

March 13, 1945.

A. COMPARE

2,371,222

AUTOMATIC RECORD DISK CHANGING DEVICE FOR PHONOGRAPHS

Filed Jan. 16, 1941

6 Sheets-Sheet 1

Fig. 1

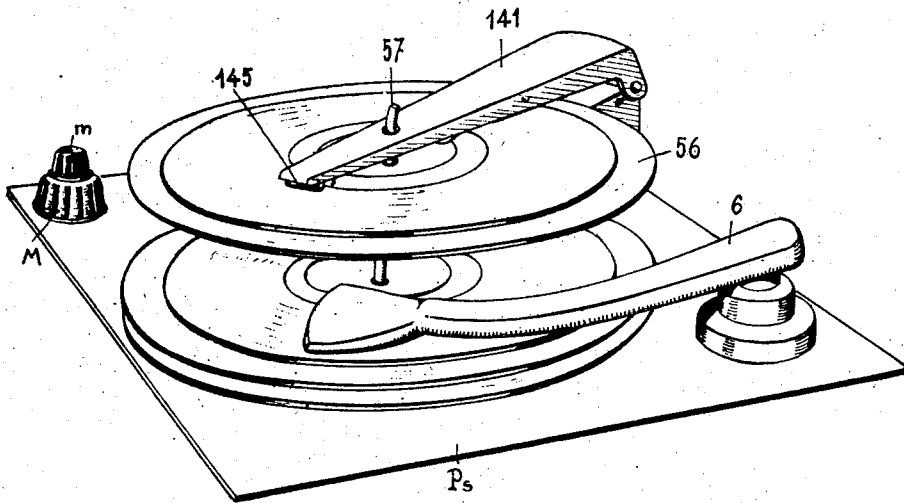
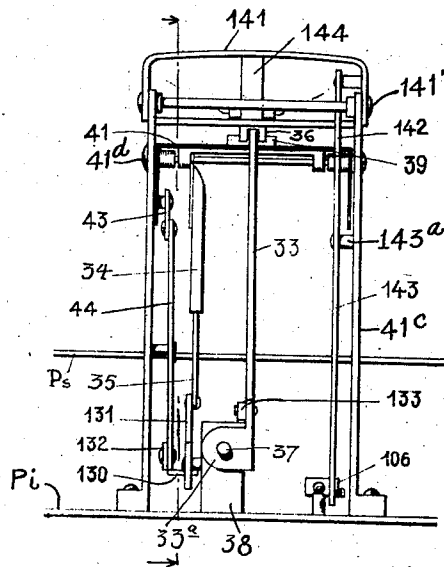


Fig. 3.



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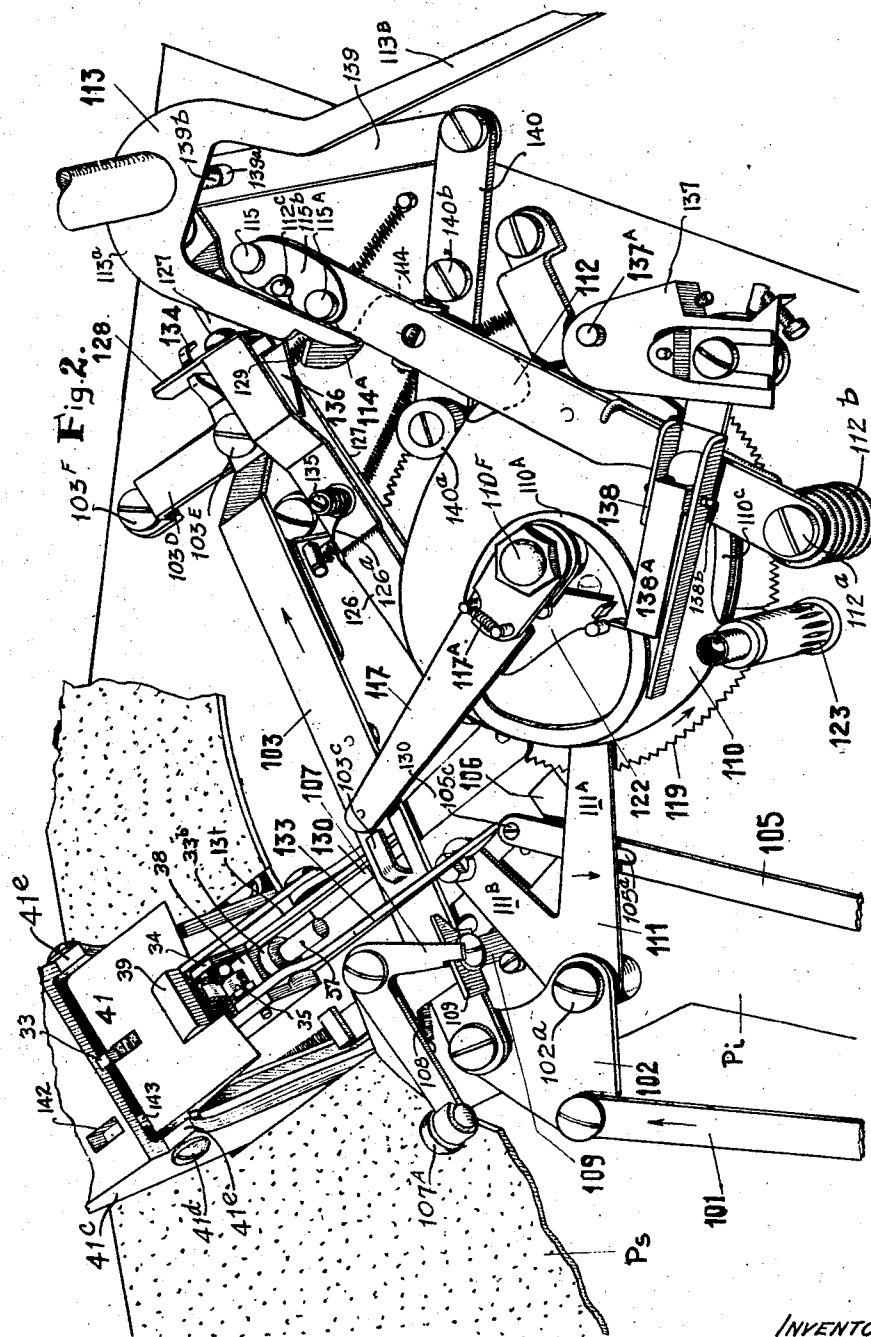
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AUTOMATIC RECORD DISK CHANGING DEVICE FOR PHONOGRAPHS

