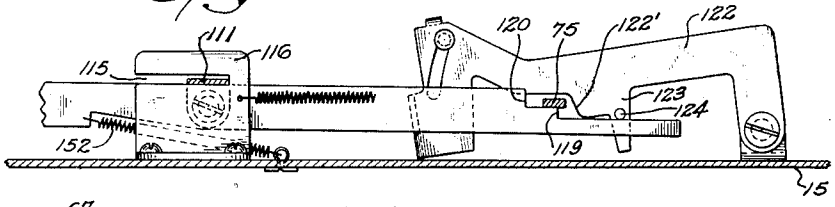



Fig. 11.



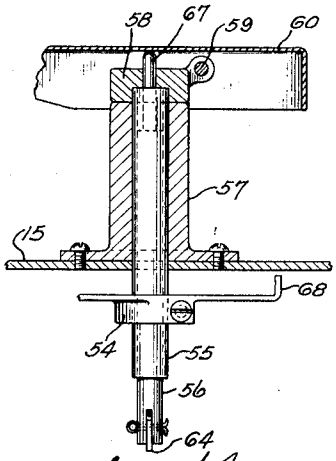




Fig. 14.

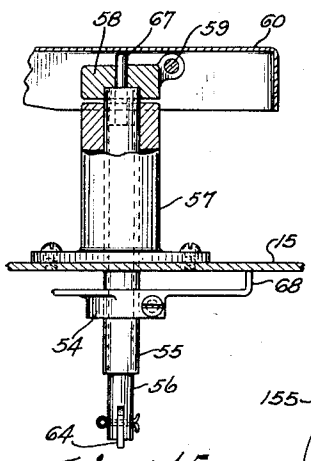



Fig. 15.

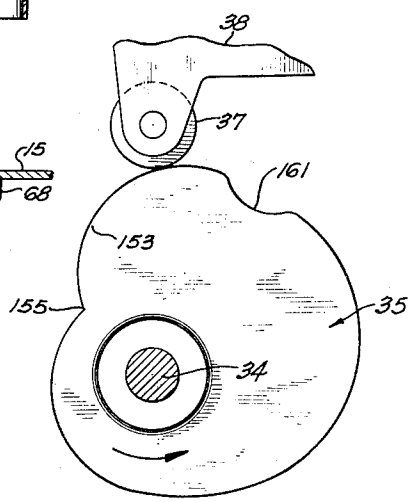



Fig. 13.

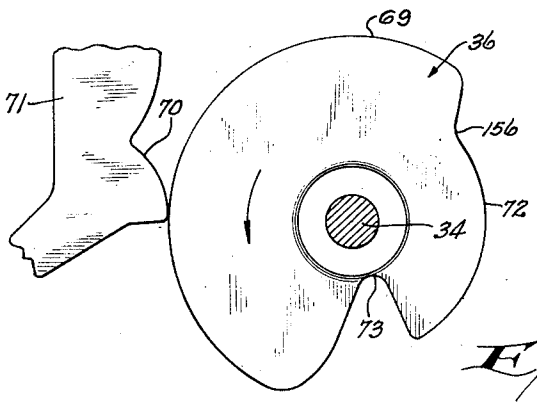



Fig. 12.

INVENTOR.
A. E. Ristau
A. J. Ristau
BY
Morsell & Morsell
ATTORNEYS.

Patented Mar. 20, 1951 2,546,136

# UNITED STATES PATENT OFFICE

2,546,136

## AUTOMATIC RECORD CHANGING PHONOGRAPH

Arnold E. Ristau and Alfred G. Ristau, Kaukauna, Wis., assignors to Ristaucrat, Inc., Kaukauna, Wis., a corporation of Wisconsin

Application August 2, 1946, Serial No. 688,064

6 Claims. (Cl. 274—10)

1

This invention relates to improvements in automatic record changing phonographs.

The invention relates in general to that type of phonograph wherein a stack of records may be inserted to be played in sequence with the changing of the records being accomplished automatically. Often-times, if the records comprising a stack can be played over and over again, this will suffice for an evening's entertainment. With the usual type of machine, however, after each record in the stack has been played once, then the records must be manually transferred to their original position if it is desired to have them replayed.

It is a general object of the present invention to provide relatively simple mechanism capable of use in a relatively inexpensive type of automatic phonograph, and automatically operable after the last record in a stack has been played for shifting the entire stack to a position where the records may be replayed.

