

Nov. 8, 1932.

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1,887,309

DISK CHANGER AND REVERSER FOR AUTOMATIC MUSICAL INSTRUMENTS

Filed Aug. 24, 1929

3 Sheets-Sheet 1

Fig. 1.

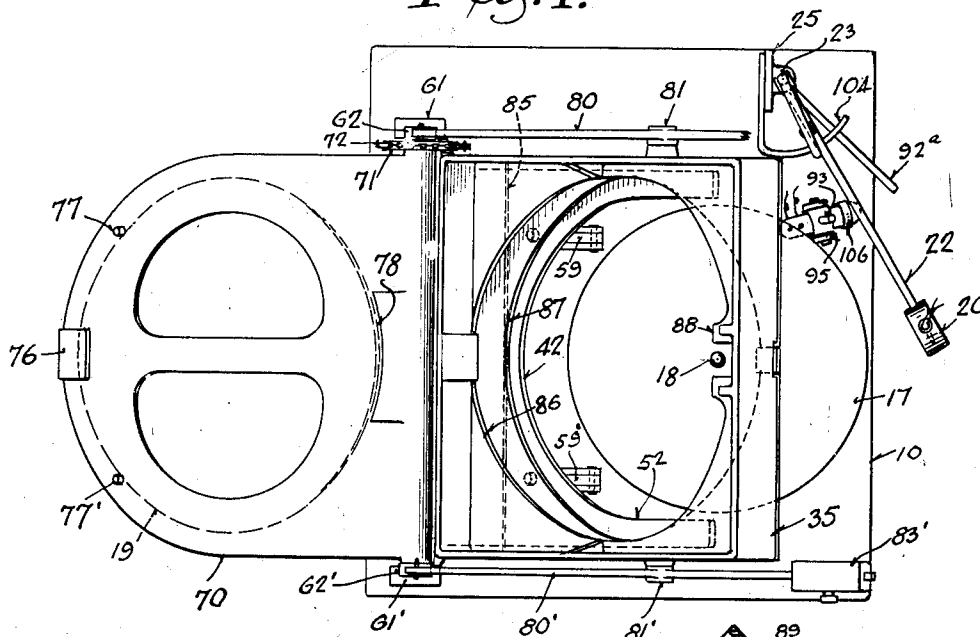
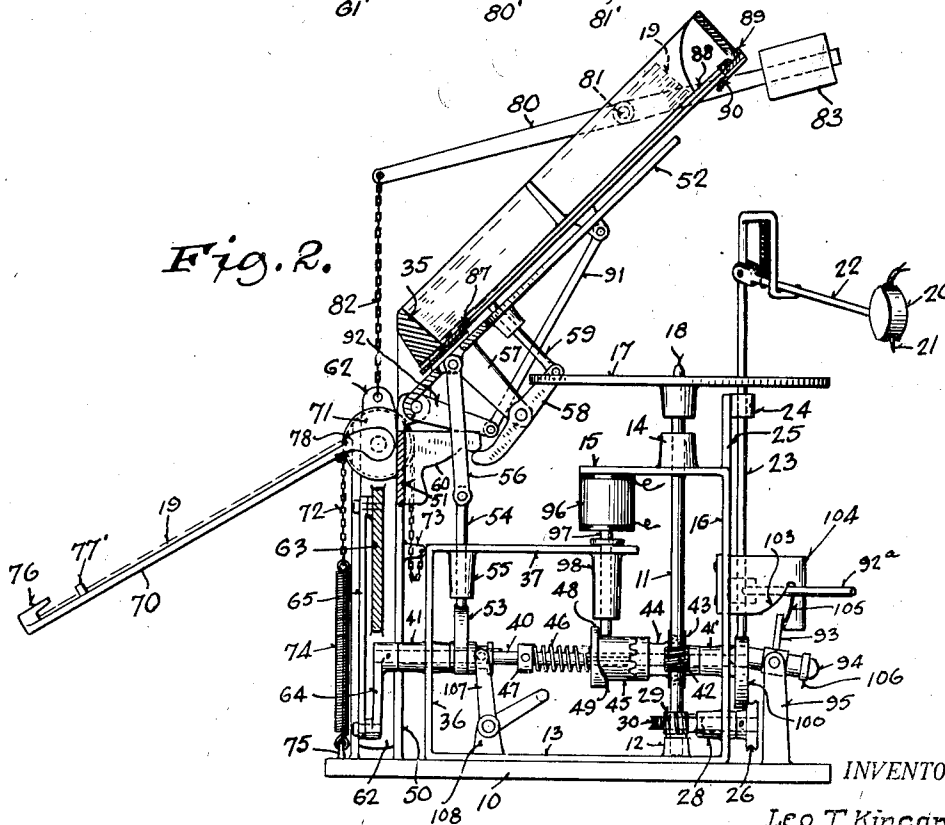


Fig. 2.