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6 Sheets-Sheet 2



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6 Sheets-Sheet 3

Fig. 4.

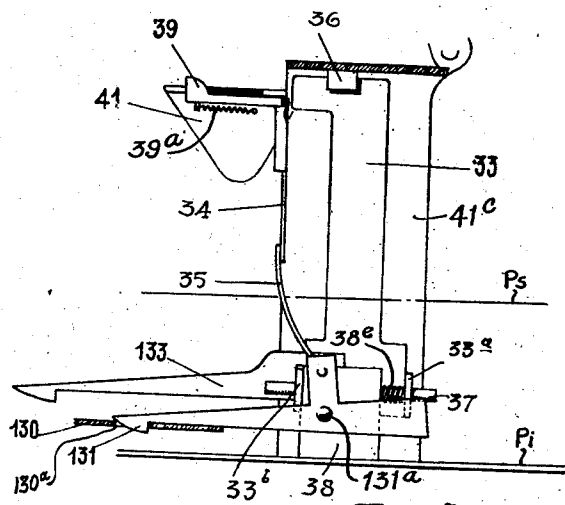
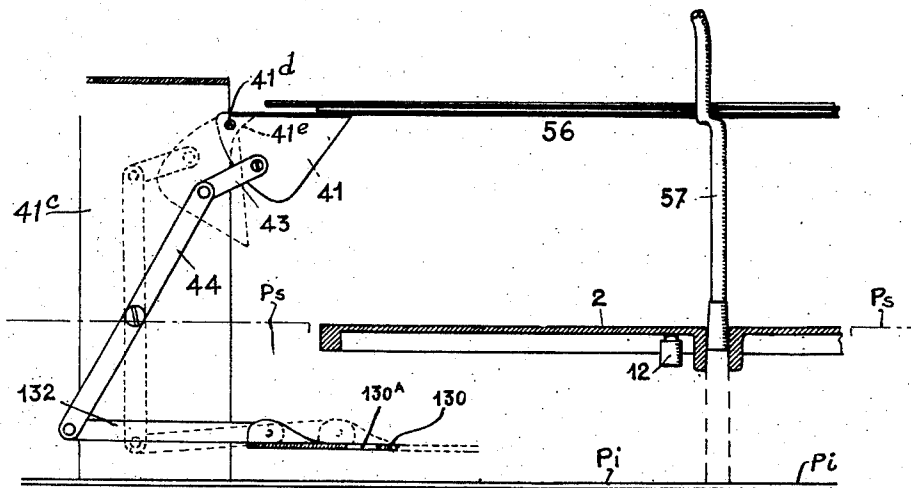


Fig. 5.

