

Oct. 6, 1953

L. C. AMMLUNG, JR., ET AL

2,654,457

PHONOGRAPH CONTROL MEANS

Filed Oct. 28, 1948

3 Sheets-Sheet 1

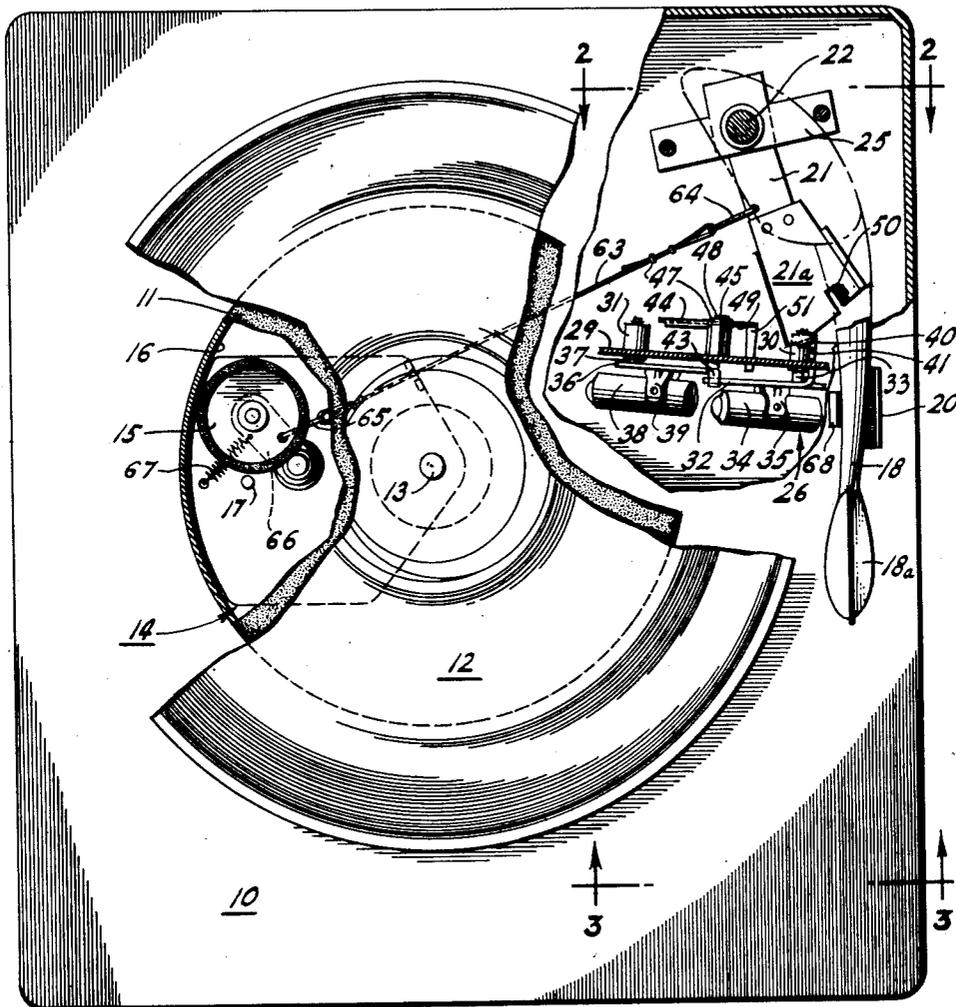


FIG. 1.

INVENTORS  
LOUIS C. AMMLUNG JR. AND  
JOHN A. TOURTELLOT  
BY

*Brown, Olenk & Synnestvedt*  
AGENTS



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FIG. 4.

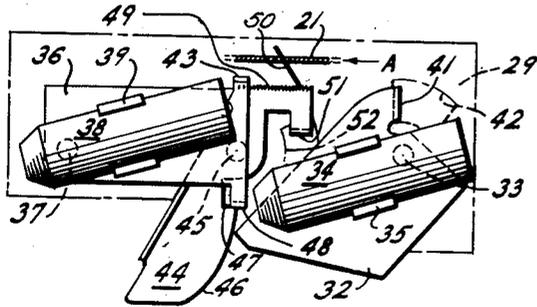


FIG. 5.

