RECORD CHANGING MECHANISM FOR PHONOGRAPHS

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This invention relates to an automatic record changer for disc record phonographs wherein the stack of records is supported above the turntable, the lowermost record of the stack being released to drop by gravity upon the turntable for reproduction.

The principal object of the invention is to enable a selective record changing mechanism to be produced with a minimum of working parts so as to be capable of economical production and take up little space in the phonograph. Thus, the invention is primarily directed toward improving upon record changes of this type in the direction of simplified mechanism.

One feature of the invention resides in the simplified adjustable record support for groups of either 10- or 12-inch records in the nature of a pair of nested plates, the shorter plate being fixed and the longer plate being pivoted relative thereto so as to be swung about its pivotal mounting to expose the shorter fixed plate. The phonograph is provided with oppositely disposed pairs of supporting plates mounted above the turntable upon which a stack of records may engage and be supported along the diametrically opposite portion of their edge. This arrangement is such that a stack of 10-inch records may be supported above and in spaced relation to the turntable by the longer pivotal plates while a stack of 12-inch records may be similarly supported by the fixed plates when the longer plates are swung upwardly and free thereof.

Another feature of the invention resides in the mechanism for releasing the lowermost record of the stack of superimposed records while said plates continue to support the records of the stack thereabove. This is accomplished by an upwardly extending portion of the centering pin which is fixed to and rotatable with the turntable in association with a slight forward motion of one pair of the nested supporting plates. To this end, the centering pin extension is provided with a reduced portion or neck lying in the plane of the lowermost record when supported on said plates and terminating in an enlarged head of substantially the diameter of the central hole of the record lying in the plane of the next record above the lowermost record. Said head may be continued into a further upward extension tapering to a reduced portion to permit convenient threading of the records therein. By a forward pushing movement of one of the plates against the edge of the lowermost record, it may be shoved laterally to the extent permitted by the reduced neck of the spindle while the next record thereabove is maintained in its normal position by the enlarged head portion. Upon return movement of such supporting plate, the lowermost displaced record will drop down onto the turntable into playing position.

Another feature of the invention resides in the driving mechanism for transmitting movement from the turntable drive to the record shifting means to automatically effect a change of records. This is accomplished by a cam wheel having a mutilated periphery normally in registry with the turntable drive, but movable upon completion of the record out of registry whereby the turntable drive will engage and rotate the cam wheel to effect the record shifting operation.

Other objects and features of the invention will be readily understood from the accompanying drawings and the following description and claims:

Fig. 1 is a plan view of the record changer with the unplayed records removed. Fig. 2 is a side elevation thereof showing a group of 10-inch records supported over the turntable and on the turntable in playing position, but with the trip mechanism removed for clearness. Fig. 3 is the same as Fig. 2 showing the rear elevation of the record changer. Fig. 4 is the same as Fig. 2 showing a bottom plan view thereof. Fig. 5 is schematic top plan view of the trip mechanism as positioned during the playing of a record. Fig. 6 is a section taken on the line 6—6 of Fig. 5. Fig. 7 is an illustrative showing of the lowermost record being displaced laterally to effect its release in full lines, and showing its position after complete release in dotted lines. Fig. 8 is a wiring diagram showing the circuit through the switches and motor.

In the drawings there is shown a record changing and reproducing mechanism including a base 10 supporting a horizontally rotatable turntable 11 carrying one or more records 12 thereon, the uppermost record of the group carried by the turntable being positioned for reproduction. The unplayed records 12 are supported in a stack immediately above the turntable and spaced therefrom in position for release of the lowermost record for permitting it to drop by gravity into playing position on the turntable. Associated with the turntable there is the usual reproducer 13 mounted on the end of the tone arm 14.

The unplayed stack of records 12 have the diametrically opposed peripheral portions of their
edges supported by pivotally mounted longer supporting plates 15 and 16, which plates are extended to support the stack of 10-inch records as illustrated. Nested within said plates 15 and 16 and embraced thereby there are shorter plates 15A, 16A, which are fixed to the upper surfaces of said supporting plates and are so related as to support 12-inch records.

For this purpose, and in order that the shorter plates may be exposed, the plates 15 and 16 are pivotally mounted at 17 so that they may be swung upwardly to a vertical position out of the way of the 12-inch records when supported on the plates 15A, 16A. The plates 15, 16A are supported upon a movable standard 18 as will be hereinafter described, whereas the plates 16, 16A are supported upon a fixed standard 19 secured to the base plate 18 by a bracket 20.