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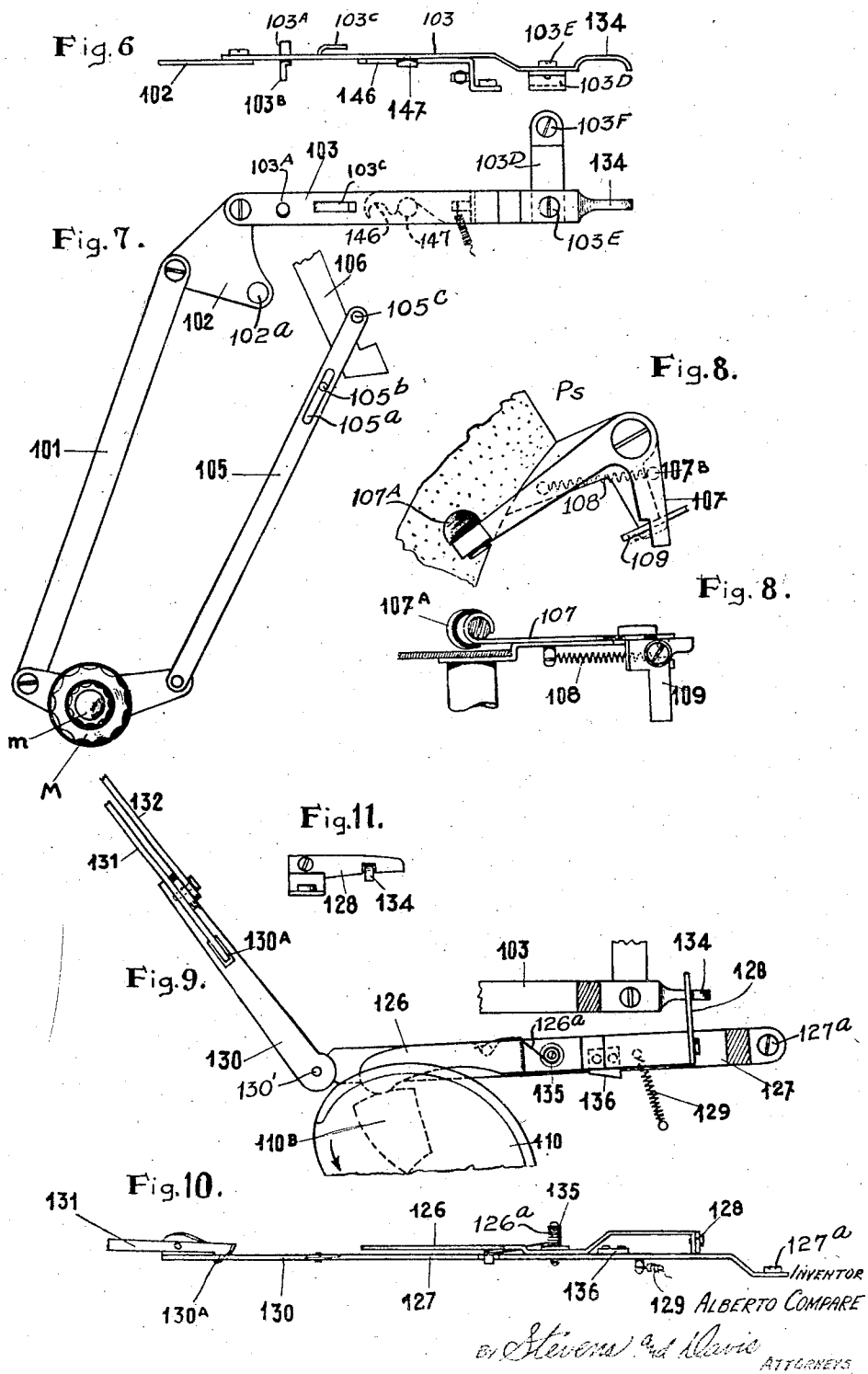
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Filed Jan. 16, 1941

6 Sheets-Sheet 4



March 13, 1945.

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2,371,222

AUTOMATIC RECORD DISK CHANGING DEVICE FOR PHONOGRAPHS

Filed Jan. 16, 1941

6 Sheets-Sheet 5

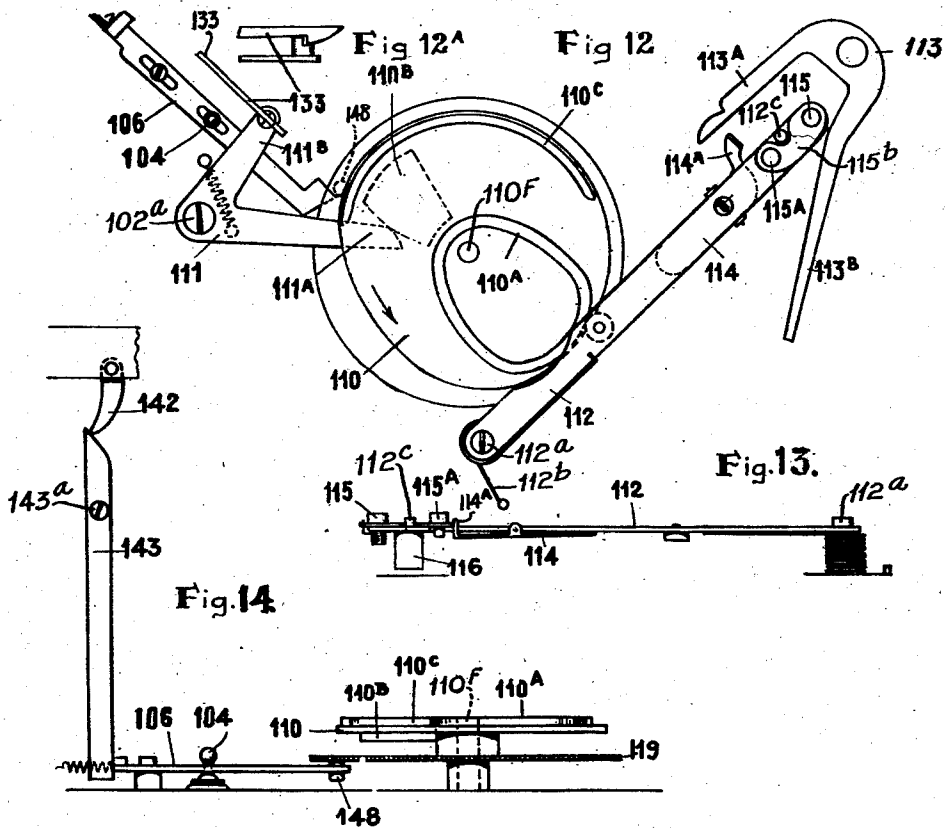
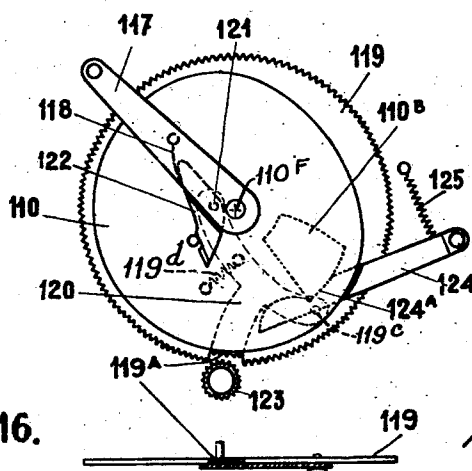


Fig. 15.