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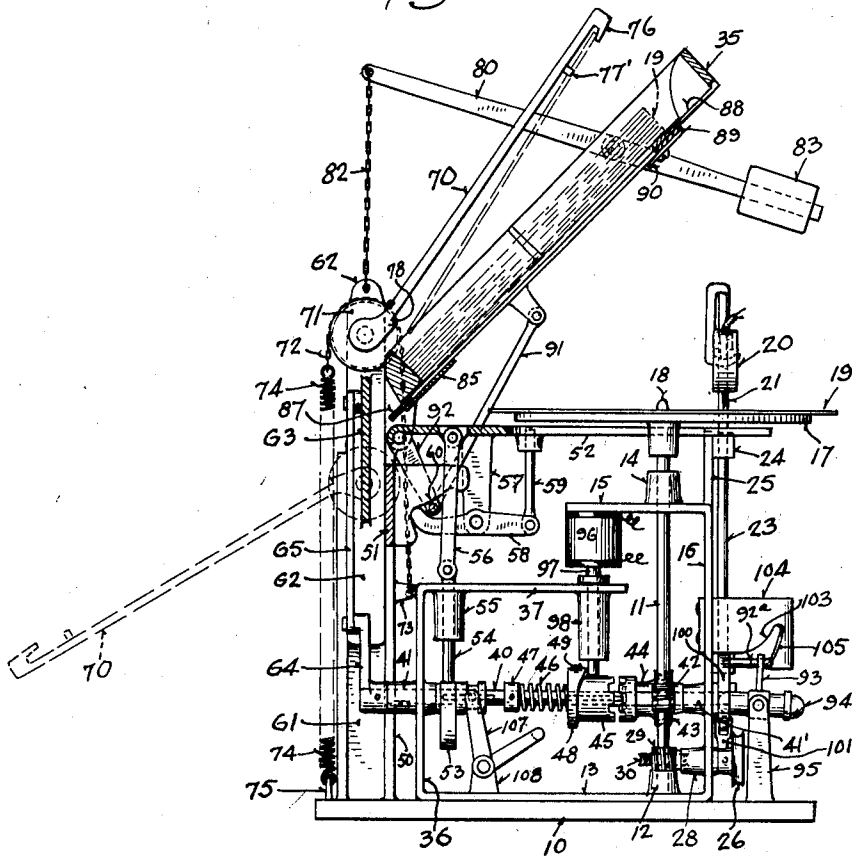
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Fig. 3.



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3 Sheets-Sheet 3

Fig. 4.

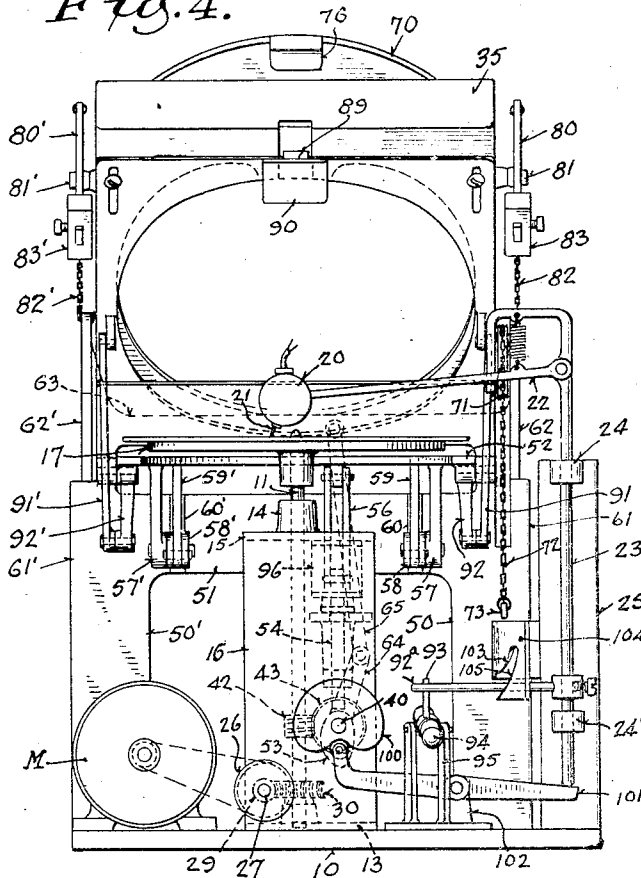


Fig. 8.

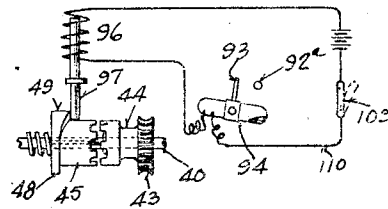


Fig. 9.