The turntable 24 is provided with the usual record centering pin indicated at 21 extending upwardly therefrom and of the usual diameter for a distance of substantially the maximum height of the stack of records when all have been dropped into playing position on the turntable. From that position upwardly there is an extended portion in the form of a taper indicated at 22 which terminates in the reduced neck portion 23. As shown in Fig. 2, said neck portion lies in the plane of the lowermost record and extends through the center thereof. Said neck portion 23 terminates in a head 24 lying in the plane of the next record above the lowermost record and is of a diameter slightly less than the centering hole thereof so as to truly center said record in respect to the supporting plates.

The head 24 terminates in a tapered shoulder indicated at 25 which ends in a reduced record threading extension 26. Thus the records may be conveniently mounted over the threading extension 26 and by the tapered neck portion 25 may be guided into centered position as they are lowered into the plane of the head 24.

The displacement of the lowermost record from the supports into playing position on the turntable is effected by a forward pushing movement imparted to the plates 15, 15A by said plate 20. Said plates are provided with shoulders 27 and 28, the shoulder 27 abutting against the adjacent edge portion of a 10-inch record and the shoulder 28 against a corresponding edge of a 12-inch record. When the standard 18 is tilted in the manner hereinafter described, said plates will be moved forwardly to engage and push the lowermost record so that it will be displaced laterally and in respect to the neck portion 23 from its position as shown in Fig. 2 to the position shown in full lines in Fig. 7. The other edge of said record will then slide upon the plate 16 or 16A. During this movement the head 24 will maintain the next record thereabove in its centered position as well as the superimposed records in the stack. Thus the lowermost record will be displaced laterally with respect to the superimposed records.

After having thus displaced the lowermost record, the plates 15, 15A will be returned from their actuated to their normal position as shown in Figs. 1 and 2. This return movement of said plates will release the adjacent edge of the record, permitting it to drop downwardly until the central opening engages with the extended portion 22 of the centering pin, such movement being sufficient to slide it from the plate 18, 16A. Thereupon, the superimposed records will drop down so that the record which had been centered by the head 24 will be supported at its edge upon the supporting plates, while the released record will drop onto the turntable and be centered thereon in playing position by the centering pin 21.

The movement of the turntable and the record changing device comprises the usual electric motor 25 which is controlled by a switch 30. The motor continuously operates to continuously rotate the turntable through a turntable driving shaft 34 to which is keyed a pinion 33 positioned to mesh with the teeth surrounding an actuating cam wheel 32 rotatably suspended from the underside of the base plate 10 by a stud 34, which stud is surrounded by a spacer 35. While the pinion 32 and cam wheel 33 are shown herein as provided with the usual intermeshing teeth, they may, if desired, be provided with friction surfaces whereby the pinion will frictionally engage and drive the cam wheel.

The cam wheel is provided with a mutilated section indicated at 36 so that when said wheel is rotated to lower position the said section lies adjacent the pinion 32, there will be no driving engagement between the pinion and wheel. In this position of the wheel, the record changing mechanism is at rest while a record is being reproduced. Upon completion of the record, the trip motor 31 tripping the thickness of the record, parts a slight rotary movement to the wheel so as to move its teeth or friction driving surface into driving contact with the pinion 32 whereupon the cam wheel will be caused to rotate by the pinion through one revolution, bringing the mutilated portion 36 back into engagement so that the wheel is no longer driven and again comes to rest. During this cycle of movement of the wheel the lowermost record from the stack is caused to drop into playing position and the tone arm manipulated for that purpose.

As the wheel starts to rotate in the direction indicated by the arrows, a depending cam surface 37 engages a cam follower 33 mounted on a lever 39 which is fulcrummed intermediate its ends at 40, said fulcrum comprising a pivotal mounting on the lower end and a bracket 41 depending from the base plate. The free end of the lever engages the lower end of a vertical pin 42 slidably mounted in a guide 43 and extending upwardly through the base plate in position to engage the underside of the tone arm 44. Thus the first operation actuates the lever 39 to elevate the tone arm and lift the reproducer from the record being played.