Fig. 16.



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2,371,222

AUTOMATIC RECORD DISK CHANGING DEVICE FOR PHONOGRAPHS

Filed Jan. 16, 1941

6 Sheets-Sheet 6

Fig. 17.

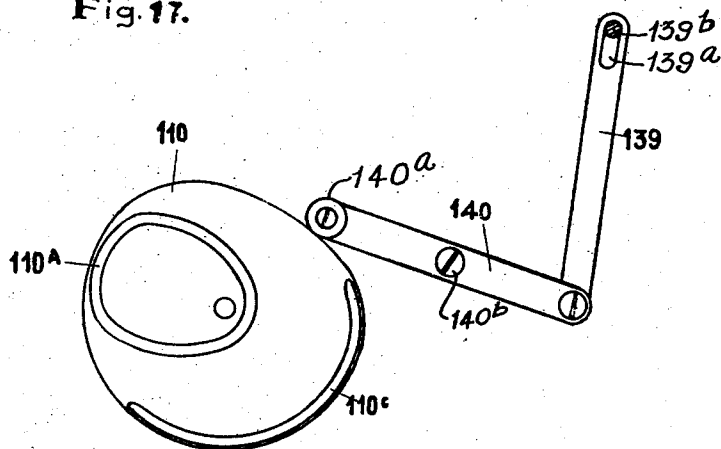


Fig. 18.

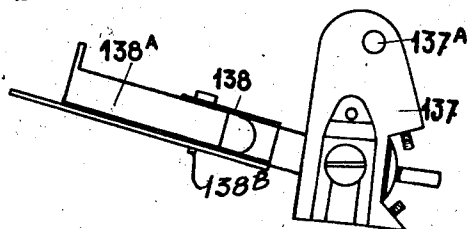
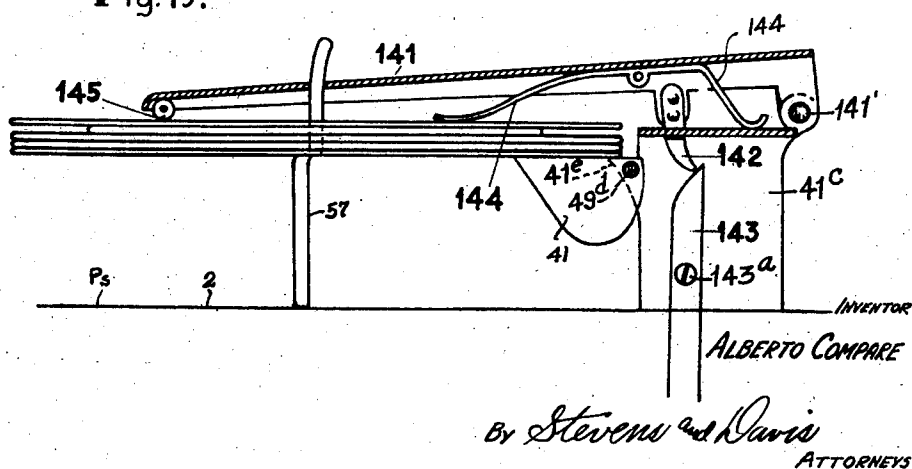


Fig. 19.



UNITED STATES PATENT OFFICE

2,371,222

AUTOMATIC RECORD DISK CHANGING
DEVICE FOR PHONOGRAPHSAlberto Compare, Milan, Italy; vested in the Alien
Property CustodianApplication January 16, 1941, Serial No. 374,772
In Italy January 12, 1940

3 Claims. (Cl. 274—10)

This invention has for its object an improved automatic record disk changing device for phonographs of the kind which allows the arrangement of a certain number of record disks, for instance up to ten disks, on the phonograph and the successive reproduction of the same in a completely automatic manner. When the phonograph is once started, all operations, such as positioning the disks on the turntable and the successive reproductions, are effected automatically.

More specifically, the device successively effects the following operations upon the actuation of a control knob: the switch is closed to start the motor so that the turntable begins to turn; the mechanism to release the first disk on the turntable is started; the pick-up is positioned upon the edge of the disk and the stylus is made to engage the outermost groove of the disk; the disk-changing mechanism is stopped.

On termination of the reproduction of the first disk, the pick-up is raised and moved outwardly beyond the edge of the disks; the second disk is released on the turntable; the pick-up and stylus are moved inwardly to the beginning of the disk groove and the stylus is made to engage the latter, and finally the disk-changing mechanism and pick-up controlling mechanism is again stopped.

These operations are repeated automatically for a plurality of disks without the necessity of employing any other manual operation.

On termination of the reproduction of the last disk, the phonograph is automatically stopped.