A more specific object of the invention is to provide in a device as above described a record shifting frame so constructed and arranged that the edges of the records in the stack will clear the record supporting device on the upswing and so that on the downswing an edge portion of the lowermost record in the stack will be intercepted by said supporting device.

A further, more specific object of the invention is to provide novel push-off mechanism to thereby insure proper push-off action of one record without affecting the record thereabove.

A further object of the invention is to provide novel means for interchangeably adapting the machine for either 10 or 12 inch records.

A further object of the invention is to provide mechanism including a clutch for controlling the driving of the tone arm moving mechanism and the driving of the record push-off device, said latter mechanism and device including cams of novel shape for accomplishing the desired movements at predetermined times in the cycle of operation, there preferably being a brake in connection with the tone arm which is effective at a predetermined time to prevent the tone arm from swinging too freely.

A further, more specific object of the invention is to provide driving mechanism which is shiftable in one direction to operate the tone arm and record push-off devices and which is shiftable in the opposite direction to cause operation of the stack shifting frame, there being a novel trip-off device for shifting the driving mechanism into or out of neutral or from one side to the other.

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A further object of the invention is to provide mechanism for positively preventing movement of the shiftable driving mechanism toward the stack shifting side at an improper time in the cycle of operation.

With the above and other objects in view, the invention consists of the improved automatic record changing phonograph, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings, illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a perspective view of the device, showing the stack shifting mechanism in an elevated position;

Fig. 2 is a perspective view looking principally at the bottom of the device to show the mechanism beneath the table;

Fig. 3 is an enlarged detail view of the trip-off mechanism taken approximately along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged detail view of said trip-off mechanism looking at the opposite side and taken along the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary view looking at the bottom of the table, as in Fig. 2, and illustrating the controls for the tone arm and record dropping devices;

Fig. 6 is an enlarged fragmentary view partly in side elevation and partly in vertical section showing the stack-supporting and record push-off mechanism;

Fig. 7 is a fragmentary vertical sectional view illustrating the mechanism for raising and lowering the tone arm;

Fig. 8 is a horizontal sectional view taken along the line 8—8 of Fig. 6;

Fig. 9 is a fragmentary sectional view taken along the line 9—9 of Fig. 1;

Fig. 10 is a partially diagrammatic view of parts of the trip-off mechanism of Fig. 4 showing the parts in neutral position;

Fig. 11 is a view similar to Fig. 10 showing the parts in tripped position;

Fig. 12 is a fragmentary plan view showing the outer cam and its follower;

Fig. 13 is a fragmentary plan view showing the inner cam and its follower;

Fig. 14 is a sectional view taken approximately on the line 14—14 of Fig. 7 and showing the brake in "off" position;

Fig. 15 is a view similar to Fig. 14 showing the brake in "on" position; and

Fig. 16 is a fragmentary detail view taken on the line 16—16 of Fig. 5.

Referring more particularly to the drawings, the numeral 15 designates a suitable table which may be supported on legs 16, or in any other suitable manner, within a cabinet.

Secured to the lower side of the table (see Fig. 2) is an electric motor 17 which through suitable gearing drives a vertical shaft 18. There is a spindle 19, which is non-rotatably supported above the table. The spindle has an intermediately located bowed portion 20 separated by a horizontal shoulder 21 from a straight top portion 22. Rotatably supported on top of the table 15 and operated by the motor 17 is a turntable 23.

Beneath the table, referring again to Fig. 2, the shaft 18 is formed with a rigidly mounted worm 24 which meshes with a worm wheel 25 rigidly mounted on a shifting shaft 26. The shaft 26 is slidable in bearings formed in brackets 27 and 28 and has its ends in the form of clutch parts. When the shaft 26 is in the position of Fig. 2, the clutch 29 at one end is in engagement. This clutch will be termed the normal operating clutch. When the shaft 26 is shifted in the opposite direction, the stack reloading clutch 30 is engaged and the clutch 29 is disengaged. If the shaft 26 is in an intermediate or neutral position, both of the clutches are disengaged. In any position of the shaft 26 the worm wheel 25 is in driving engagement with the worm 24.