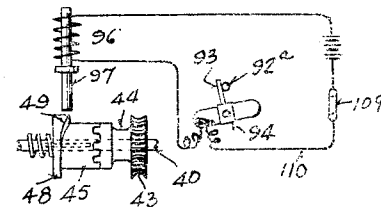


Fig. 5.

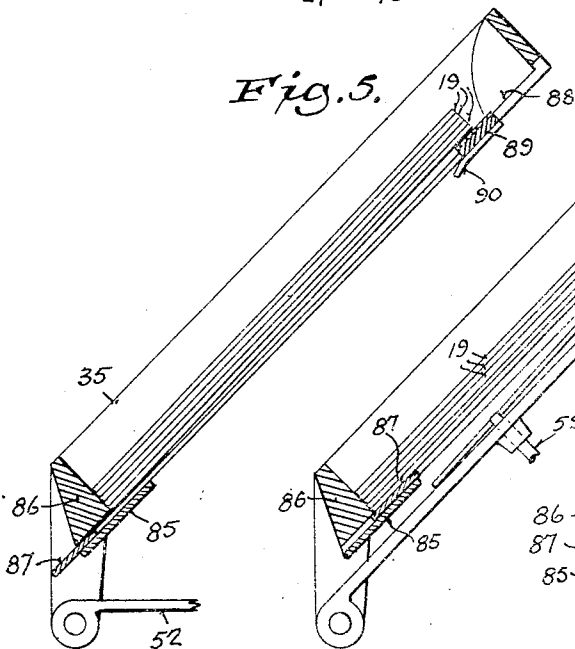


Fig. 6.

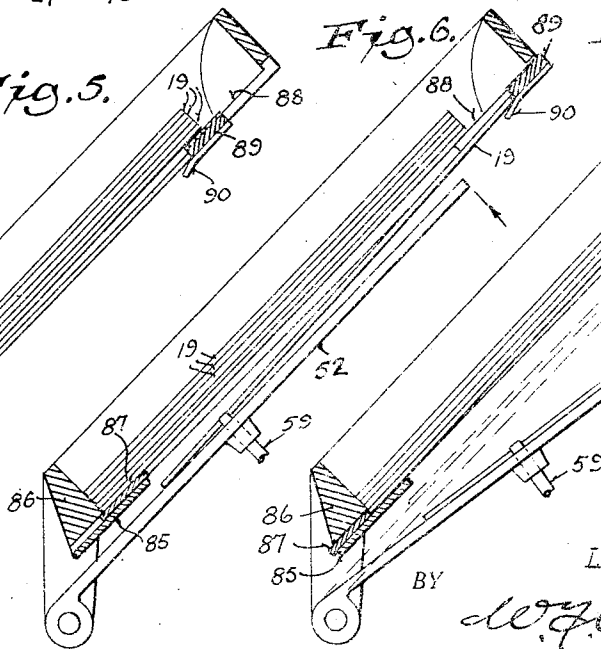
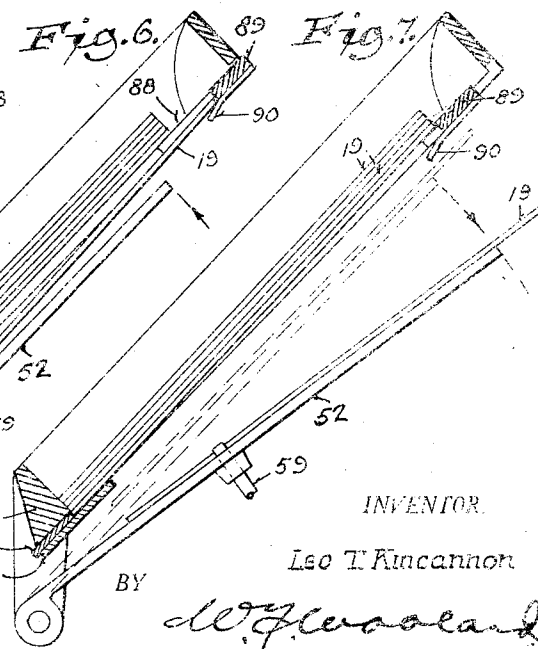


Fig. 7.



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DISK CHANGER AND REVERSER FOR AUTOMATIC MUSICAL INSTRUMENTS

Application filed August 24, 1929. Serial No. 388,204.

My invention relates to automatically operating, reproducing, musical machines employing double-faced disk records.

It consists of a novel assembly of elements and devices which co-operate to remove a disk from the rotating table after one face of the disk has been played; to discharge the said disk; to transfer a fresh disk from a magazine containing a plural number of disks, and position such disk upon the table; to reverse the position of the faces of the discharged disk; to restore the discharged disk to the magazine with the unplayed face of the disk uppermost; and to perform these operations in cycle, until all of the disks in the magazine have been played, discharged, reversed, transferred, and re-played, as far as may be desired.