The device also permits the repetition of a disk at the termination of its reproduction. In order to accomplish this purpose, it is necessary to move the control knob anti-clockwise. In this way, the disk-changing mechanism remains inoperative and the same disk is repeated.

Further, by moving the control knob clockwise at any time during the reproduction of a disk, this reproduction is immediately terminated and the disk-changing device is started in order to reproduce the next disk.

The device further permits the arrangement, in any order, of a number of disks having differing diameters, and in such a case both the disk-changing mechanism and the pick-up controlling device will work automatically to successively reproduce the recordings.

The disk-changing device, according to this invention, comprises a crank spindle which is immovably inserted into the shaft carrying the turntable. On said spindle, the disks to be reproduced are arranged one above the other in the

form of a pile. The changing device further comprises a disk-releasing device disposed laterally on the margin of the turntable, a pick-up controlling device and a device controlling the disk-releasing device, these three devices cooperating in a manner to automatically effect the above-described operations.

The present invention refers more particularly to certain improvements in these devices, which improvements are designed to assure simplicity of the individual parts, the reliable operation, and the low cost of manufacture. The new and useful improvements, according to this invention, are particularly set forth in the claims attached at the end of this specification.

The objects of the invention will appear when taken in connection with the annexed drawings in which:

Fig. 1 is a perspective view of the disk-changing device according to this invention;

Fig. 2 is a perspective view, from above, of the mechanism for controlling the disk-releasing device and the pick-up moving device;

Fig. 3 is a rear view of the disk-releasing device;

Fig. 4 is a detail of the disk-releasing device;

Fig. 5 is another detail of the disk-releasing device;

Figs. 6 through 18 are details of the mechanism shown in Fig. 2; and

Fig. 19 shows the lateral disk support and an arm for holding the pile of disks in horizontal position.

The device comprises a base plate P_i and a cover plate P_s , the latter being partially removed in Fig. 2 in order to show the various devices. Most of the elements of the devices are arranged between these two plates and are supported on the base plate P_i .

M and m (Figs. 1 and 7) indicate the control knobs which are supported in the cover plate P_s and serve to control the single operations, i. e. to start the phonograph, to arrest it, to repeat a disk and to reject a disk. Knob M is connected with a control bar 101 which, through a transmission plate 102 pivoted as at 102a on the base plate P_i , controls a controlling lever 103. This lever 103 (Fig. 6) carries an upper stud 103A, a lower stud 103B and a raised tongue 103C. The free end of lever 103 has a depressed portion, to which a guide lever 103D is pivoted as at 103E, which lever 103D is supported on base plate P_i as at 103F. Lever 103 terminates with a raised tongue 103A. This control lever 103 controls the starting of the motor, and the operation of the disk-changing

and pick-up moving devices, as will be described hereafter.

Knob *m* is connected to a bar 105 which is guided at the other end on the base plate by means of slot 105A and pin 105B, and which carries on the underside of its free end a stud 105C, by which it may move the lever 106 of the motor switch, in order to switch it off.

A double lever 107 serves to arrest the turntable by means of the gum button 107a fixed on one leg of the lever (Figs. 8, 8A). Said lever is pivoted on the base plate *Pi* and is actuated by a spring 108 which spring presses the gum button against the inner border of the turntable, while a loosely pivoted tooth 109 serves to bring and to hold the button in a non-arresting position.

On the pivot 102A of the transmission plate 102, there is also pivoted a double lever 111 (Fig. 12), said lever having an arm 111A which engages cam 110B on a cam disk 110 during a disk-changing operation. Arm 111B of lever 111 operates a mechanism which releases the next disk on the turntable. The arm 111A of this lever is therefore actuated by cam disk 110 which, during one complete revolution, controls all operations of disk-changing and pick-up moving.

The cam disk 110 has a small lower cam 110B and a small upper cam 110A, as well as a cam guide 110C. The cam disk 110 is fixed on the same axis as the toothed wheel 119, said wheel meshing with a pinion fixed on the motor shaft 123, which shaft is also journaled in the turntable 2. The lower cam 110B serves to actuate lever 111, which in turn initiates the release of the disks on the turntable. The cams 110A and 110C serve to control the tone arm which carries the pick-up. To this purpose, the cam disk 110A cooperates with a controlling lever 112. This lever is pivoted on the base plate *Pi* as at 112A. A torsion spring 112B is tensioned so as to push the lever 112 towards the disc cam 110. In the rest position of the phonograph (Fig. 12), this lever 112 rests against the cam 110A and the axial spring of the lever is tensioned. A loosely pivoted balancing member 114 is supported by the lever 112 and bears on its underside, one end of said member carrying a laterally and upwardly projecting tooth. On the upper side of the free end of lever 112, there is pivoted a small plate 115B as at pivot 115, said pivot forming a stud on the upper side of the lever. The free end of small plate 115B carries another stud 115A. By means of a spring fixed on its pivot 115, the plate is pressed against a stud 112C fixed on the lever 112. Corresponding to the latter stud, but on the underside of lever 112, there is another stud 116 (Fig. 13).

The toothed wheel 119 (Fig. 15), which is normally meshing with the motor shaft 123, may be disengaged from this shaft by means of retractable segment or toothed portion 119A of the wheel itself. This portion 119A is formed on a lever 120 pivoted upon the wheel 119 as at 119C and actuated by a spring 119D also fixed on this wheel. One end of the lever 120 carries a stud 121 which extends upwardly through disk 110 and projects above said disk where it carries a plate 122 (Fig. 16). On the common axis 110F of the toothed wheel 119 and cam disk 110, above same, there is also pivoted a lever 117 made of two parts (Fig. 2), the one of which is actuated by a spring 117A fixed on the other. This lever 117 carries on its underside a springy plate 118.