The shaft 31 is formed with a rigidly mounted bevel gear 32 which meshes with a bevel gear 33 mounted on a vertical stud 34. The stud 34 carries an inner or tone arm swinging cam 35 close to the bottom of the table 15 and an outer or record controlling cam 36 (see Figs. 5, 12 and 13). The cam 35 co-acts with a follower 37 carried by an intermediate portion of a tone arm swinging lever 38. The lever 38 is pivotally mounted at one end, as at 39, and has its other end movable in a slot 40 of a bracket 41. The bracket 41 is angular in cross section and has a base part formed with a slot 42 through which a screw 43 extends to adjustably connect the bracket to the underside of the table 15. By moving the bracket in one direction or the other, the position of a stop shoulder 44 may be varied for a purpose to be hereinafter described.

Projecting laterally from the pivoted arm 38 is a lug 45 having a slot 46 through which a screw 47 extends. The screw projects from an adjustment plate 47' which may be moved transversely when the screw is loosened.

Pivoted, as at 48, to the lever 38, is a link 49. The link 49 has a portion of reduced width which extends slidably beneath a bridging portion of a bridge 53 (see Figs. 3 and 4). The outer end of the link 49 has an offset portion 51 formed with a slot 52. A pivot pin 50 extends loosely through the slot and pivotally connects the link 49 to an arm 54 projecting from the lower end of a sleeve 55 surrounding a shaft 56. The slot 52 allows the arm 54 to travel the length of the slot while the record is being played.

The sleeve 55 extends rotatably through the table 15 and rotatably through a supporting post 57 (see Fig. 7). Also a slight amount of axial movement is permitted as is illustrated in Figs. 14 and 15. The extreme upper end of the sleeve 55 extends into and is rigidly connected to a rotatable cap 58. Pivoted to the cap 58 on a horizontal pivot pin 59 for elevating and lowering movement is a tone arm 60. The swinging movement of the tone arm is accomplished by partial rotating movement imparted to the sleeve by the arm 54 and associated mechanism. This, of course, acts through the rotatable cap 58 to swing the tone arm.



*Tone arm elevating and lowering*

Rigidly mounted on the end of the shaft 31 (see Fig. 7) is a tone arm elevating cam 61 which has a low spot 62. The cam acts on a follower 63 formed on the end of a lever 64. The lever 64 is intermediately pivoted, as at 65, and has its other end pivotally connected to the lower end of the rod 56, as at 66. The rod 56 is slidably movable in the sleeve 55 and carries a pin 67 at its upper end which is engageable with the tone arm just ahead of the horizontal pivot 59. When the pin is pushed upwardly, which occurs when the follower 63 is on a high part of the cam 61, then the tone arm is elevated. This action also causes an upward pull on the lower end of the sleeve 59 and a movement of the arm 54 toward the bottom of the table. The arm 54 has an end formed with an upturned lug 68 (see Figs. 2, 14 and 15) which is adapted to frictionally bear against the underside of the table 15, as in Fig. 15, while the tone arm is in an elevated position. This acts as a brake to prevent the tone arm from swinging too freely while elevated.

The outer or lowermost cam 36, which cam is designated the record controlling cam, is formed with a peripheral portion 69 which is concentric with its axis of rotation (see Fig. 12). This concentric portion acts on a follower lug 70 carried by an intermediate portion of a lever 71 to hold the lever in an outward position while the tone arm is being brought in toward the record and being lowered. Following that, the follower 70 co-acts with a lower peripheral portion 72. The cam 36 is formed with a relatively deep drop-in recess 73 for a purpose to be hereinafter described.

The lever 71 is pivoted to the bottom of the table 15, as at 74, and has its opposite end 75 operable in a horizontal slot 76 (see Figs. 3, 4 and 5) of the bridge 53. Intermediate the follower lug 70 and the end 75, the lever 71 is formed with an offset part 77 which is normally engaged by a latch formed by a bent end 78 of a rod 79. When the end 78 is engaged in the offset 77, as in Fig. 5, then the follower 70 is prevented from entering the deep drop-in recess 73.

The rod 79 has a transversely bent portion 80 which is pivoted in a bracket 81. The rod then extends upwardly, as at 82, and has a laterally bent end 83 (see Fig. 1).

