Feb. 19, 1946. J. D. WEAVER 2,395,026

HYDRAULIC RECORD CHANGER MECHANISM

Filed Feb. 23, 1944 2 Sheets-Sheet 1

FIG. 1

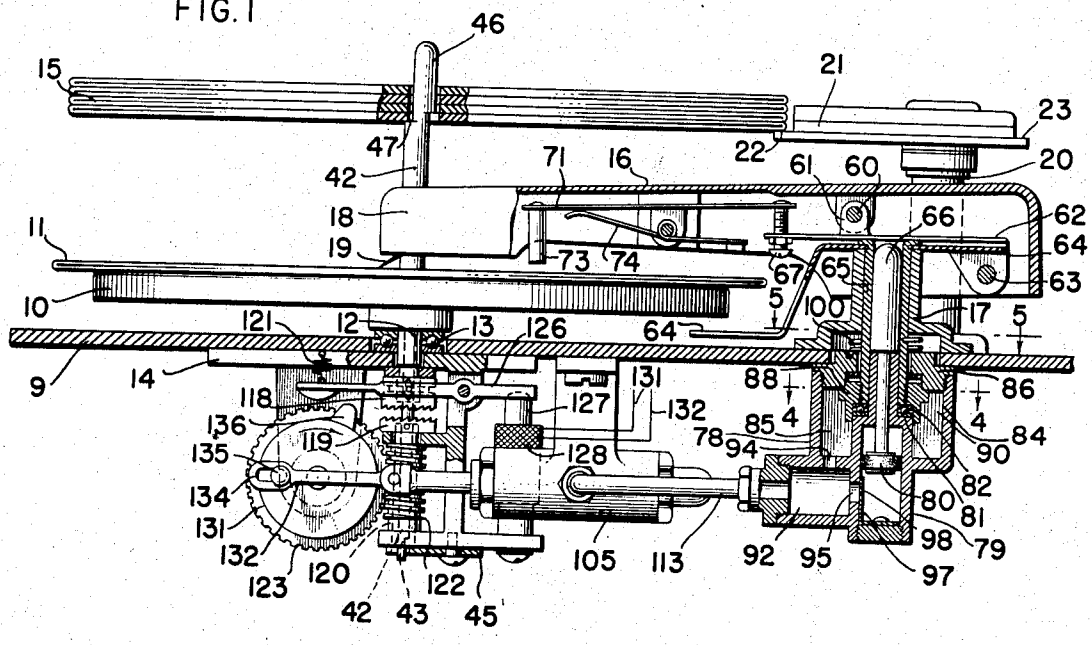


FIG. 3

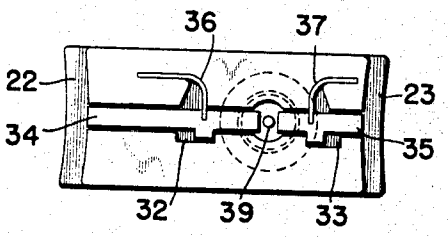


FIG. 5

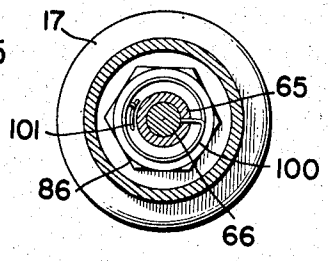


FIG. 2

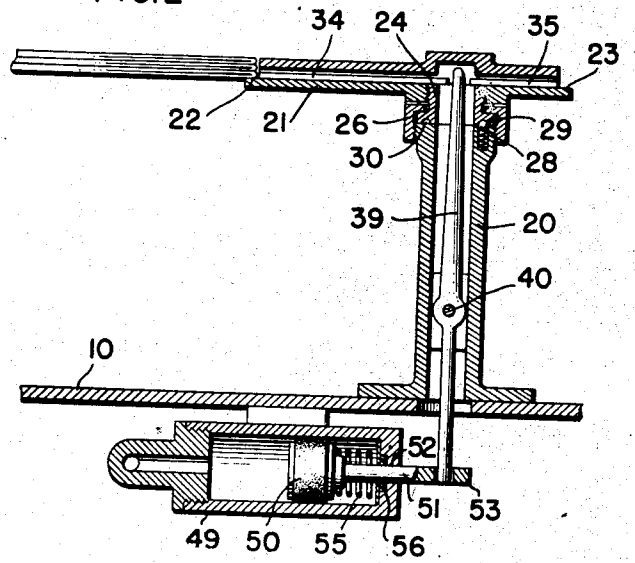
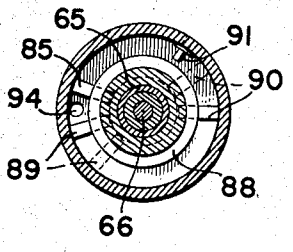


FIG. 4



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HYDRAULIC RECORD CHANGER MECHANISM