126 and 127 (Figs. 9-10) are the adjusting

levers to adjust the disk-changing and tone arm moving device for a large or a small disk, as the case may be.

The lever 127 is pivoted on the base plate *Pi* as at 127A, and the lever 126 is pivoted on lever 127 at point 135. The lever 126 is actuated by a spring 106A disposed on its pivot 135, one end of lever 126 being spaced above lever 127 to provide room for a stop 136 on the lever 127. The end of lever 126 near the pivot point 127A of lever 127 carries a laterally projecting tooth 128. The end of lever 127 remote from its pivot 127A is pivoted as at 130' to element 130, said element having an opening 130A, within which element 131 is hookable. The end of lever 126 is disposed in the path of cam 110B of disk 110. The lever 127 is also actuated by a spring 129.

Fig. 17 shows levers 139, 140 which control lowering and raising of the tone arm carrying the pick-up respectively at the beginning and at finishing of the reproduction. For this purpose, the lever 139 has an opening 139A in which a pin 139B is guided, said pin being fixed on the pivot of the tone arm. The free end of lever 140 carries a roller 140A running against the peripheral edge of cam disk 110. The two levers 139 and 140 are pivoted together and lever 140 is further pivoted on the base plate *Pi* as at 140B.

Fig. 18 shows the elements which initiate the starting of the disk-changing device when the reproduction of a disc is finished, namely a plate 137 with a stud 137A and an organ 138 with a tooth 138A pivoted as at 138B.

Figs. 3 and 19 schematically show the lateral support for the disks on the releasing device, with the arm 141 carrying a gum roller resting on the topmost disk and a plate 144 pivoted on said arm, which members 144 and 145 serve to hold the pile of disks in horizontal position to thereby assure the resting of the disks on the lateral support so that they may be properly engaged by the releasing organs, and also to assure the arrest of the phonograph after reproduction of the last disk.

This releasing action is effected by a tooth 142 which is attached to the arm 141 (Figs. 14 and 19), and which engages the upper end of a lever 143 pivoted on the framework of the releasing device as at 143A. The lower end of lever 143 actuates the lever 106 of the switch 104 so that the lever 106 is brought beneath the toothed wheel 119.

Figs. 3, 4 and 5 show the disk-releasing device. This device comprises framework 41C fixed on base plate *Pi*. On the top of this framework is hinged the arm 141 as at 141'. Furthermore, a support 41 is hinged at 41D upon this framework. Support 41 is hinged on two lateral projections 41E of said framework which projections form the support for the larger disks (Figs. 2 and 1a), while 41 is the support for the smaller disks. On support 41 is guided the tooth 39 serving to release the smaller disks, said tooth being normally urged to the right in Fig. 5 by spring 39A. Support 41 may be lowered by means of articulated elements 43, 44 and 132, as shown by dotted lines in Fig. 4, so as to allow releasing of the larger disks.

The tooth 39 is pivoted and has a downwardly projecting plate 34. Against this plate 34 rests an upwardly projecting plate 35, said plate being fixed on the balancing member 131, which member is loosely pivoted on a fixing block 38 as at 131A (Fig. 5).

33 is the releasing element, which element is

guided on block 38 by means of two lateral flanges 33A, 33B, through which passes a pin 37 fixed on block 38. A spring 38E is arranged between one flange 33A and the block 38, so as to return the element 33 after each action. Hook 133 is fixed on said element 33. Element 36 is a guide for the element 33.

57 indicates the central crank spindle and 2 indicates the turntable. 56 indicates the disks and 12 indicates a gum button fixed on the underside of the turntable near its turning axis (Fig. 4).

The various automatic operations of the device proceed as follows:

(1) By rotating knob M to the right (Figs. 1 and 7), the control lever 103 is moved to the right. This lever, by means of its lower stud 103B, acts first on the switch 104 and starts the motor. Then, the upper stud 103A engages the lever 107, which lever normally depresses the tooth 109. At this time, the tooth 109 becomes raised, because its opposite part is heavier (Fig. 8A). With the tooth raised, the lever 107 is blocked, so that the turntable 2 is now free to turn. The raised tongue 103C of lever 103 has displaced the lever 117, so that the plate 118 of same has freed the plate 122 (Fig. 15) and, thus, the lever 120 is pulled by spring 119D to bring the portion 119A to mesh with the motor shaft 123. Thus begins rotation of the toothed wheel 119 and of the cam disk 110. The position shown in Fig. 12 corresponds to the rest position of the device and with a small record disk in releasing position, that is to say, in the lowest position of the pile (Fig. 4). The tone arm with the pick-up is in the rest position outward the turntable.