A plate 84 which is pivoted, as at 85, is formed with an integral depending arm 86 (see Figs. 1 and 6). When there are still records 87 in the stack to be played, then the swinging plate 84 is held in the position of Fig. 6. However, after the last record of the stack 87 has been dropped, then gravity will cause the plate 84 to swing downwardly and the lower end of the extension 86 to engage the bent end 83 of the rod 82. This will cause the engaging end 78 on the rod portion 79 beneath the table to release the lever 71. This will then allow the spring 88 (see Fig. 5) to pull the lever 71 toward the right, referring to Fig. 5, when such action is otherwise permitted by the positions of the parts.

When the outer cam 36 has its high peripheral portion starting to engage the follower 70 on the lever 71, then the lever will be swung in a direction so that its shoulder 89 acts on a short arm 90 (see Fig. 5). This arm has its inner end rigidly

connected to a shaft 91. The shaft 91 (see Fig. 6) extends upwardly through the table and through a tubular post 92. The upper end of the post 92 is connected to a plate 93 projecting from an upright bracket 94.

Mounted on top of the plate 93 is a cut-off disc 95 having opposite peripheral notches 96 and 97 (see Fig. 8). The upper end of the shaft 91 extends rotatably through the disc 95 and has its upper end rigidly connected to a wheel 98. The wheel 98 is rotatable in a circular opening of a plate 99. The plate 99 in turn supports for slidable movement a push-off plate 100 having a transverse slot 101 within which an eccentric pin 102 on the upper end of the wheel 98 acts. One end of the push-off plate 100 is provided with a stepped record supporting edge forming a shoulder 103 which is of slightly less height than the thickness of a record, and the opposite edge of the plate 100 is formed with a similar stepped record supporting edge having a record engaging shoulder 104.

When 10 inch records are being played, as in Fig. 6, the push-off plate is in the position shown in Figs. 6 and 8 with the shoulder 103 engaging the edge of the bottommost record in the stack. The central portion of each record is, of course, supported on the spindle shoulder 21. The push-off plate and associated parts are held in the 10 inch record position by reason of the fact that the latch 105 of Fig. 8 is engaged with the notch 96 of the plate 95. If the latch 105 is swung outwardly and the plate 95 and associated parts rotated 180° so that the latch engages the notch 97, then the shoulder 105 will be presented toward the records in a proper position to support 12 inch records rather than 10 inch records.

When the parts are in the position of Fig. 6 and the arm 90 of Fig. 5 is swung by the lever 71 to partially rotate the vertical shaft 91, this will act through the eccentric pin 102 riding in the slot 101 of the push-off plate to push the plate toward the spindle from its position of Fig. 6. This will act on the bottommost record only to move the center of the record out of its position of engagement with the shoulder 21 on the spindle. The bottommost record will then fall onto the turntable 23.

When the disc 95 is being rotated from a 10 inch position to a 12 inch position, a rod 106 which extends downwardly from said disc (see Fig. 1) has its lower end movable in a semicircular slot 107 in the table. This will bring the lower end of the rod 106 to the opposite position in the slot 107 from that illustrated in Fig. 5. The end of the rod 106 projects sufficiently far below the table 15 so that when it is in the opposite position from that shown in Fig. 5, it will serve to limit the movement of the lever 38 so that the tone arm will be swung a lesser distance to be suitable for the playing of 12 inch records. A very accurate adjustment for record sizes may also be made through manipulation of the screw 47 to provide for sliding of the stop 47' to a selected position for engagement with the lower end of the rod 106.

The arm 90 which controls the record dropping is normally urged to its normal position by a coil spring 108. The link 49 is connected by a spring 109 with the table, and this spring normally urges the lever 38 and link 49 to the position shown in Fig. 5. The stack feeler plate 84 is normally urged in a downward direction by a coil spring 110.



*The trip-off mechanism*

A shifting lever 111 (see Figs. 2 and 5) is pivoted at one end to the bottom of the table, as at 112, and has its opposite end pivotally connected, as at 113, to an intermediate portion of a trip-off bar 114. The lever 111 is guided in a slot 115 of a depending bracket 116 (see Figs. 3 and 4). Intermediate the length of the lever 111 is a pin 117 which is engageable in a groove 118 of a collar on the shifting shaft 26 (see Fig. 2). Movement of the lever 111 on its pivot will through the pin 117 cause movement of the shifting shaft either toward the left, referring to Fig. 2, to engage the clutch 29, toward the right to engage the clutch 30, or to an intermediate neutral position.