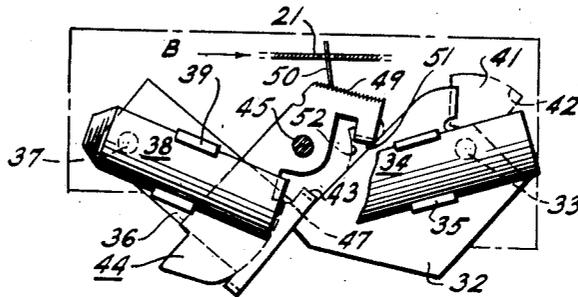


FIG. 6.

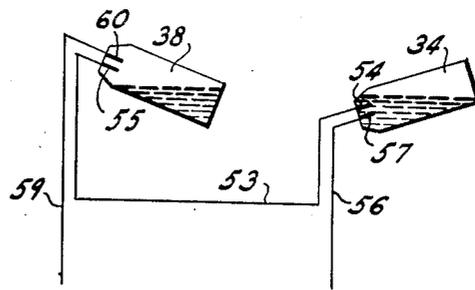
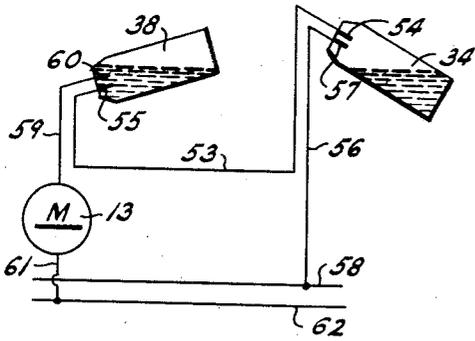


FIG. 7.

FIG. 8.

INVENTORS.  
LOUIS C. AMMLUNG JR. AND  
JOHN A. TOURTELLOT  
BY

*Brown, Deak & Synnestvedt*  
AGENTS

# UNITED STATES PATENT OFFICE

2,654,457

## PHONOGRAPH CONTROL MEANS

Louis C. Ammlung, Jr., Philadelphia, Pa., and  
John A. Tourtelot, Merchantville, N. J., as-  
signors to Philco Corporation, Philadelphia,  
Pa., a corporation of Pennsylvania

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7 Claims. (Cl. 192-124)

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The present invention relates to phonograph apparatus and, more particularly, to mechanism operable to control the stopping and starting of the motor which drives the turntable of a phonograph. Specifically, the invention has to do with improvements in motor control means especially devised for association with phonographs of the type in which the tone-arm is adapted to be manually moved in and out of playing position.

In order to simplify the use of a phonograph of the kind above mentioned, it is desirable to provide a mechanism which insures automatic stopping of the turntable motor when the tone-arm reaches a predetermined position at the end of the playing of a record, which prevents energization of the motor when the tone-arm is placed in rest position, and which insures starting of the motor when the tone-arm is moved from rest position to playing position over a record. Mechanisms of this general type have heretofore been proposed for the above stated purposes. However, many of these proposed mechanisms make no provision to prevent objectionable momentary energization of the driving motor as the tone-arm is moved from final position to rest position, and those mechanisms which include means to prevent such momentary energization, usually, are too complicated and expensive to warrant their use in low cost phonograph apparatus.

Moreover, in phonographs wherein a rubber rimmed idler is employed to establish the drive connection between the motor shaft and the turntable, it is desirable that the idler be moved out of contact with the turntable and, especially, with the motor shaft, during periods when the phonograph is not in use, so as to prevent the formation of sharp flat or uneven surfaces on the idler rim. The presence of such flat and uneven surfaces about the periphery of the idler, tends to result in turntable speed variations which, of course, are conducive to bad reproduction. Arrangements effective to withdraw the idler from the motor shaft have heretofore been suggested. In known arrangements, however, it is customary to move the idler in response to actuation of an off-and-on switch button or knob, so that with phonographs of the manually operable type, the operator is required to manipulate not only the tone-arm, but also a separate control switch member.