At beginning of its rotation, cam disk 110, by means of its lower cam 110B, pushes immediately the arm 111A of lever 111, the arm 111B of which pulls the lever 133 (Figs. 5, 12 and 12A). The latter pulls the element 33 which, in turn, acts on tooth 39 to thus release the lowest disk on the turntable 2. After this, the upper cam 110A, which in the meantime held the lever 112 and therewith the tone arm 6 in rest position, allows the lever 112 to move inwardly. The lever 112 moves inwardly under the action of its axial spring 112B and follows the cam guide 110A. By moving inwardly, the lever 112, the tone arm 6 with the pick-up is also moved inwardly. For this purpose, a double lever 113 is provided, which lever is fixed on the tone arm pivot (Fig. 2). The tooth 114A of the lever 112 passes beneath the end of lever arm 113A to thereby slightly lower the tooth 114A (Fig. 12). When the tooth 114A has been depressed, the lever 113A is again raised, because its opposite end 114 is heavier. The arm 113A is now between the tooth 114A and the stud 115A of plate 115, and this latter plate 115 has been slightly moved in opposition to its axial spring. Continuing the rotation of cam disk 110, the lever 112 also continues its inward displacement and, as a consequence, the lever arm 113A is also moved inwardly, and with it also the tone arm. This movement is arrested when the lever 112 is arrested, by its lower stud 116 against stop 136, said stop being fixed on the adjusting lever 127. The position of lever 127 corresponds exactly to the diameter of the record disk just released on the turntable. Therefore, the tone arm with the pick-up is brought exactly above the border of this record disk. At this moment, when lever 112 is arrested by stop 136, the cam disk 110 has reached, with the flat portion of its peripheral cam guide, the roller 140A of lever

140 so that the levers 139, 140 may become displaced by the weight of the tone arm so as to allow lowering of the tone arm. After this, the flattened beginning portion of cam guide 110C of the cam disk 110 has engaged member 114. The guide 110C raises one end of member 114 and now the stud 115A of plate 115, which is slightly tensioned by a spring previously mentioned, pushes the arm 113A slightly. This pushing of arm 113A and as a consequence of the pick-up, serves to bring the stylus of the latter to engage the outermost groove of the record disk and to begin thus the reproduction. At this moment, the plate 122 is arrested by plate 118 of lever 117 and, therefore, the segment portion 119A of the toothed wheel is disengaged from the pinion of the motor shaft 123 and, thus, the wheel 119 is arrested. Now, the disk-changing and pick-up moving device is arrested and only the motor shaft carrying the turntable rotates.

(2) When reproduction of the record disk is finished, the mechanism is in the position shown in Figs. 2 and 15. At the termination of reproduction, the stylus of the pick-up is rapidly moved inwardly. Thus, the arm 113B pushes the element 138 near the motor shaft 123. During the rotation of turntable 2, the gum button 12, fixed on the underside of the turntable near shaft 57 (Fig. 4) engages the element 138 and the element is pushed in an opposite direction whereby the element 138A moves the plate 122 which becomes thus freed from plate 118. In this way, the portion 119A may return to mesh with pinion 123 and the wheel 119 begins to rotate. Since the disk cam 110, at the beginning of its rotation, is in the position shown in Figs. 2 and 15, its first action will be that of its peripheral cam guide, which acts on roller 140A of lever 140 and raises the pick-up. Immediately thereafter, the cam 110A begins to move the lever 112 outwardly which in turn moves the tone arm outwardly. In the meantime, the cam 110B reaches the lever 111A and initiates, in the described manner, the release of the next disk. Now, the cam 110A permits the return of the tone arm and the beginning of the next reproduction, in the described manner.

(3) When it is desired to interrupt reproduction of a disk, during its playing, in order to play the next disk, then one rotates knob M towards the right. With this movement, the tongue 103C of controlling lever 103 moves lever 117, which liberates plate 122 so that the disk-changing device is immediately started and the next disk is brought onto the turntable and the pick-up is moved so as to play this new disk, in the manner already described.

(4) When a disk should be repeated, one rotates the control knob M to the left, during any moment of its reproduction or on termination of same. With this movement, the tongue 103C of control lever 103 raises the lever 133. At the end of reproduction, the disk-changing and pick-up moving device is started, in the described manner, then the lever 111 cannot act on lever 133, and therefore no new disk is released on the turntable. The cam disk 110 commands only the tone arm so as to repeat the record disk lying on the turntable. The control lever 103 remains in the repeating position where it is held by a spring acted lever 146 and by a stud 147, and must be returned in normal position by returning the control knob M by hand (Fig. 6).

(5) To arrest the phonograph at any desired moment, one rotates control knob M to the right

(Fig. 7), so that bar 105 operates the lever 106 of the switch 104, thus switching off the motor.

(6) When the reproduction of the last disk of the pile is finished, then the tooth 142 of arm 141 (Figs. 14 and 19) presses on lever 143, which in turn pushes the end of lever 106 beneath the toothed wheel 119. On termination of reproduction of the last record disk, the wheel 119 is started in the known manner, and the lower stud 148 of this wheel acts on the lever 106 so as to switch off the motor. The lever 106 also pushes the lower portion of balancing tooth 109, the toothed part of which will thus be lowered and the lever 107, under action of its spring 108, presses gum button 107A against the inner edge of the turntable, arresting the latter.

Before switching off the motor, the disk cam 110, by means of guide 110A and lever 112, has brought the tone arm in rest position.