The trip-off bar 114 has its upper edge, near one end, formed with a first shoulder 119 (see Figs. 4, 10 and 11) and with a second shoulder 120. The shoulders 119 and 120 are in stepped relationship with one another.

Pivoted, as at 121, to a lower corner of the bridge 53 is a trip-off lever 122 having a projection 123 which projects toward the bottom of the table and which is formed with a lateral pin 124. The movable end of the trip-off lever 122 is bent laterally, as at 125, and has an angled edge 125', for cooperation with a bell crank member 126 (see Figs. 5 and 16). When the member 126 is in the position of Fig. 5 it will hold the member 122 in a position pivoted away from the bottom of the table. If the member 126, however, is swung to release the lug 125, then the spring 127 (see Fig. 4) will act to pull the trip-off lever 122 into contact with the bottom of the table. When this occurs, the pin 124 will engage the edge of the bar 114 at one end thereof to tilt the opposite end of the bar upwardly. This action will also serve to allow the spring 152 to pull the bar 114 so that the position of the end 75 of the lever 71 changes from a position behind the first shoulder 119 (see Fig. 10) to a position as in Fig. 11.

The bell crank lever 126 is normally urged by a coil spring 128 to the position of Fig. 5. The opposite arm of the bell crank lever is in the form of a screw or roughened pin 129. An arm 130 which projects from the tone arm control sleeve 55, has a yieldingly pivoted dog 131 on its end. When the tone arm sleeve 55 is being swung in one direction, the dog will slide inwardly along the screw 129 without effecting the position of the bell crank lever. However, when the tone arm sleeve is being pivoted in the opposite direction, the dog will press against the bolt 129 and pivot the bell crank a sufficient distance against the tension of the spring 128 to release the bent end 125 of the trip-off lever 122.

On the opposite end of the bar 114 is a pivoted dog 132. A coil spring 133 normally holds the dog in a raised position against a stop pin 134 (see Fig. 4). However, pressure in the opposite direction will cause pivoting of the dog against the tension of the spring 133. The end of the bar which carries the dog has its lower edge notched, as at 135, for cooperation with a stop block 136, as will be hereinafter explained.

*Stack reloading*

Referring to Figs. 1 and 9, the reloading frame includes spaced arms 137 which are pivoted to the table, as at 138, and which have depending lugs 139 formed with cam followers 140. These followers cooperate with cams 141 mounted rigidly on opposite ends of a transverse shaft 142 below the table (see Fig. 2). The shaft 142 is equipped with a ring gear 143 which is adapted to be driven

by a bevel pinion 144 mounted on a short stud shaft having the clutch part 30. It is obvious that when the shifting shaft 26 is shifted toward the right in Fig. 2 that the shaft 142 and cams 141 will be driven.

The reloading frame also includes a U-shaped releasing structure 145 which is pivoted to the ends of the arms 137, as at 146.

Below one of the arms 137 is a parallel arm 148 which is mounted for movement in parallelogram fashion with the arm 137. The arm 148 is adapted to pass into and out of a slot 149 in the table and carries a tripping lug 150 which is adapted to co-act with the dog 132 on the end of the trip-off bar 114 when the reloading frame has been fully lowered after a reloading operation. The slot 149, as well as the corresponding slot 151, on the opposite side of the table are notched out properly to permit the cam followers 140 to pass to positions beneath the table.

*Operation*

Assuming that there is a record on the turntable 23 and that the latter is rotating, and being played, the shifting shaft 26 is in neutral position so that neither of the clutches 29 or 30 is engaged. The remainder of a stack of records 87 is being supported on the spindle shoulder 21 and push-off plate 100 in the manner shown in Fig. 6. When the tone arm comes to the end of the record the needle will follow the usual trip-off groove on the record. This groove, which spirals back, will on a backward spiral, act on the tone arm 60 to swing the rotatable cap 58 of Fig. 7 and partially rotate the sleeve 55 and swing the arm 130 of Fig. 5 in a direction toward the outer end of the screw 129. During such movement the dog 131 will act on the screw to cause pivoting of the bell crank 126 against the tension of the spring 128 and release of the bent end 125 of the trip-off lever 122. The spring 127, connected with the trip-off lever 122, will then snap this lever toward the bottom of the table 15. The edge 125' (see Fig. 16) of the lug 125 is so angled that it pivots the bell crank 126 outwardly and holds it in such position to give the dog 131 clearance from the screw 129. During such movement the pin 124 (see Figs. 4 and 10) will act on the end of the bar 114 to pivot said end of the bar toward the bottom of the table as in Fig. 11. This will free the end 75 of the lever 71 from engagement with the first shoulder 119 on the trip-off bar 114 and permit the spring 152 to pull the trip-off bar toward the right in Figs. 4 and 11 or toward the left in Fig. 2. This movement of the trip-off bar 114 toward the left in Fig. 2 acts through the shifting lever 111 to slide the shifting shaft 26 into a position of engagement with the clutch 29. The two horizontal cams 35 and 36 and the vertical cam 61 will now be rotated.