It is, therefore, the primary object of this invention to provide an improved phonograph control mechanism for a manually operable phonograph, which mechanism avoids the above men-

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tioned objectionable features and which, because of its constructional and operational simplicity, can economically be incorporated in phonographs of the type referred to, particularly those in the less expensive class.

Another and more specific object of the invention is to provide an arrangement adapted to control the stopping and the starting of the turntable driving motor, as well as to control the engagement of the idler with the motor shaft and turntable in response to movements of the tone-arm, so that manipulation of the tone-arm, alone, is necessary to effect all the desired controls. Thus, in accordance with this object of the invention, when the user displaces the tone-arm from record-engaging position to rest position, the switching means is opened and the idler is withdrawn from pressing engagement with the motor shaft and turntable, and when the user displaces the tone-arm from rest position to record-engaging position, the switching means is closed and the idler is permitted to move into engagement with the motor shaft and the turntable.

These and other objects, and the manner in which they are obtained, will more clearly appear from the following description based on the accompanying drawings in which:

Figure 1 is a plan view of a phonograph embodying control means constructed in accordance with this invention, certain portions being broken away for clarity of illustration, and the parts being shown in the position they assume when the tone-arm is in its rest position, and the turntable and its driving motor are stopped;

Figure 2 is a sectional elevational view, on an enlarged scale, looking in the general direction of arrows 2-2 of Figure 1;

Figure 3 is a view similar to Figure 2, but looking in the general direction indicated by arrows 3-3 of Figure 1;

Figure 4 is a side elevational view of the switch mechanism as seen in Figure 3, the supporting bracket being indicated in dot and dash lines, and the various parts being shown in the position they assume during the playing of a record, when the turntable and its driving motor are in operation;

Figure 5 is a view similar to Figure 4, but shows the position of the various parts when the end of playing of a record has been reached, and the turntable and its driving motor have stopped; and

Figures 6, 7 and 8 are explanatory schematic views illustrating the operation of the electrical

control, depending upon the relation and position of the parts as shown in Figures 3, 4 and 5, respectively.

Referring more particularly to Figures 1, 2 and 3 of the drawings, the phonograph illustrated comprises a cabinet structure which includes a horizontal panel or motor board 10 adapted to support the various parts, as hereinafter described. A turntable 11 is rotatably mounted on the panel 10 and serves to hold a record 12 for the playing thereof. As is customary, a spindle 13 (Figure 1) serves to center the record on the turntable. The turntable is driven by a suitable electric motor indicated, generally, at 14 in Figure 1, by means of a rubber rimmed wheel or idler 15, which is disposed for frictional engagement with an annular surface 16 provided by the usual depending flange of the turntable. The idler 15, in turn, is driven through motor shaft 17.

A tone-arm 18 is mounted on the panel 10 for movement both vertically and horizontally relative to the turntable. The tone-arm is provided with a head portion 18a which houses a suitable pickup device (not shown) having a reproducing stylus or needle represented at 19, in Figures 2 and 3. A supporting post 20 is arranged to support the tone-arm in rest position, as is shown in Figures 1, 2 and 3 of the drawings. An arm 21 which is connected with the tone-arm through the mounting shaft 22 thereof, serves to control the operation of the motor and, also, to control the engagement of the driving wheel 15 with the motor shaft and turntable, in response to movement of said tone-arm. The parts or elements by means of which these functions are accomplished will now be described.

The arm 21 is provided with a clamp structure 23 (Figures 2 and 3) which embraces and rigidly secures said arm on the lower portion of the tone-arm shaft 22 to move with rotation of said shaft in its upper bearing 24 and lower support 25, as the tone-arm 18 is swung horizontally. The arm 21 is secured to the shaft 22 so as to extend in predetermined angular relationship to the tone-arm, as is shown in Figure 1, and the extended free end portion of said arm is adapted for cooperation with the motor controlling switch mechanism indicated, generally, at 26.