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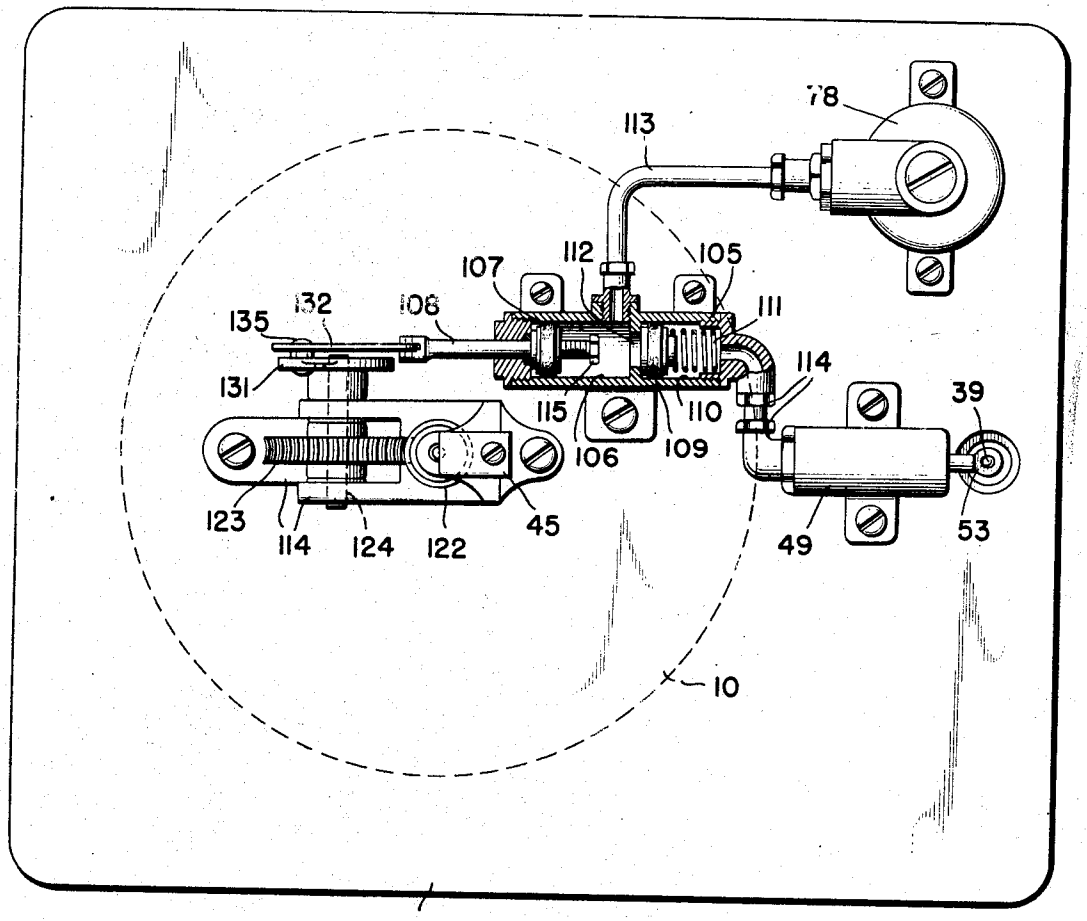

FIG. 6

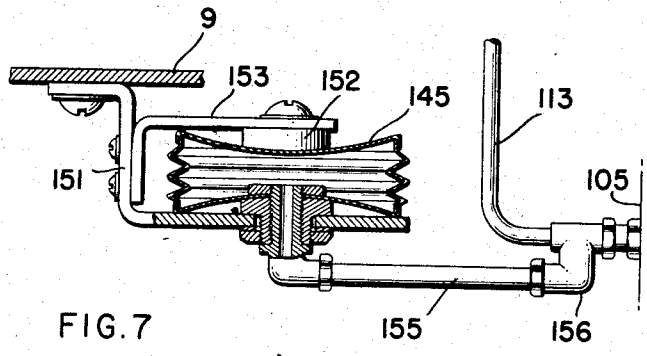

FIG. 7

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HYDRAULIC RECORD CHANGER MECHANISM

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Application February 23, 1944, Serial No. 523,529

14 Claims. (Cl. 274—10)

This invention relates generally to automatic phonograph devices and more particularly to a mechanism for controlling the record-changing cycle in an automatic phonograph.

Conventional automatic phonograph mechanisms customarily include cam and lever mechanisms for controlling a record-changing cycle. There is usually provided a cam wheel having one or more cam surfaces, the contours of which must be accurately formed and timed with relation to one another for successively controlling the movements of a pickup arm and a record-release mechanism. The various cam surfaces operate to perform these control functions through one or more levers connected to the pickup arm and the record-release mechanism. In many cases it is necessary that the levers be accurately formed for maintaining the time relationships between the movements of the pick-up arm and the record-release mechanism. Similarly, it is necessary that the adjustment of the levers be very critical.

While the control mechanism is usually concealed within an automatic phonograph, such mechanism is nevertheless subject to considerable abuse, for example, during shipment and during normal operation by unskilled operators. In view of the critical relationships between the various levers and the cams, such abuse frequently results in maladjustments which in turn result in faulty operation. Such faulty operation often requires frequent repairs and adjustments. In view of the fact that record changers are usually operated by persons unskilled in the record-changer art, it is extremely desirable to provide an automatic phonograph mechanism which inherently does not include delicate mechanisms which can be damaged when subjected to normal use by unskilled operators.

Accordingly, the principal object of this invention is to provide an automatic phonograph mechanism comprising a novel change-cycle control mechanism.

Another object of the present invention is to provide in an automatic phonograph a change-cycle control mechanism which does not have critical dimensions or adjustments and will be inherently free of mechanical weakness insofar as normal use is concerned.

In accordance with the present invention, there is provided an automatic record-changing mechanism comprising a rotatable turntable for supporting a record thereon, a pickup arm, a pedestal on which said pickup arm is mounted to move vertically and horizontally into and out of engagement with a record on said turntable for playing it, means for supporting a stack of records above said turntable, and for releasing the lowermost record from said record-supporting means. There is also provided a driving means for carrying out a record-changing cycle, and a novel hydraulic means connected to said driving means, said pickup arm and said record-releasing means for moving said pickup arm outwardly beyond the edge of the record for releasing the lowermost record from said record-supporting means while said pickup arm is in its outward-most position and for moving said pickup arm inwardly into engagement with the initial playing groove of said record on said turntable during a record-changing cycle.

For a better understanding of the invention, together with other and further objects thereof, reference is made to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation, partly in section, of the apparatus in accordance with this invention showing a group of records supported over the turntable and one record on the turntable in playing position;

Fig. 2 is a side elevation of the peripheral record-supporting and releasing mechanism shown partly in section;

Fig. 3 is a top plan view of the peripheral record support with the cover plate removed;

Fig. 4 is a fragmentary view, partly in section, taken on line 4—4 of Fig. 1 showing the mechanism for moving the pickup arm outwardly;

Fig. 5 is a fragmentary view, partly in section, taken on line 5—5 of Fig. 1 showing the mechanism for retarding the outward movement of the pickup arm and for swinging the pickup arm inwardly;

Fig. 6 is a bottom plan view, partly in section, showing the underside of the apparatus; and

Fig. 7 is a fragmentary view, partly in section, showing an alternative mechanism for controlling the inward movement of the pickup arm.