In the foregoing, I have indicated the general nature and purposes of my invention. In the specification which follows, I will describe in detail the above and other structural features of my invention, and in the appended claims will point out the novelty residing therein.

In the accompanying drawings:

Figure 1 is a plan view of my improved record changer.

Fig. 2 is a side view, partly in section, looking from the lower side of Fig. 1, showing the apparatus with parts in the positions assumed when a record, after being played, is discharged, and a new record is being transferred from the magazine to the table of the musical instrument.

Fig. 3 is a like view showing the apparatus with parts in the positions to which they have been moved in transferring a new record to the table, and the previously discharged record is being reversed and restored to the magazine.

Fig. 4 is a view of the apparatus in front elevation, that is, looking from the right in Fig. 1.

Figs. 5, 6 and 7 are sectional views from front to rear through the magazine, showing the successive steps or operations performed in effecting the transfer of a new record from the magazine to the table.

Figs. 8 and 9 are diagrammatic views illus-

trating the operations of the main clutch and the mercury switch for controlling the engagement of the clutch.

In the drawings, the numeral 10 indicates the base of the apparatus in which my invention is embodied, such base and the parts which it supports being preferably positioned within the cabinet of a disk-receiving mechanical player, which will be provided with a suitable amplifier or annunciator.

A vertically disposed, driven shaft 11, is stepped at its lower end in a bearing 12 on a plate 13 resting on the base, and is supported and journaled at its upper end in a bearing 14, formed in or on an arm 15 extending inwardly from a post 16 rising from the plate 13. The shaft 11 supports a table 17 at its upper end, the said table being provided on its upper face with a dowel pin 18, in alignment with the axis of the shaft, so as to center the disks 19 as they are supplied in a progressive succession to the table.

The pick-up 20, with its needle 21, is carried upon the free end of an arm 22, pivoted for movement in a vertical plane, so that the microphone and its needle may be moved toward and away from the disk when required. At its pivoted end, the arm 22 is connected to a vertically disposed shaft 23, guided in lugs 24, 24', on a standard 25, rising from the base 10. The shaft 23 is mounted in the lugs 24, 24', so as to have both axial and rotary reciprocating motions, to raise and lower the microphone and swing it clear of the disk, when the latter is to be changed, and to restore it to operating position, as will hereinafter be described.

A motor M, Fig. 4, is belted to a pulley 26, fixed on a short shaft 27, journaled intermediate its ends in a bearing 28, formed on the post 16. The other end of the shaft 27 has fixed thereon a worm 29, in mesh with a worm gear 30, fixed on the lower end of the vertical shaft 11, near the stepped bearing 12, of the latter, and through the arrangement described, the table 17 on which the disks are placed, is given its forward movement of rotation, to transmit the recorded impressions to the pick-up.

A magazine 35, having an open top, and a

bottom constituted as an escapement for a single disk, but with capacity for holding and retaining a considerable number of disks, is mounted in fixed inclined position at the rear side of the apparatus, and made to extend forwardly and upwardly substantially over the table 17, so that disks released singly from the bottom of the magazine will drop upon the transferring device and be placed upon the table, in the direct movement of the transferring devices by which the disk is supported during transit. To permit their transfer, the disks must be of a diameter somewhat greater than that of the table, so that after the transferring device receives the disk from the magazine, the transferring device, supporting the disk at its margins, may retire into a plane below that of the surface of the table, and effect the deposit of the disk in proper position upon the table, with which it may rotate, free from interference by the now inactive transferring device.

From the opposite end of the plate 13, a second post 36 rises, and from its upper end, an arm 37 extends inwardly as does the arm 15 on the post 16, but in a plane separated somewhat from that of the arm 15. The plate 13, the posts 16 and 36, and the arms 15 and 37, constitute what may be termed a frame, which latter has the function of supporting several of the parts of the apparatus.

The disk discharging devices and the transferring devices receive their respective movements from a countershaft 40, journaled in bearings 41, 41', formed upon the posts 36 and 16. The said countershaft receives periodic rotations from the vertical shaft 11, which latter has fixed thereon a worm 42, meshing with a worm gear 43, formed with a sleeve 44 rotating loosely upon the countershaft, but with provisions for coupling the loose sleeve 44 and its worm gear to the countershaft, so as to cause the countershaft to rotate in unison with the shaft 11.

To effect such coupling and rotation of the countershaft 40, I form one end of the fixed sleeve 44 with a clutch-face, and spline upon the countershaft an axially movable sleeve 45, having the end opposed to the sleeve 44 formed with a clutch face, so that when the sleeve 45 is moved longitudinally of the countershaft and the clutch faces brought into engagement, the countershaft will be rotated, so long as the shaft 11 is driven and the clutch faces are in engagement. An expansion spring 46, encircles the countershaft, and is confined between the other end of the sleeve 45 and a collar 47, fixed upon the countershaft. The said spring acts normally to keep the clutch faces in engagement.