This switch mechanism includes a mounting bracket 27 which, as best seen in Figures 2 and 3, is conveniently secured to the underside of supporting panel 10, for instance by means of bolts 28 or like fastening elements, so that a portion 29 of the bracket depends vertically from said panel. This vertical depending portion 29 of the bracket is provided with a pair of relatively spaced and substantially horizontally disposed sleeve bearings 30 and 31. A generally rectangular member or plate 32 having a trunnion 33 which is rotatably retained in one sleeve bearing 30, fixedly carries an elongated mercury switch 34, as by means of a clip 35. Another generally rectangular member or plate 36 having a trunnion 37 rotatably retained in the other sleeve bearing 31, also fixedly carries a second elongated mercury switch 38, as by means of a clip 39. The pivotal mounting of plates 32 and 36 is such that said plates, together with the mercury switches carried thereby, normally tend to gravitate in generally vertical planes, about horizontal axes provided by the cooperatively associated sleeve bearings and trunnions, from up-position (Figures 1 and 2) to down-position (Figure 5).

As more clearly shown in Figures 2 and 3, the

pivoted plate 32 is moved to and held in up-position by means of a rigid finger 40 and abutment 41. As shown, the finger 40 depends from the horizontal arm 21, and the abutment 41 extends laterally from the vertical plate 32. Thus, when the tone-arm is moved to inoperative or rest position on post 20, said finger engages said abutment, so that plate 32 is brought to its up-position and retained in that position as long as the tone-arm remains in said rest position. The down-position of plate 32 is determined by means of a stop which is advantageously obtained by providing the vertical portion 29 of the bracket with an arcuate slot 42 through which abutment 41 of said plate extends, so that a marginal portion of said slot, as best seen in Figures 4 and 5, serves to arrest said abutment in its displacement with the movement of said plate to down-position.

The pivoted plate 36 is moved to up-position by engagement of a lateral projection 43 (see Figure 3) on said plate 36 with an upper edge portion of plate 32. This edge portion of plate 32 and the mentioned projection on plate 36 further serve, as more clearly appears in Figure 5, to determine the down-position of said plate 36, since said edge portion arrests said projection in its displacement with movement of the plate to down-position.

In accordance with the invention, and as will more clearly appear from Figure 4, provision is made to retain plate 36 in its up-position, and to release said plate for movement to its down-position, independently of plate 32. For that purpose, a latch member 44 is mounted to pivot in a generally vertical plane about a substantially horizontal axis provided by a stud 45 which extends laterally from vertical portion 29 of the mounting bracket. The latch member 44 is so mounted that it tends, under the influence of its own weight, to assume a generally vertical position, as can be seen in various views of the drawings. That end portion of the latch member which extends below the pivotal axis, has a cam surface portion 46 leading into an indentation 47. This indentation is arranged to receive a laterally extending finger 48 on vertically mounted plate 36 and, thus, supports said plate in up-position, when the edge portion of plate 32 leaves projection 43 on plate 36. The mentioned cam surface and indentation on the latch member 44, are so disposed that the finger 48 on plate 36 rides along said surface, as the plate moves from its down-position to its up-position, until said finger registers with said indentation, whereupon said member pivots and effects engagement of the indentation with the finger.