Referring particularly to Fig. 1 of the drawings, the invention illustrated therein includes a record-changing mechanism comprising a base plate 9 for supporting a rotatable turntable 10 on which is shown a record 11 in position for reproduction. The turntable 10 is rigidly connected to a shaft 12 rotatably supported by a bearing member 13 provided on a bracket 14 fixed to the underside of the base plate 9 (Fig. 1). The turntable 10 may be driven by any suitable means.

for example, such as that described in United States Patent No. 2,286,490 of Arthur L. Knox, patented June 16, 1942. The unplayed records 15 (Fig. 1) are supported in a stack above the turntable so that the lowermost record may be moved into playing position on the turntable. A pickup arm 16 is mounted for movement in a horizontal plane on pedestal 17 situated at one side of the turntable 11 as shown in Fig. 1. At the free end of the pickup arm 16 there is provided a reproducer or pickup 18 with a stylus 19 which is adapted to cooperate with a record on the turntable 10 to reproduce it in the conventional manner.

Record-supporting and releasing mechanism

The unplayed stack of records 15 is supported above the turntable 10 on a peripheral support which engages the peripheral edge of the lowermost supported record. The stack is also supported at the edge of the centering aperture of the same record by a fixed centering pin. The peripheral support includes an upwardly extending pedestal 20 (Figs. 1 and 2) which is fixed to the base plate 9 in a suitable manner. At the upper end of the pedestal, there is provided a swivelly mounted bracket 21 which includes two supporting shelves 22 and 23. For swivelly mounting the bracket 21 on the upper end of the pedestal 20, there is provided flanged member 24 threaded to the bracket and a flanged member 26 threaded to the pedestal 20 as shown in Fig. 2. Member 24 can rotate on the pedestal and is retained in a centered position by member 26.

The bracket 21 is arranged to be held in either of two relatively fixed positions with respect to the pedestal 20. This is accomplished by spring biased ball 28 which is adapted to engage at different times a pair of notches 29 and 30 provided in the flanged member 24 (Fig. 2). The notches 29 and 30 are spaced 180° from each other. When the supporting shelf 22 is in position for supporting a stack of ten-inch records, as shown in Figs. 1 and 2, the spring biased ball 28 is in engagement with the notch 29. When the bracket 21 is rotated about its vertical axis relative to the pedestal 20, to a point 180° from the position shown in Figs. 1 and 2, the spring biased ball 28 comes into engagement with the notch 30 and the supporting shelf 23 is locked in position for supporting twelve-inch records. The bracket 21 is provided with a pair of channel portions 32 and 33 in which a pair of spring biased record-moving members 34 and 35 are adapted to reciprocate. The members 34 and 35 are biased to their respective positions, as shown in Fig. 3, by a pair of spring members 36 and 37. The members 34 and 35 are adapted to be engaged and moved by a lever 39 which is pivoted on a pin 40 provided near the base of the pedestal 20 as shown in Fig. 2.

As shown in Fig. 1, there is provided a fixed record-centering pin 42 which extends upwardly through shaft 12 and above the turntable 10. The lower end of the pin 42 is provided with a notch portion 43 which is engaged by a locking member 45 provided on the bottom of the bracket 14 (Fig. 1). At the upper end of the spindle 42 there is provided an off-set portion 46 to form a record-supporting shoulder 47. The off-set portion 46 is adapted to center the stack of records 15 on the shoulder 47 and the supporting shelf 22 of the bracket 21, as shown in Fig. 1.

The mechanism for moving the lever 39 is illustrated in Figs. 2 and 6 and comprises a fluid-operated mechanism including a cylinder 49 in which a piston 50 is adapted to be moved. The piston 50 is connected to a rod 51 which is adapted to be moved through an aperture 52 provided at the end of the cylinder. A member 53 is connected between the lever 39 and the rod 51. The piston 50 and the member 53 are normally biased to the position shown in Fig. 2 by a spring member 55. A suitable oil-retaining washer 56 is provided for retaining the oil or other fluid in the cylinder 49.

The cylinder 49 is connected to a master cylinder presently to be described. In operation, when fluid is forced into the cylinder 49 from the master cylinder, the piston 50 and therewith the member 53 is moved to the right (Fig. 2) against the biasing action of the spring 55, thereby moving the lever 39 in a counterclockwise direction to actuate the member 34 and thereupon release the lowermost record from the shoulder 47 and the bracket 21. When the fluid is drawn out of the cylinder 49, the piston 50 and the member 53 are returned to the position shown in Fig. 2 by the spring member 55.

Pickup arm mounting and mechanism for moving the pickup arm

As shown in Fig. 1, the pickup arm 16 may be pivotally mounted on a pin 60 supported by a bearing member 61 provided on a plate 62. The plate 62 is pivotally mounted on a pin 63 which is fixed to a plate 64. The plate 64 is connected to the upper end of a rotatable hollow shaft 65 in which the pickup arm lift-pin 66 is adapted to move vertically.

Intermediate the ends of the pickup 16 there is pivotally connected thereto a lever 71 in a suitable manner such as shown in Fig. 1. To one end of the lever 71, there is affixed a downwardly extended pin 73. The opposite end of the lever 71 is in engagement with a screw 67 provided on the plate 62, as shown in Fig. 1. A spring 74 is connected to the pickup arm 16 and associated with the lever 71 in the manner shown in Fig. 1, to maintain the lever 71 in the position shown in Fig. 1. As will be evident from the description hereinafter, when the raised pickup arm 16 is moved from its outermost position toward the turntable 11 and the record on the turntable 11 is a twelve-inch record, the pin 73 will extend in the plane of the twelve-inch record on the turntable and serve to position the stylus 19 of the pickup arm 16 over the initial playing groove of that record.