Thereupon the reproducer is swung outwardly, clear of the records on the turntable. This is accomplished by a cam 44 on the cam wheel which is brought into engagement with a head 45 of a lever 46. Said lever is fulcrummed intermediate its ends at 47 on the lower end of a post 48 depending from the base plate. The free end of lever 46 engages a bar 49 which is secured to a post 50 extending vertically through bearings in the base plate and upon which the tone arm is secured as to horizontal movement but pivoted at 51 for vertical movement. Thus as the head 45 is moved outwardly by the cam 44, the lever 46 will bear against the plate 49 and turn it for swinging the tone arm free of the turntable and supported records.

The tone arm is brought back to the beginning of the next record to be played at the end of the cycle by a spring 52. One end of said spring is connected with a bracket 53 secured to the base plate while the other end is connected with
an arm 54 freely pivoted to the underside of the base plate upon a stud 55. The arm 54 extends into free engagement with an end of the tone arm swinging post 49 on the opposite side of its pivotal mounting from that engaged by the tone arm swinging lever 46.

After the cam wheel is moved to release lever 46, the tone arm is free to swing inwardly to the beginning of a new record under tension of the spring 52. The tone arm is positioned by the arm 54 being arrested by an oblong slot 56 extending in the path of said arm from a dependable position in the base plate 10. The stud and head has a knurled pin 58 with a pointer 50 to indicate its adjusted position for arresting the tone arm for either a 10- or a 12-inch record. If the head 56 is turned by the knob 59 so that the arm 54 engages its longer side, the tone arm will be permitted to swing inwardly to the farther position for a 10-inch record. If the head is turned to have its end engaged by the arm, it will arrest the inward movement of the tone arm in the position for the beginning of a 12-inch record.

The next operation after swinging the tone arm clear of the turntable is to operate the plates 15, 15A by swinging them inwardly to shove the lowermost record to releasing position. For this purpose, the standard 18 extends downwardly through the base plate 10 and into a depending bracket 60. The bottom of said standard, which is below the plane of the wheel 33, is bent at right angles to form a horizontal arm portion 61 extending under the cam wheel. At its bent or elbow portion it is pivoted to the bracket 60 at 62. The arm portion 61 of said standard is in position to be engaged by a pin 63 extending downwardly from the underside of the cam wheel so that as the wheel rotates said pin will kick the arm 61 downwardly to move the plates 15, 15A forward. Immediately after the pin 63 passes from under the arm it is returned to normal position to retract said plates by a spring 64. Spring 64 has one end secured to the underside of the base plate and the other is connected with a rod 65 extending sideways from the arm so as to avoid interference with the cam wheel.

Following this action and allowing sufficient time for the record to be released to drop onto the turntable, the tone arm is then swung into the beginning of the newly deposited record in the manner above described. Thereupon the cam wheel has completed its cycle and comes to rest with the mutilated portion registerling with the pinion 32.

The trip mechanism for initiating the record changing cycle is best shown in Fig. 5. This mechanism comprises a follower arm 66 which has one end frictionally engaging the tone arm swinging post 58. Its free end extends toward the cam wheel and is connected with a trip arm 67 through a connecting rod 68. The trip arm 67 is pivoted at 69 to the underside of the base plate 10 over the cam wheel. One end of the trip arm and the follower arm 66 are formed of sheet metal which bears under spring tension against an upper surface about the rim of the cam wheel. Extending upwardly from said rim portion of the cam wheel normally under the pawl 70 there is a short stud 71 adjacent the end of the said pawl. One end of the trip lever 61 is provided with an inwardly extending curved head 72 projecting toward the pinion 32 which rotates with the motor. Extending outwardly from the hub of said pinion in the plane of the head 72 there is a striker 73.

The trip mechanism functions in the following manner: During the playing of a record the tone arm moves inwardly with the grooves, frictionally swinging the arm 66 and consequently the head 72 of trip lever 67 toward the hub of pinion 32. For each rotation of the striker 73 with the pinion and turntable, the head 72 will be moved inwardly a slight distance corresponding to the pitch of the records. Thereupon the striker 73 will engage the head 72 and push it back a corresponding distance, causing the arm 66 to frictionally move about its connection with the tone arm. During this operation effected by the playing of the record, the downwardly curved end of the pawl 70 is free to move back and forth over the pin 71 the distance of the reproducing record groove pitch. However, upon the terminating record grooves, whether of spiral or eccentric pitch, being reached by the reproducer, the rapid swinging thereof will throw the trip lever 67 inwardly a substantial distance before it is again struck by striker 73. This throw will be sufficient to carry the downwardly curved end of pawl 70 over the pin 71, locating it on the other side thereof. Then, when the striker 73 again strikes the head 72, it will move it outwardly a substantial distance sufficient to cause the end of pawl 70 to push the pin 71 and cam wheel 33 a corresponding distance. This action will move the mutilated portion 38 beyond the pinion, bringing the gear teeth or the frictional surface of the pinion and cam wheel into driving engagement. The cam wheel will thereby be rotated to drive the record changing operation above described until the mutilated portion 38 again registers with the pinion and with the stud 71 again lying under the pawl 78, arresting further action of the record changing drive.