Referring to Figs. 5, 12 and 13, the cams 35 and 36 are being driven in a counter-clockwise direction. At this same time the tone arm elevating cam 61, Fig. 7, rotates to a position wherein the high portion of its periphery engages the follower 63 to cause an upward push on the rod 56 and a raising of the tone arm off of the record. During this operation the end of the sleeve 55 is pulled upwardly and this in turn presses the bent end 68 of the arm 54 (see Fig. 2) into frictional engagement with the lower surface of the table. This acts as a brake to prevent the tone arm from swinging laterally to an undesired position.

Following the raising of the tone arm, the cam 35 rotates to a position where its peripheral part 153 engages the follower 37 on the lever 38. Inasmuch as this is a movement toward the high part of the cam, the lever 38 will be swung on its pivot 39 to exert a pull on the link 49 against the tension of the spring 109. This acts through the arm 54 to pivot the sleeve 55 and tone arm and cause a swinging of the tone arm while elevated from a position over the center of the record to a position beyond its periphery.

The outer cam 36 then moves the follower 70 on the lever 71 toward its high peripheral portion 69. This acts through the shoulder 89 on the lever 71 to push the arm 90 against the tension of the spring 108 and cause a partial rotation of the shaft 91. Referring now to Fig. 6, rotation of the shaft 91 operates the eccentric pin 102 on the wheel 98 to push the record engaging shoulder 103 in a direction toward the turntable spindle and push the lowermost record off of the spindle shoulder 21. This record will now fall on top of the previous record on the turntable. At the same time the end 75 of the lever 71 will act on the inner inclined edge 122' of the member 122 to swing the latter away from the bottom of the table so that the bell crank lever 126 can snap in and hold it in cocked position.

The follower 37 on the lever 38 now starts to enter the low spot 155 of the inner cam 35. This causes a swinging of the tone arm toward the periphery of the record just over the start of the sound track. At this point the end of the lever 38 engages the end of the slot 40 in the adjustment bracket 41. This bracket is adjusted to a suitable location for the playing of 10 inch records. As before mentioned, if 12 inch records are to be played, the rotation of the push-off plate assembly 180° causes the pin 106 to be swung to the location in the slot 107 shown in Fig. 2. When in this position, the lower end of the pin 106 forms a stop which prevents the lever 38 from being moved as far in the slot 40 as it is in Fig. 5. This position shown in Fig. 2 is suitable for playing 12 inch records.

As the follower 37 enters the low spot 155 of the inner cam 35, the vertical tone arm elevating cam 61 travels to the position of Fig. 7 allowing the follower 63 to enter the low spot 62. This acts through the rod 56 to cause a lowering of the tone arm and a dropping of the needle into the beginning of the sound track on the record for the playing of the record. As soon as the tone arm is lowered to the position of Fig. 7, the pressure on the tone arm brake 68 of Fig. 2 is released.

Referring now to the outermost cam 36, the cam follower 70 will follow the high peripheral portion 69 until it enters the low spot 156. This allows the spring 88 to pull on the end 75 of the lever 71 to cause said end to press against said first shoulder 119 on the bar 114 to move said bar toward the right, referring to Fig. 2, and place the shifting shaft 26 in a neutral position out of engagement with both clutches. The parts will remain in this position while the record is being played and until the needle is acted on by the trip-off groove of the record as heretofore described.