The six automatic operations described above are involved when a small record disk is to be released. Under such conditions, member 133 is moved to the left, as viewed in Fig. 5, and member 33 is moved therewith in the same direction. The end of member 33 strikes against member 39 and moves the same to the left to cause discharge of a small record. It will be noted, however, that member 39 is a bell crank. Thus, if a large record is resting on support 41, dog 39 will be depressed and depending member 34 will be swung to the right, as viewed in Fig. 5. When this is done, counterweighted lever 131 can swing in a clockwise direction, the latch 35 being free for movement. Under such conditions, plate 130 is freed. A hook of lever 131 is unfastened when cam 110B, at the beginning of its movement, pushes lever 126 connected to lever 127 through hook 128. The counterbalance of lever 131 is responsible for the release after plate 130 has been moved.

Now, when gear 119 and the cam disk 110 are operated, the lever 126, 127 tends to move inwardly under the thrust of spring 129. This also draws in lever 130 which is pivoted to lever 127. When lever 130 is retracted, levers 132, 43 and 44 lower support 41, as shown by the broken lines in Fig. 4. The large disk is then moved by member 33 to release position. Thus, when a small record is released, member 33 discharges it by moving member 39; while in the case of a large record, member 33 directly causes the discharge, support 41 being previously moved out of position.

At the same time, the stop 136 fixed to lever 127 is brought inwardly, so that the tone arm carrying the pick-up is arrested by this stop in a position corresponding to the border of a large disk.

At beginning of the next disk-changing operation, the cam guide 110A first pushes levers 126, 127 again outwardly so that the support is again raised. Then, through the action of hook 131, lever 130 and cam guide 110B, the disk-changing operation for either a large or small disk is completed.

When effecting the repeating operation, the control lever 103, which in this case becomes moved towards the left, frees the hook 128. In this manner, the disk cam 110 moves only the lever 126, which does not effect any operation, while the levers 127 and 130 are not operated and remain in their position, that is, in the outer position when a small disk is on the turntable for playing, and in the inner position when a large disk is on the turntable for playing.

What I claim is:

1. A record changer for phonographs of the type which include a turntable and means for driving the same comprising, a stationary guide rod extending axially upwardly from the center of the turntable, said guide rod having a record supporting shoulder thereon, means for marginally supporting a record substantially in the plane of said shoulder, a dog extending through said supporting means at a point adjacent the position of the edge of a record of small size resting on said supporting means, means supporting said dog for movement to and from the edge of said supporting means and in a plane normal to the surface of a record resting on said supporting means, means, in the same plane as said dog, responsive to rotation of said turntable driving means for moving said dog toward that edge of said supporting means which underlies a record to cause discharge of a small record therefrom so that it may fall by gravity to the turntable under the guidance of said guide rod, means for moving said record supporting means out of supporting position, locking means normally rendering said last-named means inoperative, and means responsive to depression of said dog by a record of large size overlying the same and resting on said supporting means for releasing said locking means, said dog moving means also extending through said record supporting means to directly engage the edge of a large record.

2. A record changer for phonographs of the type which include a turntable, means for driving the same and a tone pickup comprising, a stationary guide rod extending axially upwardly from the center of the turntable, said guide rod having a record supporting shoulder thereon, means for marginally supporting a stack of records of different diameters with the lowest thereof substantially in the plane of said shoulder, a dog extending through said supporting means at a point adjacent the position of the edge of a record of small size resting on said supporting means, means supporting said dog for movement to and from the edge of said supporting means and in a plane normal to the surface of a record on said supporting means, means in the same plane as said dog and responsive to rotation of said turntable driving means for displacing said dog in the direction of that edge of said supporting means which underlies a record to cause discharge of a small record therefrom so that it may fall by gravity to the turntable under the guidance of said guide rod, means for moving said supporting means out of supporting position, locking means normally rendering said last-named means inoperative, means for moving the tone pickup to playing position, a stop for positioning the pickup adjacent the outermost groove of a record of small diameter, means for moving said stop for positioning the pickup adjacent the outermost groove of a record of large diameter, said stop moving means also being rendered normally inoperative by said locking means, and means responsive to depression of said dog by a record of large size overlying the same for releasing said locking means, said dog moving means also extending through said record supporting means to directly engage the edge of a large record, whereby when a large record is released the pickup will be automatically stopped at the outermost groove of said record.

3. A record changer for phonographs of the type which include a turntable and means for driving the same comprising, a stationary guide

rod extending axially upwardly from the center of the turntable, said guide rod having a record supporting shoulder thereon, means for marginally supporting the record substantially in the plane of said shoulder, a dog extending through said supporting means at a point adjacent the position of the edge of a record of small size resting on said supporting means, means supporting said dog for movement to and from the edge of said supporting means and in a plane normal to the surface of a record resting on said supporting means, a pivoted arm for exerting pressure downwardly from above the record on the surface thereof, means, in the same plane as said dog, responsive to rotation of said turntable driving means for moving said dog to the edge of the supporting means to cause discharge of a small record therefrom so that it may fall by gravity to the turntable under the guidance of said guide rod, means for moving said supporting

5 means out of supporting position, locking means normally rendering said last named means inoperative, means responsive to depression of said dog by a record of large size overlying the same for releasing said locking means, said dog moving means also extending through said record supporting means to directly engage the edge of a large record, and means responsive to a predetermined angular movement of said arm for immobilizing the turntable driving means, whereby small records are discharged from said supporting means by said dog, large records depress said dog under the urging of said arm to allow the support to be moved away from supporting position so that the record may be discharged by the dog moving means, and the absence of records permits movement of said arm to immobilize the turntable driving means.

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