Arrangement is also made for manually tripping the mechanism to initiate the record changing action and change the record. For this purpose there is provided a rod 74 pivoted to the underside of the base plate at 75 and having its free end bearing against the trip lever 67. Connected with said rod intermediate its ends there is a manually operated plunger 76. By pressing the plunger, the rod 74 will impart the same action to the trip lever 67 as is imparted thereto by the terminal record grooves so that the same action as above described takes place.

The motor 29 is in circuit with the hand controlled snap switch 30 and also a hold-in switch 77 in parallel therewith. Said hold-in switch is secured to the underside of the base plate and lies adjacent the cam wheel 33. It is normally closed but is opened by the head 78 when the cam wheel 33 reaches the position wherein the tone arm is swung free of the turntable. Thus, when it is desired to stop the machine and discontinue its operation, the snap switch 30 may be moved to "off" position so as to break the circuit therethrough. However, the circuit through the motor will continue to be closed by the normally closed hold-in switch 77 until the tone arm is swung to its outer position, whereupon head 78 will open said switch and break the circuit to the motor and thereby bring the machine to rest. To start the machine, the switch 30 is turned to "on" position which again closes the motor circuit, moving the cam wheel to a position to again close the switch 77 so that it will then be prepared to continue the circuit closed
4. 2,871,862 until the hand switch is again opened and the tone arm has been swung to its outermost position.

The invention claimed is:

1. An automatic record changing mechanism for a phonograph comprising a turntable, a motor for rotating said turntable, a tone arm cooperating with a record on said turntable, and a cam wheel provided with a mutilated section and operative to change a record on said turntable, a driving member driven by said motor, said driving member being freely rotatable with respect to said wheel when the mutilated portion thereof is in registry and positioned to drive said wheel upon said mutilated section being moved out of registry, a trip lever movable in one direction by said tone arm and in the opposite direction by periodic engagement by said driving member during the normal inward movement of the tone arm by the normal pitch of the record grooves, and means on said wheel engageable by said lever for moving said wheel to effect driving engagement with said driving member upon said wheel being moved by said tone arm a greater than normal distance.

2. An automatic record changing mechanism for a phonograph comprising a turntable, a motor for rotating said turntable, a tone arm cooperative with a record on said turntable, a cam wheel provided with a mutilated section and operative to change a record on said turntable, a driving member driven by said motor, said member being freely rotatable with respect to said wheel when the mutilated portion thereof is in registry and positioned to drive said wheel upon said mutilated portion being moved out of registry, a trip lever operatively connected with said tone arm to be moved inwardly therewith, a striker on said member for periodically moving said lever in the opposite direction a distance corresponding to the normal pitch of the record grooves, and a projection on said wheel so related to said lever as to be unaffected by its movement when restricted by the normal pitch of the record grooves but be effectively engaged to move with the movement of said lever upon the movement of said lever being accelerated by a motor provided operatively connected with said tone arm to move inwardly therewith, and means actuated by the effective movement of said trip lever for imparting a partial rotation to said wheel to thereby move its mutilated portion out of registry with said member, said lever being fixedly connected with said tone arm to move inwardly therewith, and means actuated by the effective movement caused by the tone arm advancing the normal pitch of the record grooves, and effective upon a more extensive movement caused by a more rapid advance of the tone arm.

3. An automatic record changing mechanism for a phonograph comprising a turntable, a motor for rotating said turntable, a tone arm cooperative with a record on said turntable, a cam wheel provided with a mutilated section and operative to change a record on said turntable, a driving member driven by said motor, said member being freely rotatable with respect to said wheel when the mutilated portion thereof is in registry therewith and positioned to drive said wheel upon said mutilated portion being moved out of registry therewith, a trip lever operatively connected with said tone arm to move inwardly therewith, and means actuated by the effective movement of said trip lever for imparting a partial rotation to said wheel to thereby move its mutilated portion out of registry with said member, said lever being fixedly connected with said tone arm to move inwardly therewith, and means actuated by the effective movement caused by the tone arm advancing the normal pitch of the record grooves, and effective upon a more extensive movement caused by a more rapid advance of the tone arm.