The above procedure is repeated for each record until all of the records in the stack have been played. When the last record in the stack 87 is dropped, the pivoted feeler plate 84 will no longer be supported. The spring 110 will therefore pull the lower end of the extension 86 into engagement with the bent end 83 of the upstanding rod 82. This causes an upward pivoting of

the latching end 78 (see Fig. 6) so that said latch 78 is no longer engaged with the lever 71. Nothing, however, takes place as a result of this release until the playing of the last record has been completed and the machine has tripped off to throw the shifting shaft 126 into clutch engagement at 29 with the parts in the position of Fig. 11. Following this procedure, then when the lowermost portion 73 of the outer cam 36 is opposite the follower 70, then because the lever 71 is no longer limited in its movement by the latch 78, the follower 70 is pulled by the spring 88 all the way into the low spot 73. While this takes place the follower 37 of the other cam 35 enters a recess 161 (see Fig. 13) to relieve the torsional friction in the clutch 29 so that it will disengage and permit the follower 70 to enter the low spot 73 and permit a movement of the shifting shaft 26 to the other side. This causes the end 75 of the lever 71 to act against the shoulder 120 on the bar 114 to move the bar and shifting lever 111 in a direction to cause engagement of the shifting shaft 26 with the clutch 30. During such movement the bar 114 is so pivoted as not to be stopped by the block 136. Also, during such movement the dog 132 on the end of the bar 114 moves into engagement with the tripping lug 150, as is illustrated in Fig. 9. As soon as the clutch 30 is engaged, the shaft 142 starts rotating to rotate the cams 141 simultaneously. As the cams rotate in a clockwise direction, referring to Fig. 9, the followers 140 on the reloading frame will first follow the peripheral portion 159 which is of increased height. This will cause a swinging of the frame upwardly from the position of Fig. 9 to the position of Fig. 1 to elevate the entire stack of records which was formerly supported on the turntable. At the start of such elevating movement, the lug 150 on the bar 147 will snap past the dog 132. The action of the swinging frame is such that during elevating movement from the position of Fig. 9 to the position of Fig. 1, the structure 145 tends to draw across beneath the lowermost record to pull the records into engagement with the side 165 (see Fig. 6) of the spindle. Thus, as the records are pulled outwardly when they move up along the curved portion 20 of the spindle, the holes of the records will be kept in contact with the side 165 of the spindle to be sure to clear the edge 103 of the push-off plate on the upswing. If it were not for this action then, due to the variation in size of center holes, some records might fail to clear. After the records have been fully elevated, the shape of the cams 141 is such that the stack will be slowly lowered. During such lowering the reloading structure 145 will move across the bottom of the lowermost record in the opposite direction than it did during elevating. This tends to constantly urge the holes in the records into contact with the spindle side 166 (see Fig. 6) so that the edge of the lowermost record will be caught by the ledge 103 and so that the center of the lowermost record will be supported on the spindle shoulder 21. It is thus apparent that the shape of the spindle, together with the action of the swinging frame, insures clearance of the push-off plate on the upswing and insures interception of the records during lowering. After the records have been supported, as in Fig. 6, the reloading frame will continue downwardly toward the fully lowered position of Fig. 9. When this occurs the lug 150 will press against the end of the dog 132. Inasmuch as the dog cannot pivot in this direction of movement, this will cause a tilting of the bar 114. Such tilting will move the shoulders 119 and 120 away from the end 75 of the lever 71 and the lower edge of the bar 114 will engage above the inner end 75 of the lever 71. This permits the spring 152 to pull the bar 114 toward the left, referring to Fig. 2, to engage the clutch 29 and disengage the clutch 30. Following this procedure, the horizontal cam 36 acts on the follower 70 which has previously been in the low notch 73 to move the lever 71 through a relatively wide arc and cause the end 75 to move to the right, referring to Fig. 4, beyond the shoulder 119. This same movement also acts through angled edge 122' on the lever 122 to move the latter away from the bottom of the table and permit the bell crank 126 to snap in between the bent end 125 and the table. At the same time, the lever 71 moves to the high part of the cam to cause a push on the arm 90 and a dropping of the first record onto the turntable.

The block 136 (see Fig. 4) is so positioned that during the process of shifting into neutral it will positively prevent the bar 114 from so moving as to cause an undesired engagement of the clutch 30.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What we claim as the invention is:

1. In an automatic phonograph having a turntable of less diameter than the records to be placed thereon and a support associated therewith for receiving a plurality of records to be successively placed in playing position on said turntable, the combination therewith of a reloading structure partially embracing the periphery of said turntable below the lowermost record thereon, a pair of lifting arms pivoted to said phonograph at one end thereof and to said structure at the other end thereof, a cam member carried by said phonograph operably engaging said lifting arms intermediate their pivoted ends for raising said structure to elevate the records from the turntable to a position above said support and lower said structure to deposit said records thereon.