The mechanism for moving the shaft 65 and pin 66 to rotate and elevate the pickup arm is shown in Fig. 1 and comprises a hydraulic mechanism including a housing 78 provided with a cylinder 79 in which a piston 80, fixed to the lower end of the pin 66, is adapted to be moved vertically to elevate the pin 66 and the pickup arm 16. The upper end of the cylinder 79 is provided with a shoulder 81 which is adapted to support a bearing assembly 82 for rotatably supporting the shaft 65 as shown in Fig. 1. At the upper end of the cylinder 79 there is provided a second cylinder 84. A baffle 85, as shown in Fig. 4, is formed on the inner wall of the cylinder 84 to extend to the outer wall of the cylinder 79 and from the bottom of the cylinder 84 to the cap member 86 (Fig. 1). A rotatable member 88 is fixed to the lower end of the shaft 65, as shown in Fig. 1. The member 88 has two vanes 89 and 90. The vane 90 is adapted to engage a stop 91 when the member 88 has been

rotated a predetermined distance in a counterclockwise direction, as shown in Fig. 4.

Adjacent the lower end of the cylinder 79 there is provided a small reservoir 92 connected to a master cylinder, previously referred to. The reservoir 92 and lower portion of the cylinder 79 are filled with a suitable fluid such as oil. When fluid is forced into the reservoir 92 (Fig. 1), fluid is also forced from the reservoir 92 through the ports 94 and 95 into the cylinders 79 and 84 to operate the piston 80 and rotatable member 88.

As shown in Fig. 1, a spring valve member 97 with a small port 98 is provided in the lower end of the cylinder 79 and is adapted when in one position partially to close the opening 95. When the fluid is forced through the port 95 from the reservoir 92 to the cylinder 79, the member 97 is moved away from the port 95 to permit fluid to enter the cylinder 79 with less obstruction than the cylinder 84 having the smaller port 94. When the stylus of the pickup arm 16 is over the initial playing groove of a record, the vanes 89 and 90 are in approximately the dotted-line position shown in Fig. 4. When the pickup arm has moved into the tripping groove of a record, the vanes 89 and 90 are in the full-line position shown in Fig. 4. When fluid is forced into the cylinder 84 in the area between the baffle 85 and the vane 89, the member 88 and shaft 65 are rotated in a counterclockwise direction (Fig. 4). The rotation of the shaft 65 is retarded by a spring member 100 (Figs. 1 and 5), one end of which is anchored to the shaft 65 and the other end of which is movable to a limited extent in a slot 101 provided in the cap member 86 (Fig. 5).

Since the fluid is permitted to flow faster into the cylinder 79 than into the cylinder 84, it will be evident that the piston 80 and the pickup arm 16 will be elevated before a sufficient amount of fluid is forced into the cylinder 84 to rotate the member 88. When the piston 80 is elevated sufficiently far to engage the upper end of the cylinder 79 (Fig. 1), the pickup arm is elevated out of engagement with the record on the turntable. Thereafter, fluid ceases to be forced into the cylinder 79 and the spring-valve member 97 moves back partially to close the opening 95 as shown in Fig. 1. As the fluid continues to be forced into the cylinder 84, the member 88 rotates in a counterclockwise direction (Fig. 4), thereby swinging the pickup arm outwardly. When the pickup arm 16 has been swung outwardly to a position approximately over the outer groove of a record on the turntable, the free end of the spring member 100 engages the lower end of the slot 101 (Fig. 5). Further rotary movement of the member 88 builds up tension in the spring member 100. When the member 88 is rotated in a counterclockwise direction until the vane 90 engages the stop 91 (Fig. 4), the pickup arm is beyond the edge of the record on the turntable.

When the fluid is gradually drawn out of the cylinders 79 and 84, in a manner to be described hereinafter, the spring member 100 rotates the member 88 in a clockwise direction (Fig. 4) to swing the pickup arm inwardly and the weight of the pickup arm 16 on the pin 66 forces the piston 80 downwardly. This horizontal and vertical movement of the pickup arm is controlled by the speed with which the fluid is drawn from the cylinder 84 through the large opening 94 and from the cylinder 79 through the restricted opening 98 in the member 97 (Fig. 1). From the above it will be apparent that the fluid will be expelled from the cylinder 84 faster than it is expelled from the cylinder 79. Thus, it will be evident that the pickup arm 16 will be moved inwardly under the biasing action of the spring member 100 to a position immediately over the initial groove of a record on the turntable before the weight of the pickup arm 16 on the pin 66 forces the piston 80 downwardly to the position shown in Fig. 1 where the stylus 19 of the pickup arm 16 engages the record on the turntable.

Driving mechanism for hydraulic pickup arm control and record-releasing mechanism

The mechanism for actuating the hydraulic pickup arm control and record-releasing mechanisms is shown in Figs. 1 and 6 and comprises a master cylinder mechanism including a housing 105 providing a cylinder 106 in which there is a piston 107 connected to a rod 108. Adjacent to the right-hand end of the cylinder 106 (Fig. 6) there is provided a second cylinder 110 in which a piston 109 is adapted to be moved. The piston 109 is normally biased to the position shown in Fig. 6 by a spring member 111. The cylinder 106 is connected to the cylinder 110 by an opening 112, and the cylinders 106 and 110 are filled with a suitable fluid such as oil.

As shown in Fig. 6, the cylinder 106 is connected to the pickup arm control housing 78 by a tube 113, and the cylinder 110 is connected to the record-releasing housing 49 by a coupling 114. When the piston 107 is moved inwardly a predetermined distance, a projection 115 on the piston 107 engages and moves the piston 109 inwardly against the biasing action of the spring member 111. This movement of the pistons 107 and 109 forces the fluid out of the cylinders 106 and 110 into the pickup arm control and record-releasing housings 78 and 49 respectively.