The pivoted vertical latch member is further provided with a generally horizontal serrated edge portion 49. This edge portion is so distric final groove of the record, a pawl 50, which is loosely mounted on and dangles from posed that when the tone-arm nears the eccentric arm 21, engages and sweeps over said edge portion of the latch member, as is indicated by arrow A in Figure 4. When the pickup needle enters the usual eccentric terminal groove of the record, the latch member is rotated counterclockwise, as viewed in Figure 5, due to reversal movement of the arm 21, as indicated by arrow B, and to the engagement of pawl 50 with the serrated edge portion 49 on said latch member. Consequently, plate 36 is released and trips to down-position, under the influence of its own weight. The loose mounting of pawl 50 pre-

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vents premature tripping due to any slight eccentricities which may be present in the sound groove of the record. In practice, the arm 21 is advantageously formed in two parts, the part 21a (see Figure 1) which carries the pawl 50 and the resetting finger 43, being adjustable to vary the position of said pawl and finger, so as to time their action. In order to prevent undue displacement of latch member 44, a stop 51 which is provided on said member, extends through an elongated slot 52 in the vertical portion 29 of the mounting bracket, the ends of said slot cooperating with stop 51 to limit the extent of movement of the latch member.

The purpose and operation of the structure so far described, will be best understood from schematic Figures 6, 7 and 8, with reference to Figures 3, 4 and 5. As illustrated, the mercury switches 34 and 38, which are carried by pivoted plates 32 and 36, are connected in series with the phonograph motor 13. Thus, a conductor 53 connects one contact 54 of one switch 34 with one contact 55 of the other switch 38; a conductor 56 connects the other contact 57 of one switch 34 to one side 58 of a source of current; a conductor 59 connects the other contact 60 of the other switch 38 to the motor; and a connector 61 connects the motor to the other side 62 of said source of current.

The condition represented in Figure 6 exists when both plates 32 and 36 are in up-position, as is shown, for instance in Figures 2 and 3, that is, when the tone-arm is in rest position on post 20, and the finger 40 on arm 21 is in operative engagement with the abutment 41 on plate 32. Under this condition, switch 38 is closed but switch 34 is opened, so that no current flows through the phonograph motor. This condition takes place when the user manually picks up the tone-arm and moves it from a position over the record to a position adjacent the rest post 20.

The condition represented in Figure 7 exists when plate 36 is in up-position and plate 32 is in down-position, as is shown in Figure 4, that is, when the tone-arm is in playing position over the record, and the finger 40 on arm 21 has left abutment 41 on plate 32, but latch member 44 is in operative engagement with finger 43 on plate 36. Under this condition, both switches are closed so that current flows through the phonograph motor. This condition takes place when the user manually brings the tone-arm from the rest post 20 to a position over the record.

The condition represented in Figure 8 exists when both plates 32 and 36 are in down-position, as is shown in Figure 5, that is, when the tone-arm has reached the position where the pickup needle engages the eccentric final groove of the record, and the pawl 50 has displaced latch member 44 to release plate 34. Under this condition, switch 36 is closed but switch 38 is opened, so that no current flows through the motor. This condition occurs automatically, in response to reversed movement of the tone-arm as a result of engagement of the pickup needle with the final eccentric groove of the record.

It will be understood that the condition shown in Figure 6, is restored from either the condition shown in Figure 7 or the condition shown in Figure 8, when the user manually moves the tone-arm back to rest position. In restoring the condition shown in Figure 6 from the condition shown in Figure 7, that is, in moving the tone-arm to the rest position from a record playing position, the switch 38 remains undisturbed be-

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cause plate 32, only, is moved from down-position to up-position as a result of the engagement of finger 40 with abutment 41. However, in restoring the condition shown in Figure 6 from the condition shown in Figure 8, that is, in moving the tone-arm to rest position from a position in which tripping of plate 36 has occurred, the two switches 34 and 38 are simultaneously displaced because, as plate 32 is moved from down-position to up-position by engagement of finger 40 with abutment 41, plate 36 is likewise moved from down-position to up-position by engagement of plate 32 with projection 43 on plate 36. In this connection, it is important to note that the switches are so related that, although the two switches move simultaneously during restoration of the condition shown in Figure 6, from the condition shown in Figure 8, switch 34 opens before switch 38 closes. In this manner, undesirable momentary flow of current through the motor is positively prevented.