The disengagement of the clutch faces is effected by the longitudinal movement of the sleeve 45, in opposition to the force of the spring 46. To do this, I provide upon the end of the sleeve 45, opposite its clutch face,

a circumferential flange 48 having an axially extending nose 49 pointed toward the clutch face. By interposing a fixed object in its path of rotation, the sleeve 45 is caused to move along the countershaft, compressing the spring 46, and separating the clutch faces, whereupon the rotation of the countershaft will cease, and the elements operated from it be at rest for the time being.

The magazine 35 is supported by a framework composed of two uprights 50, 50', rising from the base 10 at the rear of the apparatus, the uprights being connected near their upper ends by a cross bar 51, as shown in Fig. 4. A disk transferer 52 of the contour shown in plan in Fig. 1, is hinged at its rear edge to the framework so as to oscillate between the horizontal plane of the top of the table 17 and the angular plane of the bottom of the magazine 35, to receive the disks when released from the magazine and position them upon the table, in single succession.

The disk transferer 52 is actuated from a cam 53, splined on the countershaft 40 and rotating therewith, but slidable longitudinally thereof. Riding upon the face of the cam 53, is the lower end of a rod 54, guided for vertical movements in a bearing 55, formed on the arm 37 of the frame before referred to. A connecting link 56, is pivoted at its lower end to the upper end of the sliding rod 54, and at its upper end to the underside of the disk transferer 52, so as to translate the rotation of the cam into the required vibrations of the disk transferer. Normally, the low part of the cam 53 is under the end of the rod 54, and at such time the countershaft 40 and the disk transferer are inactive, with the disk transferer in its position of rest just below the plane in which the table 17 lies.

Depending from the lower side of the disk transferer 52, are two hangers 57, 57', to the free ends of which rocking levers 58, 58' are pivoted intermediate their ends. The outer ends of the said levers are pivotally connected to the lower ends of rods 59, 59', the upper ends of which are guided in perforated bosses formed on the lower side of the transferer 52, through which latter the perforations are continued. The rear ends of the said rocking levers are in engagement with irregular cam surfaces formed on the edges of plates 60, 60', attached to the cross bar 51 and extending forwardly therefrom. In the vibrations of the disk transferer 52, the free ends of the rocking levers 58, 58', follow the cam surfaces of the said plates, to project the ends of the sliding pins 59, 59', into positions above the upper face of the transferer, as in Fig. 2, and to retract the said pins into positions flush with or below the said upper face of the transferer, as in Fig. 3, the said cam surfaces being developed on lines which will produce the desired movements of the sliding

ing pins. The purpose in arranging and operating the pins as stated, will later be described.

Associated with the frame composed of the uprights 50, 50', and the connecting cross bar 51, are guides 61, 61', formed as opposed channels or otherwise, in which are disposed slides 62, 62', connected to the ends of a cross bar 63, the movable structure constituting a vertically reciprocable cross head. The vertical traverse of the cross head is defined by a crank 64 fixed upon the inner end of the countershaft 40, and pivotally connected to the said cross bar by a link 65.

The numeral 70, Figs. 1 and 2 particularly, indicates a platform for receiving the disks 19 in single order after the same have been played and then removed from the table 17 by the disk transferer 52, and by which they are discharged onto the platform 70, preparatory to being reversed and restored in the magazine. The platform stands normally at the angle shown in Fig. 2, in which position it receives the discharged disk, but means are provided for lifting the platform bodily to bring it into operative relation to the magazine, and at the same time rotating it through an arc approximating 180°, so as to turn over the disk to reverse the position of its sides in the operation of restoring it to the magazine.

As shown in Fig. 1, the corners at the inner side of the platform 70, have journals in bearings in the slides 62, 62', of the cross head, so that as the latter is given the vertical movements described, the platform rises and falls bodily.

Fixed with respect to the shifting axis of the platform 70, is a circumferentially grooved wheel or sprocket 71, about which is passed a cord or chain 72, anchored at one end, and having frictional or other engagement with the said wheel, so as to effect the partial rotation of the platform when the cross head is reciprocated vertically. One end of the cord or chain, that is, the end of the run of the cord or chain which is at the front of the wheel or sprocket, is anchored to a lug 73, on the upright 50, while the other end of the cord or chain, that is, the run of the cord or chain which is at the rear of the wheel or sprocket, is connected to one end of a contractible spring 74, the other end of which spring is attached to a lug 75, fixed to the base 10.