2. In an automatic phonograph having a turntable of less diameter than the records to be placed thereon and a support associated therewith for receiving a plurality of records to be successively placed in playing position on said turntable, the combination therewith of a U-shaped reloading structure extending about the periphery of said turntable normally positioned below the lowermost record thereon, a pair of lifting arms each having one end thereof pivotally connected with opposite sides of said structure, respectively, and their other ends pivotally anchored to said phonograph, a cam mounted on said phonograph in position to cause said arms to raise and lower said structure, a movable feeler normally supported against movement by gravity by the top record on said support, and means initiated by a release of said feeler after the top record on said support has been placed on said turntable for actuating said cams to raise and lower said structure and the records engaged thereby for reception by said support.

3. In an automatic phonograph having a fixed spindle provided with a supporting shoulder for engaging the inner edge of a center opening of the lowermost record of a stack to provide a central support therefor, a shelf for peripherally sup-

porting said stack of records through engagement therewith of the peripheral edge of the lowermost record, and a turntable rotatable about said spindle for successively receiving records from said stack to be played, the combination therewith of a reloading structure normally positioned below the lowermost record on the turntable, lifting arms pivotally supported on said phonograph each having their movable ends pivotally connected with said structure for swinging said frame from its normal position to an elevated position with an arcuate movement in one direction upon being elevated and lowering said structure to normal position through an arcuate movement in the opposite direction, and mechanism operable to raise and lower said arms, the arcuate movement of said structure in one direction during elevation thereof being adapted to direct the stack of records being elevated free of said shelf and the arcuate movement of said structure in the opposite direction upon being lowered causing said stack of records to be engaged with said supporting shoulder and shelf for interception thereby.

4. In an automatic phonograph having a support for a stack of records to be played comprising a shouldered spindle and a shelf spaced therefrom for supporting engagement with the central and lateral portions of said records, respectively, and a turntable rotatable about said spindle below said supports for successively receiving records therefrom, said spindle being bowed laterally intermediate said turntable and its supporting shoulder, the combination therewith of a reloading structure normally embracing said turntable below the outer edge of the lowermost record thereon, and mechanism operable upon the last record of the stack being played to elevate said structure for raising the stack of records upon the turntable to a position above said shouldered support and shelf and lowering said structure to its normal position about said turntable, said mechanism including a linkage between said structure and phonograph for causing said structure to swing upwardly in a direction to pull said records against the bowed portion of said spindle free of said supporting shelf to avoid interference therewith, and in the opposite direction upon being lowered to move said stack of records laterally in a direction to be intercepted by said shouldered spindle and supporting shelf.

5. In a record changer for phonographs of the drop type including a base plate, a support for holding a stack of records above a turntable rotatable over said base plate to be individually released and dropped thereon into playing position,



and means operable to effect such release, the combination therewith of a reloading structure including a pair of spaced lifting arms pivotally supported at one end to said base plate extending thereover to embrace opposite sides of said turntable in the plane thereof and below the lowermost record thereon, a record engaging and lifting means normally lying in the plane of said turntable at opposite sides thereof and pivotally supported on the free ends of said arms below said record for direct engagement therewith to raise it onto said support, and power means in operable engagement with said arms to swing them upwardly for elevating said lowermost and superimposed records onto said support and downwardly to normal position.

6. In a record changer for phonographs of the drop type including a base plate, a support for holding a stack of records above a turntable rotatable over said base plate to be individually released and dropped thereon into playing position, and means operable to effect such release, the combination therewith of a reloading structure including a pair of spaced lifting arms pivotally supported at one end to said base plate extending thereover to embrace opposite sides of said turntable in the plane thereof and below the lowermost record thereon, a record engaging and lifting means normally lying in the plane of said turntable at opposite sides thereof and pivotally supported on the free ends of said arms below said record for direct engagement therewith to raise it onto said support, power means in operable engagement with said arms to swing them upwardly for elevating said lowermost and superimposed records onto said support and downwardly to normal position, and a guide member connected with said record engaging and lifting means to move upwardly and downwardly therewith to maintain said last-mentioned means in parallel relation to said turntable during the upward and downward swinging movement thereof.

ARNOLD E. RISTAU.
ALFRED G. RISTAU.


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