It is also important to note that the relative disposition of the serrated edge portion 49 on trip latch 44 and of the trip pawl 53 on arm 21, is such that engagement of said pawl with said edge portion occurs only when the tone-arm reaches a position closely adjacent the final eccentric groove of the record. This arrangement makes it possible, during playing of a record, to move the tone-arm back for the purpose of repeating a recorded passage without causing tripping of the switch means.

In accordance with the invention, and as will clearly appear from Figure 1, the arm 21 which, as hereinbefore explained, controls the operation of the switches, also serves to control the position of the driving wheel or idler 15 with respect to the motor shaft 17 and with the turntable flange surface 16. For that purpose, a flexible connection, such as a cord 53, has one of its ends attached, as at 54, to the arm 21 and has the other of its ends attached, as at 55, to the usual pivotally mounted plate 56 which is biased, in the customary manner, by means of a spring 67 to urge the wheel 15 into snug engagement with motor shaft and with the turntable flange.

From the preceding description, it will be understood that, when the tone-arm is placed on rest post 20, the arm 21 functions, not only to reset switch 38 and to actuate switch 34 for the purpose of stopping the motor but, further, exerts a pull on cord 53 against the action of spring 67, thereby moving the driving wheel 15 away from the motor shaft 17 and surface 16 of the turntable flange. Accordingly, as long as the tone-arm is in inoperative position on rest post 20, no flat surfaces will develop on the periphery of the rubber rim of wheel 15, as is likely to occur when, during long periods of idleness, said rubber rim is allowed to remain in pressing engagement with the turntable flange and, particularly with the motor shaft. In order to prevent the tension of spring 67 from pulling the tone-arm away from its rest post, the post is conveniently provided with an upstanding lip 68 against which a side portion of the tone-arm abuts, as is shown in Figure 1, when the tone-arm rests on said post. Movement of the tone-arm from rest post 20 to a playing position over the record, not only effects release of switch 34 to initiate operation of the motor but, also, relieves the pull on cord 53 so that the driving wheel 15 engages the motor shaft and the turntable flange, under the influence of spring 67. The arrangement as above described has the advantage that movement of the tone-

arm to and from operative position, is all that is needed to turn the motor on and off and to place the driving wheel 15 in and out of engagement with the motor shaft and turntable.

We claim:

1. A phonograph control mechanism comprising, in combination with a turntable and a tone-arm movable into and out of record-engaging position, an electric motor coupled with the turntable to rotate the same, a pair of switches connected in series with said motor, control means cooperating with the tone-arm to effect opening of one switch and closing of the other switch in response to movement of the tone-arm from record-engaging position, to effect closing of said one switch in response to movement of the tone-arm to record-engaging position, and to effect opening of said other switch in response to movement of the tone-arm upon reaching the end of the playing of a record, and means connected with the tone-arm and effective to provide for uncoupling of the motor from the turntable in response to movement of the tone-arm from record-engaging position, and for coupling of the motor to the turntable in response to movement of the tone-arm to record-engaging position.

2. A phonograph control mechanism comprising, in combination with a turntable and a tone-arm movable into and out of record-engaging position, an electric motor having a driving shaft, an idler movable in positions to couple and to uncouple said shaft and turntable, a pair of switches connected in series with said motor, control means cooperating with the tone-arm to effect opening of one switch and closing of the other switch in response to movement of the tone-arm from record-engaging position, to effect closing of said one switch in response to movement of the tone-arm to record-engaging position, and to effect opening of said other switch in response to movement of the tone-arm upon reaching the end of the playing of a record, and means connected with said idler and tone-arm to move the idler in position to uncouple said shaft and turntable in response to movement of the tone-arm out of record-engaging position and to move the idler in position to couple said shaft and turntable in response to movement of the tone-arm to record-engaging position.