The driving mechanism for actuating the piston 107 is best illustrated in Figs. 1 and 6. Referring to Fig. 1, there is connected to the lower end of the shaft 12 a clutch member 118. As is evident from Fig. 1, the connection of the clutch member 118 to the shaft 12 permits the clutch member 118 to rotate with the shaft 12 and to move relative thereto longitudinally along its axis. Normally the clutch member 118 is maintained in the position shown in Fig. 1, by a spring member 121, one end of which is connected to the base plate 9 and the other end of which is connected to the lever 126.

Immediately below the clutch member 118, a clutch member 119 is mounted on a tubular shaft 120 which is rotatable about the axis of the fixed spindle 42 and supported by the bracket 14. The clutch 119 is mounted in such a manner that it does not rotate except when it is engaged by the clutch member 118. The shaft 120 also has affixed thereto a worm gear 122 which is in continual driving engagement with a gear 123 (Figs. 1 and 6) which is fixed to a shaft 124. The shaft 124 is rotatably supported by the bracket 14 as shown in Fig. 6.

The mechanism for moving the clutch member 118 into driving engagement with the clutch member 119 is best illustrated in Fig. 1 and includes a lever 126 pivotally mounted on the bracket 14 (Fig. 1). The free end of the lever 126 is adapted to be in continual engagement with the clutch member 118. The opposite end of the lever is in engagement with the armature 127 of a solenoid 128. Solenoid 128 is adapted to be energized through the conductors 131 and 132 by a tripping mechanism such as that disclosed in U. S. Patent No. 2,018,881, patented

October 29, 1935. When the solenoid 128 is energized, the armature 127 is moved upwardly to move the lever 126 in a counterclockwise direction (Fig. 1). The movement of the lever 126 is sufficient to move the clutch member 118 into operative engagement with the clutch member 119.

A wheel 131 is fixed to the shaft 124, as shown in Fig. 6, to rotate therewith in a clockwise direction. The wheel 131 is connected to the rod 108 (Fig. 6) by a connecting rod 132, one end of which is swivelly connected to the free end of the rod 108 and the other end of which is provided with an elongated aperture 134 which engages a shouldered pin 135 provided on the wheel 131. The wheel 131 is provided with a cam portion 136 which is adapted to engage the free end of the lever 126 (Fig. 1) at the end of the cycle of operation of the wheel 131, for moving the clutch member 118 out of engagement with the clutch member 119 (Fig. 1).

During a cycle of operation of the wheel 131, it performs the following functions in sequence. When it is in its idle position, the pistons 107 and 109 are in the positions shown in Fig. 6, and the pin 135 on the wheel 131 is in engagement with the right-hand end of the elongated aperture 135 as shown in Fig. 1. When the wheel 131 begins to rotate in a clockwise direction (Fig. 1) the connecting rod 132 moves the rod 108 and piston 107 inwardly (Fig. 6). This movement of the piston 107 forces the fluid out of the cylinder 106 through the tube 113 into the reservoir 92 and cylinders 79 and 84 to elevate the pickup arm 16 and swing it horizontally beyond the edge of the record on the turntable 10, in the manner heretofore described. While the fluid is being forced out of the cylinder 106, the tension of spring member 111 being greater than the pressure of the fluid against the piston 109 maintains the piston 109 in the position shown in Fig. 6. When the piston 107 has been moved inwardly sufficiently far for the fluid forced from the cylinder 106 into the cylinders 79 and 84 to swing the pickup arm 16 to its outermost position, the projection 115 on the piston 107 engages the piston 109. As the piston 107 continues its inward movement, the piston 109 is moved against the biasing action of the spring member 111, thereby forcing the fluid from the cylinder 110 into the cylinder 49 (Fig. 2), to release the lowermost record from the shoulder 47 and bracket 21, in the manner heretofore described. When the lowermost supported record has been released, the wheel 131 has completed one-half of a cycle. Since the aperture 134 (Fig. 1) is elongated, it will be apparent that the wheel 131 will rotate a predetermined distance before the pin 135 will engage the left-hand end of the aperture 134 (Fig. 1) and thereafter move the piston 107 outwardly (Fig. 6). The piston 107 in so moving permits the spring member 111 to move the piston 109 outwardly to the position shown in Fig. 6 and draw the fluid out of the cylinder 49 (Fig. 2). Likewise, the piston 107 in moving outwardly draws the fluid out of the cylinders 79 and 84. However, due to the length of the aperture 134 in the connecting rod 132, it is evident that when the wheel 131 is returned to its normal position shown in Fig. 1, the piston 107 is not returned to its normal position. Therefore, the pickup arm 16 ceases to be moved inwardly by the movement of the piston 107 (Fig. 6) and the spring 100 (Figs. 1 and 2). With the piston 107 out of its normal position, it is evident that a portion of the fluid remains in the cylinder 84.

In order for the mechanism to function properly during the succeeding cycle of operation of the wheel 131, it is necessary to move the piston 107 back to the position shown in Fig. 6. To do this, pressure must be created in the cylinder 106. This pressure is developed by the movement of the pickup arm 16 as it reproduces a record. As the pickup arm 16 moves inwardly, the vane 89 in cylinder 84 is moved from the dotted-line position to the full-line position shown in Fig. 4, to force the fluid remaining in the cylinder 84 through the tube 113 into cylinder 106 (Fig. 6) to build up pressure therein and move piston 107 back to the position shown in Fig. 6.

According to a modification of this invention, the mechanism illustrated in Fig. 7 may be utilized to eliminate the elongated slot 134 in member 132. As described hereinbefore, slot 134 is required to allow inward movement of the pickup arm. Thus a bellows 145 may be provided having a volume sufficient to contain the quantity of oil displaced in cylinder 84 when pickup arm 16 moves from the initial playing groove of the record to the tripping groove of the record.