From this it will be seen that when the cross head carrying the platform 70 is lifted by the action of the crank 64, the anchored end of the cord or chain will ride the periphery of the wheel or sprocket 71, and effect the rotation of the platform from the disk receiving position shown in dotted lines in Fig. 3, to the disk reversing position contiguous to the magazine 35, as shown in full lines in the said Fig. 3. In such movement of the cross head,

the spring 74 is distended and its accumulated energy utilized to effect the reverse rotation of the platform, at the time that the cross head receives its downward movement from crank 64. To ease the movement of the platform 70, I find it advisable to employ a counter-balance, such as is shown, it consisting of levers 80, 80', pivoted intermediately of their ends, as at 81, 81', to opposite sides of the magazine 35, the rear ends of such levers being connected by chains 82, 82', to the upper ends of the slides 62, 62', of the cross head, and carrying adjustable weights 83, 83', at their outer ends.

The discharge of the disk from the table 17, after being played, or when a change is desired, occurs in the upward rocking movement of the disk transferer 52 about its fixed axis. When, in such upward movement, the angular position of the transferer becomes coincident with that of the platform 70, the disk being unrestrained, will slide from the transferer onto the platform.

At its outer edge, the platform 70 is provided with an overhanging finger 76, under which the margin of the disk is engaged in its sliding movement from the transferer 52, and by which the disk is arrested in the desired position. The face of the platform is provided with two studs 77, 77', spaced equidistant oppositely of the finger 76, to engage the peripheral edge of the disk at points about 90° apart in the circumference of the disk, the studs insuring the positioning of the disk for accurate deposit in the magazine. The platform 70 is provided with a third point of engagement for the edge of the disk, in the form of a heel 78, rising slightly above the face of the platform, and acting oppositely to the studs 77, 77'. The heel 78 serves in the disk reversing movement of the platform, to keep the disk from sliding on the platform before the latter reaches the over-center position shown in Fig. 3. At the time the platform passes to the right of the center line, the overhanging finger 76 will restrain the upper edge of the disk. But when the platform has reached the position shown in full lines in Fig. 3, the lower edge of the disk will fall away from the heel 78. The disk will escape from the restraining finger 76, and then drop into the magazine 35. The movement of the disk in this respect, is shown in dotted lines in Fig. 3.

To effect the release of the disks singly and in succession from the bottom of the magazine 35, I provide an escapement device which will permit the delivery of one disk only in each operation. The escapement is in the form of a substantially square plate, provided with a circular opening large enough to permit a disk 19 to pass therethrough. A cross bar or plate 85 is affixed to the magazine 35 just below the main bottom bar 86, and slightly spaced from the latter so as to constitute a guide for the escapement plate,

which latter is slightly thicker than one of the disks. The lower edges of the disks in the magazine rest against the said bottom bar 86, and are normally supported upon the lower part 87 of the escapement and a fixed upper cross bar or ledge 88 of the magazine. The upper part 89 of the escapement is guided so as to slide in the bottom of the magazine, and is provided at its under side with a lip or finger 90. The upper part 89 of the escapement rises above the cross bar 88, just sufficiently to engage the edge of the lower disk of the stack in the magazine.

In the downward sliding movement of the escapement during the previous operation, which downward movement is the second step in the cycle of operations involved in effecting the delivery of a disk from the magazine and its deposit upon the table, the part 87 is withdrawn from its position of supporting the lower edge of the bottom disk of the stack, and the said edge drops to the lower cross bar 85 of the magazine, in line with the space beneath the main bottom bar 86 of the magazine. In the same movement, the elevated edge of the part 89 of the escapement engages the upper edge of the bottom disk and pushes it off from the cross bar or ledge 88, so that such upper edge drops upon the lip or finger 90, by which it is supported for the moment, the lower edge of the disk meanwhile having entered the space between the bars 85 and 86 of the magazine, as is shown in Fig. 5. The transferring devices are now at rest. The cycle of movement involved in the operation of transferring a disk begins with the upward sliding movement of the escapement, in which the lower edge of the bottom disk is pushed out of the narrow space and clear of the cross bar 85. Such edge then drops onto the transferrer 52, as is shown in Fig. 6, and as the said disk follows the inclined surface of the transferrer during the upward movement of the escapement, the upper edge of the disk slides off from or clears the lip or finger 90, and falls flat upon the surface of the transferrer. Then the restoration of the parts performing the second cycle of the operation, as already described, takes place, and the cycle of movements is repeated in effecting the successive release of the disks from the magazine.

Following the sliding of the discharged disk from the transferrer to the platform as before described, high points on the fixed cams 60, 60', actuate the levers 58, 58', to project the pins 59, 59', slightly beyond the face of the transferrer 52, and into positions where the ends of the pins will arrest the sliding movement of the disk delivered from the magazine. The said pins are so located in the transferrer that the disk will be correctly positioned for the entry of the dowel pin 18 of the table in the central perforation of the disk, and at the time the transferrer deposits

the disk on the table 17, the levers 58, 58', are reversely actuated by low portions of the cams to withdraw the ends of the pins below the surface of the transferrer.