3. In a phonograph, a turntable adapted to support a record for the playing thereof, a tone-arm pivotally mounted adjacent the turntable to move to and from record-engaging position, an electric motor having a driving shaft, switch means operable to energize and to deenergize the motor, an idler mounted for movement between said driving shaft and said turntable, tension means associated with and normally acting on the idler to urge it into a position establishing a driving connection between said shaft and said turntable, means interconnecting the idler and tone-arm to move and to hold said idler, against the action of the tension means, in a position disrupting said driving connection in response to movement of the tone-arm out of record-engaging position and to release said idler for movement to its first mentioned position in response to movement of the tone-arm into record-engaging position and to release said idler for movement therewith for operating said switch means to energize the motor in response to movement of the tone-arm to record-engaging position and to operate the switch means to deenergize the motor in response to movement of said tone-arm out of record-engaging position.

4. In a phonograph, a turntable adapted to support a record for the playing thereof, an electric motor, means coupling said motor to the turntable, a tone-arm pivotally supported adjacent said turntable to move to and from operative and rest positions, a pair of circuit controlling switches connected in series with said motor, a first pivotally mounted member carrying one switch and movable to and from positions to effect opening and closing of said one switch and normally tending to move to switch opening position, a second pivotally mounted member carrying the other switch and movable to and from positions to effect opening and closing of said other switch and normally tending to move to switch closing position, a pivotal latch element engaging said first member to hold it in switch closing position, means connected and movable with the tone-arm and engaging said second member to move and to hold it in switch opening position in response to movement of the tone-arm from operative to rest position and disengaging said second member to free it for movement to switch closing position in response to movement of the tone-arm from rest to operative position, other means connected and movable with the tone-arm and engaging said latch element to release the first member for movement to switch opening position in response to movement of the tone-arm upon reaching a predetermined position at the end of playing of a record, and means provided on the second member and disposed to be engaged by the first member to effect reengagement of said second member with the latch element in response to movement of the first plate to switch opening position.

5. The arrangement set forth in claim 4, in which the means coupling the motor to the turntable includes an idler normally urged into engagement with said driving shaft and turntable to establish a driving connection therebetween, and a connection between the tone-arm and idler to disrupt said driving connection in response to movement of the tone-arm to rest position, and to reestablish said driving connection in response to movement of the tone-arm to operative position.

6. A circuit controlling switch mechanism for the turntable driving motor of a phonograph comprising, in combination with a tone-arm movable into and out of record-engaging position, a pair of members each mounted for movement in two positions, a mercury switch fixedly arranged on one member so as to open in response to movement of said one member to one of its positions and to close in response to movement of said one member to the other of its positions, a second mercury switch fixedly arranged on the other member so as to open in response to movement of said other member to one of its positions and to close in response to movement of said other member to the other of its positions, and control means cooperating with the tone-arm to effect movement of one member to switch opening position and for movement of the other member to switch closing position in response to movement of the tone-arm out of record-engaging position, to effect movement of said one member to switch closing position in response to movement of the tone-arm to record-engaging position, and to effect movement of said other member to switch closing position in response to movement of the tone-arm upon reaching the end of the playing of a record.

7. A circuit controlling switch mechanism for

the turntable driving motor of a phonograph comprising, in combination with a tone-arm movable into and out of record-engaging position, a first switch structure movable to circuit opening and closing positions and normally tending to move to circuit opening position, latch means engaging said switch structure to maintain it in circuit closing position, means connected with the tone-arm and movable therewith in its movement upon reaching the end of playing of a record to trip said latch means so as to free said switch structure for movement to circuit opening position, a second switch structure movable to circuit opening and closing positions and normally tending to move to circuit closing position, other means connected with the tone-arm and engaging said second switch structure to move and to hold it in circuit opening position when the tone-arm is moved out of record-engaging position, said other means disengaging said second switch structure to free it for movement to circuit closing position when the tone-

arm is moved to record-engaging position, and interengageable means between said switch structures to move the first switch structure from circuit opening position to circuit closing position by movement of the second switch structure from circuit closing position to circuit opening position.

LOUIS C. AMMLUNG, JR.  
JOHN A. TOURTELLOT.

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