Bellows 145 is fixed to bracket 151, and bracket 153 together with stop member 152 is fixed to bracket 151 for limiting the expansion of the bellows. The bellows may be connected to tube 113 by tube 155 and coupling 156.

When piston 107 is moved inwardly to force fluid from cylinder 106 into cylinders 79 and 84, bellows 145 can expand until it engages stop member 152. When the piston 107 is moved outwardly, fluid will be drawn out of bellows 145 as well as from the cylinders 79 and 84. However, as pointed out hereinbefore, fluid remains in cylinder 84 when pickup arm 18 engages the initial playing groove of the record. Since bellows 145 has been collapsed, the inward movement of the pickup arm and the rotation of the vane 89 in cylinder 84 will move fluid from cylinder 84 through chamber 92 and tube 155 into bellows 145 whereby to allow normal inward movement of the pickup arm.

Mode of operation

After a stack of records has been placed upon the shoulder 47 and shelf 22 or 23 associated with the bracket 21 (Fig. 1) and after a record has been placed in playing position upon the turntable 10, the pickup arm 16 is manually moved to place the stylus 19 of the reproducer 18 in the initial groove of the record on the turntable.

The pickup arm 16 moves inwardly as the stylus 19 of the reproducer 18 follows the playing groove of the record and eventually reaches the inner groove where the automatic tripping mechanism (not shown in the drawings) is actuated by the movement of the plate 64 (Fig. 1) responsive to the movement of the pickup arm 16. The solenoid 128 (Fig. 1) is energized and the lever 126 is moved in a counterclockwise direction (Fig. 1) to move the clutch member 118 into driving engagement with the clutch member 119 provided on the shaft 120.

Engagement of the clutch members causes the worm 122 to drive the gear 123 and therewith the wheel 131 through a record-changing cycle.

As the wheel 131 rotates, the connecting rod 132 (Fig. 6) moves the piston 107 inwardly, thereby forcing fluid from the cylinder 106 into the cylinders 79 and 84, to elevate and swing the

pickup arm 16 outwardly beyond the edge of the played record on the turntable.

Continued movement of the wheel 131, causes the projection 115 on the piston 107 to engage and move the piston 109 (Fig. 6), thereupon forcing fluid from the cylinder 110 into the cylinder 49 (Fig. 2) to move the piston 50 to the right for moving the lever 39 in a counterclockwise direction (Fig. 6) sufficiently far to move the lowermost record off the shoulder 47 and the bracket 21.

The wheel 131 has by this time rotated sufficiently far to reverse the piston 107 (Fig. 6) allowing the spring member 111 to reverse the piston 109, thereupon drawing the fluid out of the cylinder 49.

As the wheel 131 continues to move, the piston 107 is moved outwardly and the fluid is drawn out of the cylinders 79 and 84 permitting the spring member 100 to swing the pickup arm 16 over the starting groove of the record placed upon the turntable.

At this time, the wheel 131 (Figs. 1 and 6) has rotated to such a position that the stylus of the reproducer is lowered into engagement with the record placed upon the turntable. Immediately thereafter, the cam portion 136 on the wheel 131 engages the free end of the lever 126 (Fig. 1) to move the clutch member 118 out of driving engagement with the clutch member 119. Immediately after the members 118 and 119 disengage, the wheel 131 comes to rest in the position shown in Fig. 1 of the drawings and the record recently placed upon the turntable is reproduced.

The next and following cycles of the automatic operations are initiated by the automatic tripping mechanism (not shown) each time the stylus 19 in the reproducer 18 moves into the inner groove of the record being played.

While there has been described what is at present considered a preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In an automatic phonograph comprising a rotatable turntable, a pickup arm adapted to be moved into and out of engagement with a record on said turntable for playing it, means for supporting a plurality of records above said turntable, means for releasing the lowermost record from said supporting means, driving means for carrying out a record-changing cycle, means operatively associated with said driving means and said pickup arm for moving it outwardly beyond the edge of a record on said turntable and inwardly into engagement with the initial playing groove of said record and hydraulic timing means operatively associated with said pickup arm moving means and said record-releasing means for releasing the lowermost reord from said record-supporting means when the pickup arm is beyond the edge of the record on said turntable.

2. In an automatic phonograph comprising a rotatable turntable, a pickup arm adapted to be moved into and out of engagement with a record on said turntable for playing it, means for supporting a plurality of records above said turntable, means for releasing the lowermost record from said supporting means, driving means for carrying out a record-changing cycle, and hydraulic timing and actuating means connected to said driving means, said pickup arm and said record-releasing means for first moving said pickup arm outwardly beyond the edge of a record on said turntable, for then releasing the lowermost record from said record-supporting means and for lastly moving said pickup arm inwardly into engagement with the beginning of said record on said turntable during a record-changing cycle.

3. In an automatic phonograph having a rotatable turntable for supporting a record, a pickup arm for playing a record on said turntable, means for supporting a plurality of records above said turntable and releasing the lowermost record from said record-supporting means, a first hydraulic means connected to said pickup arm for moving said pickup arm to an outermost position and returning it to the initial playing groove of the record on said turntable, a second hydraulic means connected to said record-releasing means for releasing said lowermost record from said record-supporting means while said pickup arm is in its outermost position, a third hydraulic means connected to said first and second hydraulic means for actuating said pickup arm moving means and said record-releasing means in timed relation, and driving means connected to said third hydraulic means and being actuated when one side of the record on said turntable is played for respectively moving said pickup arm to an outermost position, releasing the lowermost record from said record-supporting means and returning said pickup arm to the initial playing groove of the record on said turntable.