4. An automatic record-changing mechanism for a phonograph comprising a turntable, a motor for rotating said turntable, a tone arm cooperative with a record on said turntable, a cam means adapted to be driven by said continuously rotating shaft for changing a record on said turntable, coupling means responsive to the movement of said pickup arm adapted to be engaged with said cam means upon arrival of said pickup arm at the tripping groove of a record on said turntable, and a member associated with said continuously rotating shaft for engaging with said coupling means when said coupling means is engaged with said cam means for moving said cam means into engagement with said continuously rotating shaft.

5. An automatic record-changing mechanism for a phonograph comprising a continuously rotatable turntable with a shaft, a pivotally mounted pickup arm for cooperating with a record on said turntable, a cam means adapted to be driven by said continuously rotating shaft for changing a record on said turntable, a pivotally mounted pickup arm for cooperating with a record on said turntable, a cam means adapted to be driven by said continuously rotating shaft for changing a record on said turntable, coupling means responsive to the movement of said pickup arm adapted to be engaged with said cam means upon arrival of said pickup arm at the tripping groove of a record on said turntable, and a member associated with said continuously rotating shaft for engaging with said coupling means when said coupling means is engaged with said cam means for moving said cam means into engagement with said continuously rotating shaft.

6. An automatic record changing mechanism for a phonograph comprising a continuously rotating turntable with a shaft, a pivotally mounted pickup arm for cooperating with a record on said turntable, a cam means rotatably mounted to be moved into engagement with and be driven by said continuously rotating shaft for changing a record on said turntable, lever means for engaging said cam means and operatively engaging said cam means upon arrival of said pickup arm at the tripping groove of a record on said turntable, and a member associated with said continuously rotating shaft movable thereby to engage said lever means when said lever means has engaged said cam means to move said cam means into engagement with said continuously rotating shaft.

7. An automatic record changing mechanism for a phonograph comprising a continuously rotating turntable with a shaft, said shaft having a projection thereon, a projection thereon, a projection thereon, a projection thereon, and a cam means rotatably mounted to be moved into engagement with and driven by said continuously rotating shaft for changing a record on said turntable, lever means for engaging said cam means and operatively engaging said cam means upon arrival of said pickup arm at the tripping groove of a record on said turntable, said projection on said continuously rotating shaft maintained said lever means out of engagement with said cam means and when said pickup arm moves an abnormal distance during one revolution of a record on said turntable, said projection on said continuously rotating shaft maintains said lever means out of engagement with said cam means and when said pickup arm moves an abnormal distance during one revolution of a record on said turntable, said lever means being move out of engagement with said cam means, and a member associated with said continuously rotating shaft movable thereby to engage said lever means when said lever means has engaged said cam means, and a member associated with said continuously rotating shaft movable thereby to engage said lever means when said lever means has engaged said cam means.

8. An automatic record changing mechanism for a phonograph comprising a turntable, a motor for rotating said turntable, a tone arm cooperative with a record on said turntable, and a cam means adapted to be driven by said continuously rotating shaft for changing a record on said turntable, coupling means responsive to the movement of said pickup arm adapted to be engaged with said cam means upon arrival of said pickup arm at the tripping groove of a record on said turntable, and a member associated with said continuously rotating shaft for engaging with said coupling means when said coupling means is engaged with said cam means for moving said cam means into engagement with said continuously rotating shaft.
associated with said cam gear to freely rotate with respect thereto when the mutilated section thereof is in registry therewith and drive said cam gear upon said mutilated section being moved out of registry and said gear brought into mesh therewith, a lever fulcrumed intermediate its ends in operative relation with respect to said cam gear and pinion, a trip arm frictionally connected with said tone arm at one end and having the other end operably associated with said lever, a projection on the marginal portion of said cam gear positioned to be engaged by one end of said trip lever, and a projection rotatable with said pinion positioned for operative engagement with the opposite end of said lever arranged periodically to strike said lever and return it to normal position after inward movement therewith caused by normal travel of the tone arm over said record, the opposite end of said lever arm being adapted to engage the projection on said cam gear for partially rotating the same into mesh with said pinion upon said lever being struck by the projection on said pinion caused by a more rapid advance of the tone arm inwardly of the record.

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