Links 91, 91', connected at their upper ends to the under side of the escapement plate, and at their lower ends to radial arms 92, 92', impart the sliding movements to the escapement plate. The said radial arms are pivoted in the axis of rotation of the transferrer and are moved with the latter.

As shown in Fig. 1, the transferrer 52 is cut out or forked between its side margins, so as to form a circular or U-shaped opening having a diameter in excess of that of the table 17, but less than that of the disks, so that during transfer the margins of the disk will overlap the side margins and adjacent lower part of the transferrer and so support the disk, the opening of the transferrer will permit it to fall below the plane of the table and thus position the disk thereon.

The cam 53 and the crank 64 are set oppositely on the countershaft 40, so as to operate in different parts of the cycle of rotation of the shaft.

In Fig. 3, the parts are shown as in playing position. When the pick-up 20 has reached the end of its journey, an electrical circuit will be completed to initiate the action of the countershaft 40, and the devices operated therefrom.

The vertical shaft 23, in the traverse of the needle across the disk, will have a movement of partial rotation, until a radial pin 92^a, set in the shaft, encounters a finger 93, extending from a mercury switch 94, lightly pivoted in the stand 95, on the base 10. In the throwing of the switch, the terminals of an electric circuit are connected, and the coil of a solenoid 96, wired into the circuit, is energized. The solenoid coil 96 is supported at the underside of the lateral arm 15, of the frame, before described. The armature 97 of the solenoid is extended through a guide 98, supported on the lateral arm 37, of the said frame. Normally, the solenoid is inactive, and at such times the armature is at rest in its extended position, with its free end engaging the high point of the lateral cam 49, formed on the sleeve 45, splined on the countershaft 40. In such position, the clutch faces are disengaged, but with the closing of the circuit by the action of the switch, the coil is energized, and the armature is drawn into the coil, and its end disengaged from the cams. Whereupon, the compression spring 46 about the countershaft will cause the clutch faces of the parts 44 and 45 to be engaged, and the countershaft placed in rotation, this resulting in the actuation of the devices hereinbefore described, and the accomplishment of the results stated.

In addition to its rotary motion about its axis, the shaft 23 has a vertical motion in

the direction of its axis, in order to remove the needle and pick-up from proximity to the disk. To effect this vertical motion, the countershaft 40 is provided at its other end with a cam 100, against which bears a roller at one end of a lever 101, pivoted immediately of its ends, in a stand 102, attached to the base 10. The opposite end of the lever 101 engages the lower end of the shaft 23, and in the rotation of the cam 100, the shaft 23 is given a longitudinal movement to lift the pick-up 20, above and away from the disk. In such lifting movement, the pin 92^a encounters the curved cam face 103 of a plate cam 104, fixed to the post 25, and following the action of the said cam face, the pick-up 20 is swung to one side of the disk, and into a position in which it will not interfere with the operation of the disk transferring devices. The formation of the cam 100 is such as to sustain the pick-up in its remote position for a length of time sufficient to enable the disk transferring operation to be performed.

The plate cam 104 is provided also with a second curved cam face 105, arranged oppositely to that of cam face 103, the cam faces being formed by cutting out a piece from the plate on lines extending in the same general direction, but which converge at their upper ends. When the pin 92^a reaches the point of convergence, the cam face 103 has made its extreme throw. When the cam 100 has completed its throw, with the new disk in place on the table, the shaft 23 begins its descent, with the partial reverse rotation due to the formation of the cam face 105. This automatically sets the needle of the pick-up in playing position upon the disk.

With the coupling of the clutch faces on the countershaft 40, one complete rotation of the said shaft is made. The withdrawal of the pin 92^a from engagement with the finger 93 on the mercury switch 94, permits a connected light weight 106 to reverse the switch and break the circuit. But at this time, the high point of cam 49 is clear of the end of the armature 97, and the parts continue to move until the cycle is completed, at which time the end of the armature will intercept the cam 49 and move the sleeve 45, to separate the clutch faces. The countershaft will then be at rest, until the electric circuit has again been closed.

In case it is desired to repeat the performance or rendition of a record being played, the transferrer 52 may be rendered inoperative by sliding the cam 53 along the countershaft, and out from under the lower end of the rod 54, through which the transferrer is actuated. To enable this result to be achieved in an easy manner, I form a circumferential groove about the hub of the cam 53, and engage it with one arm of a bell crank 107, or other lever device, pivotally

mounted in a fixed stand 108. By operating the latter the disengagement of the cam is effected. Restoration of the cam 53 to its operative position will cause the disk transferrer to function again. When the disk transferrer is out of commission, the movement of the disk reverser and the withdrawal of the pick-up are merely idle motions.