4. In an automatic phonograph having a rotatable turntable for supporting a record, a pickup arm for playing a record on said turntable, a peripheral-supporting means for supporting a stack of records, first and second reciprocating members associated with said peripheral-supporting means for releasing the lowermost record from said record-supporting means, a first hydraulic means connected to said pickup arm for moving said pickup arm to an outermost position and returning it to the initial playing groove of the record on said turntable, a second hydraulic means connected to said movable members for releasing said lowermost record from said record-supporting means while said pickup arm is in its outermost position, a third hydraulic means connected to said first and second hydraulic means for actuating said pickup arm-moving means and said record-releasing means in timed relation, and driving means connected to said third hydraulic means and being actuated when one side of the record on said turntable is played for respectively moving said pickup arm to an outermost position, releasing the lowermost record from said record-supporting means and returning said pickup arm to the initial playing groove of the record on said turntable.

5. In an automatic phonograph mechanism comprising a rotatable turntable for supporting a record thereon, movable peripheral-supporting means adjacent to said turntable for cooperating in supporting a stack of records of relatively small diameter or of relatively large diameter, disengaging means associated with said peripheral-supporting means adapted to engage a peripheral wall of the lowermost supported record for releasing said lowermost record from said shoulder and said peripheral-supporting means, and hydraulic means for moving said

disengaging means and moving the lowermost supported record to playing position on said turntable.

6. In an automatic phonograph having a rotatable turntable for supporting a record, a pickup arm for playing a record on said turntable, a movable peripheral-supporting means for supporting a stack of records and adapted when in a first position for supporting a plurality of records of a small diameter and when rotated 180° to a second position for supporting a plurality of records of a large diameter, disengaging means associated with said peripheral record-supporting means for releasing the lowermost record from said record-supporting means, a pivoted member connected to said record-supporting means and adapted when moved to move said disengaging means, a first hydraulic means connected to said pickup arm for moving said pickup arm to an outermost position and returning it to the initial playing groove of the record on said turntable, a second hydraulic means connected to said pivoted member for actuating said record-disengaging means to release said lowermost record from said peripheral support while said pickup arm is in its outermost position, a third hydraulic means connected to said first and second hydraulic means for actuating said pickup arm-moving means and said record-releasing means in timed relation, and driving means connected to said third hydraulic means and being actuated when one side of the record on said turntable is played for respectively moving said pickup arm to an outermost position, releasing said lowermost record from said record-supporting means and returning said pickup arm to the initial playing groove of the record on said turntable.

7. In an automatic phonograph mechanism comprising a rotatable turntable for supporting a record thereon, movable peripheral-supporting means adjacent to said turntable for cooperating in supporting a stack of records of relatively small diameter when in a first position and for supporting a stack of records of relatively large diameter when in a second position, disengaging means associated with said peripheral-supporting means for releasing the lowermost record, a hydraulic mechanism including a cylinder, a piston movable in said cylinder and connected to said disengaging means, a hydraulic driving means connected to said cylinder in said hydraulic mechanism adapted to move said piston a predetermined distance in a first direction for actuating said disengaging means, means for moving said piston a predetermined distance in a second direction immediately after said lowermost record has been released from said peripheral supporting means for permitting the second lowermost record of said stack to move into disengaging position and means for permitting said piston to move in said second direction.

8. In an automatic phonograph mechanism comprising a rotatable turntable, a pickup arm for playing a record on said turntable, a hydraulic pickup arm control means comprising a first movable means adapted for elevating said pickup arm, a second movable means connected to said pickup arm for moving said pickup arm outwardly for returning said pickup arm to the beginning of said record on said turntable, a hydraulic driving means connected to said hydraulic pickup arm control means being filled with a fluid and having a movable member adapted when moved for forcing said fluid into said hydraulic pickup arm control means for moving said first and second movable means, driving means associated with said turntable and connected to said movable member in said hydraulic driving means and adapted to cooperate with said turntable for moving said movable member to move said pickup arm to the beginning of a record on said turntable after a record has been played on said turntable, and means connected to said hydraulic pickup arm control means and said hydraulic driving means for controlling the positioning of said pickup arm over the beginning of a record on said turntable during a record-changing cycle.

9. In an automatic phonograph comprising a rotatable turntable for supporting a record, a pickup arm for playing a record on said turntable, a hydraulic mechanism connected to said pickup arm including a first cylinder, a piston movable vertically in said first cylinder adapted to lift said pickup arm out of engagement with a record on said turntable, a second cylinder, a member rotatable in said second cylinder pivotally supporting said pick-up arm to move vertically and swing horizontally into and out of engagement with said record on said turntable, a reservoir connected to said first and second cylinders by openings and filled with a fluid, a master cylinder filled with a fluid and connected to said reservoir and having a piston adapted when moved in a first direction for forcing fluid from said master cylinder into said first and second cylinders for moving said pickup arm to its outermost position and when moved in a second direction for drawing said fluid out of said first and second cylinders to swing said pickup arm inwardly into engagement with the beginning of a record on said turntable, driving means connected to said piston in said master cylinder, and means connected to said master cylinder for controlling the amount of fluid drawn out of said reservoir and said second cylinder when said piston in said master cylinder is moved in said second direction, for limiting the inward movement of said pickup arm by said hydraulic mechanism, to the beginning of a record on said turntable during a record-changing cycle.

10. In an automatic phonograph comprising a rotatable turntable for supporting a record, a pickup arm for playing a record on said turntable, means for supporting a stack of records above said turntable, movable elements associated with said record-supporting means adapted when moved to release the lowermost record from said record-supporting means, a first hydraulic means connected to said pickup arm for elevating it, a second hydraulic means connected to said pickup arm for moving it horizontally into and out of engagement with a record on said turntable, a driving means for carrying out a record-changing cycle, a master cylinder having first and second compartments filled with a fluid and connected to said first and second hydraulic means respectively, a piston connected to said driving means and movable in said first compartment for forcing said fluid from said first compartment into said first hydraulic means for moving said pickup arm to its outermost position and moving it inwardly into engagement with the beginning of a record, a piston in said second compartment adapted to be moved by said first piston, after said first piston has been moved a predetermined distance, for forcing said fluid from said second compartment into said second hydraulic means for releasing the lower-

most record from said record-supporting means while said pickup arm is in its outermost position, and means for moving said second piston in said master cylinder back to its inoperative position as said driving means moves said first piston in said master cylinder back to its inoperative position at the end of a record-changing cycle.

11. In an automatic phonograph, a rotatable turntable, a pickup arm mounted adjacent said turntable for horizontal and vertical movement with respect thereto, record-supporting means adjacent the periphery of said turntable for supporting a plurality of records in a position to be dropped to said turntable, a record-releasing means operatively associated with said record-supporting means, first hydraulic means connected to said pickup arm for elevating it in response to a change of pressure in one sense and lowering it in response to a change of pressure in another sense, second hydraulic means connected to said pickup arm for swinging it outwardly in response to a change of pressure in one sense and inwardly in response to a change of pressure in another sense, means operatively associated with said first and second hydraulic means for so regulating the pressure applied to each of said hydraulic means that said pickup arm may be elevated by said first hydraulic means before said second hydraulic means can swing said pickup arm outwardly, and that said first hydraulic means can maintain said pickup arm in its elevated position while the second hydraulic means swings the pickup arm inwardly, hydraulic means connected to said record-releasing means for moving it, master hydraulic means operatively associated with said pressure-regulating means, and said record-releasing hydraulic means for first applying pressure to said pressure-regulating means and then applying pressure to said record-releasing hydraulic means.

12. In an automatic phonograph, a rotatable turntable, a pickup arm mounted adjacent said turntable for horizontal and vertical movement with respect thereto, record-supporting means adjacent the periphery of said turntable for supporting a plurality of records in a position to be dropped to said turntable, a record-releasing means operatively associated with said record-supporting means, first hydraulic means connected to said pickup arm for elevating it in response to a change of pressure in one sense and lowering it in response to a change of pressure in another sense, second hydraulic means connected to said pickup arm for swinging it outwardly in response to a change of pressure in one sense and inwardly in response to a change of pressure in another sense, means common to said first and second hydraulic means for regulating the pressure applied to each of said hydraulic means whereby said pickup arm may be elevated by said first hydraulic means before said second hydraulic means can swing said pickup arm outwardly and whereby said first hydraulic means can maintain said pickup arm in its elevated position while the second hydraulic means swings the pickup arm inwardly, hydraulic means connected to said record-releasing means for moving it, master hydraulic means comprising a first cylinder connected to said pressure-regulating means, a second cylinder open to said first cylinder and connected to said record-releasing hydraulic means, pistons in each of the cylinders in said master hydraulic means and driving means connected to the piston in the first cylinder in said master hydraulic means for reciprocating it into and out of egagement with said second piston for first changing the pressure in said pressure-regulating means and then applying pressure from said second piston to said record-releasing hydraulic means.

13. In an automatic phonograph, a rotatable turntable, a pickup arm mounted adjacent said turntable for horizontal and vertical movement with respect thereto, record-supporting means adjacent the periphery of said turntable for supporting a plurality of records in a position to be dropped to said turntable, a record-releasing means operatively associated with said record-supporting means, first hydraulic means connected to said pickup arm for elevating it in response to increased pressure and lowering it in response to decreased pressure, second hydraulic means connected to said pickup arm for swinging it outwardly in response to increased pressure and inwardly in response to decreased pressure, a chamber common to said first and second hydraulic means, ports connecting said chamber with each of said hydraulic means, the port connecting with said second hydraulic means being smaller than the port connecting with said first hydraulic means whereby said pickup arm may be elevated by said first hydraulic means before said second hydraulic means can swing said pick-up arm outwardly, valve means associated with the port connecting to said first hydraulic means and effective to reduce the size of said port when pressure is relieved in said chamber whereby said first hydraulic means maintains said pickup arm in its elevated position while the second hydraulic means swings the pickup arm inwardly, hydraulic means connected to said record-releasing means for moving it, master hydraulic means comprising a first cylinder connected to said chamber, a second cylinder open to said first cylinder and connected to said record-releasing hydraulic means, pistons in each of the cylinders in said master hydraulic means and driving means connected to the piston in the first cylinder in said master hydraulic means for reciprocating it into and out of engagement with said second piston for first applying pressure in said chamber and then applying pressure from said second piston to said record-releasing hydraulic means.

14. In an automatic phonograph, a rotatable turntable, a pickup arm mounted adjacent said turntable for horizontal and vertical movement with respect thereto, record-supporting means adjacent the periphery of said turntable for supporting a plurality of records in a position to be dropped to said turntable, a record-releasing means operatively associated with said record-supporting means, reciprocating hydraulic means connected to said pickup arm for elevating it in response to increased pressure and lowering it in response to decreased pressure, rotary hydraulic means connected to said pickup arm for swinging it outwardly in response to increased pressure and inwardly in response to decreased pressure, a chamber common to said reciprocating and said rotary hydraulic means, ports connecting said chamber with each of said hydraulic means, the port connecting with said rotary hydraulic means being smaller than the port connecting with said reciprocating hydraulic means whereby said pickup arm may be elevated by said reciprocating hydraulic means before said rotary hydraulic means can swing said pickup arm outwardly,

valve means associated with the port connecting to said reciprocating hydraulic means and effective to reduce the size of said port when pressure is relieved in said chamber whereby said reciprocating hydraulic means maintains said pickup arm in its elevated position while the rotary hydraulic means swings the pickup arm inwardly, reciprocating hydraulic means connected to said record-releasing means for moving it, master hydraulic means comprising a first cylinder connected to said chamber, a second cylinder open to said first cylinder and connected to said record-releasing reciprocating hydraulic means, pistons in each of the cylinders in said master hydraulic means and driving means connected to the piston in the first cylinder in said master hydraulic means for reciprocating it into and out of engagement with said second piston for first applying pressure in said chamber and then applying pressure from said second piston to said record-releasing reciprocating hydraulic means.

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