The operation of the apparatus will be controlled by a suitable switch 109, in the circuit 110.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. In an apparatus of the class described, a rotating table upon which the disks to be played are positioned, a magazine for sustaining a stack of disks, an escapement device for releasing disks singly from the magazine, a disk transferrer mounted to vibrate between the table and the magazine and adapted to remove a disk from the table and discharge it and to receive a disk released by the escapement device and position the disk upon the table, a disk reversing device for receiving the discharged disk and placing it in reversed order on the stack in the magazine, and means for operating the said devices.

2. In an apparatus of the class described, a rotating table upon which the disks to be played are placed, a magazine in elevated position above the table, an escapement device for releasing disks singly from the magazine, a disk transferrer mounted to vibrate between the table and the magazine and adapted to remove a disk from the table and discharge it and to receive a disk released from the magazine and position such disk upon the table, a disk reversing device positioned below the magazine for receiving the discharged disk and placing it in reversed order in the magazine, with means for actuating the escapement and the disk transferrer, and means for lifting the reversing device up to the magazine.

3. In an apparatus of the class described, a rotating table upon which the disks to be played are positioned, a magazine in elevated position above the table and having its bottom at an angle to the plane of the table, means on the magazine for releasing the disks singly therefrom, a disk transferrer hinged at one side and adapted to vibrate from the plane of the table to the angular plane of the magazine to remove the disk from the table and permit it to slide from the disk transferrer as the latter assumes its inclined position with respect to the magazine, a disk reverser to receive the discharged disk and place it in reversed order in the magazine, and means for operating the said devices.

4. In an apparatus of the class described, a rotating table upon which the disks to be played are positioned, a magazine in elevated

position above the table, and having its bottom in a plane at an angle to the plane of the table, means on the magazine for releasing the disks singly therefrom, a disk transfer-
 5 ferrer hinged adjacent the lower side of the inclined magazine and adapted to vibrate from the plane of the table to the inclined plane of the magazine to remove a disk from the table and permit it to slide from the disk
 10 transferer as the latter assumes its inclined position with respect to the magazine, a disk reverser positioned below the magazine to receive the discharged disk, means for lifting the disk reverser up to the magazine to re-
 15 store the discharged disk to the magazine, and means for actuating the said devices.

5. In an apparatus of the class described, a rotating table upon which the disks to be
 20 played are positioned, a magazine for sustaining a stack of disks, an escapement device for releasing disks singly from the magazine, a disk transferer mounted to vibrate
 between the table and the magazine and adapted to remove a disk from the table and
 25 discharge it and to receive a disk released by the escapement device and position the disk upon the table, a disk reversing device for receiving the discharged disk and placing it in
 reversed order on the stack in the magazine,
 30 a pick-up and a vertical shaft carrying the same, the shaft being rotatably and longitudinally movable to remove the pick-up from the disk, and means for operating the said
 devices.

35 6. In an apparatus of the class described, a rotating table upon which the disks to be played are positioned, a magazine for sus-
 taining a stack of disks, an escapement de-
 40 vice for releasing disks singly from the magazine, a disk transferer mounted to vibrate between the table and the magazine and
 adapted to remove a disk from the table and discharge it and to receive a disk released
 45 by the escapement device and position the disk upon the table, a disk reversing device for receiving the discharged disk and placing
 it in reversed order on the stack in the maga-
 zine, a pick-up carrying arm, and means con-
 50 trolled by the position of the arm for actuating the said devices.

7. In an apparatus of the class described, a rotating table upon which the disks to be
 played are positioned, a magazine for sus-
 55 taining a stack of disks, an escapement device for releasing disks singly from the magazine, a disk transferer mounted to vibrate
 between the table and the magazine and adapted to remove a disk from the table and
 60 discharge it and to receive a disk released by the escapement device and position the
 disk upon the table, a disk reversing device for receiving the discharged disk and placing
 it in reversed order on the stack in the maga-
 65 zine, a pick-up carrying arm, and an electric

switch controlled by the position of the said arm for actuating the said devices.

8. In an apparatus of the class described, a rotating shaft carrying a table upon which
 the disks to be played are positioned, a maga- 70
 zine for sustaining a stack of disks, an es-
 capement device for releasing the disks sing-
 ly from the magazine, a disk transferer
 mounted to vibrate between the table and the 75
 magazine and adapted to remove the disk
 from the table and discharge it and to trans-
 fer a disk released by the magazine to the
 table, a disk reverser for receiving the dis-
 charged disk and placing it in reversed order
 in the magazine, a motor for driving the shaft 80
 for the table, a countershaft driven from the
 said shaft for actuating the said devices, a
 pick-up carrying arm, and electrical connec-
 tions controlled by the position of the said
 arm for connecting the countershaft to the 85
 first mentioned shaft, to actuate the said
 devices.

In testimony whereof, I have signed my
 name at Milwaukee, this 8th day of August, 90
 1929.

LEO T. KINCANNON.

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100

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115

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