June 23, 1942. R. S. CRANMER 2,287,726

AUTOMATIC PHONOGRAPH

Filed Aug. 21, 1941

Fig. 1.

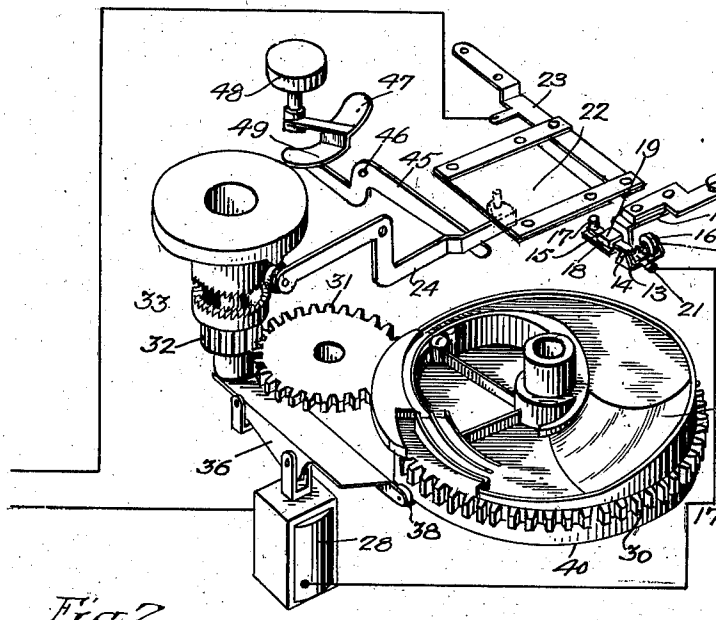



Fig. 3

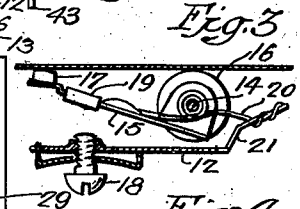



Fig. 4

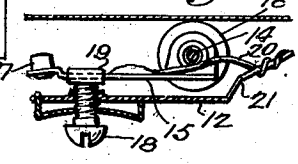
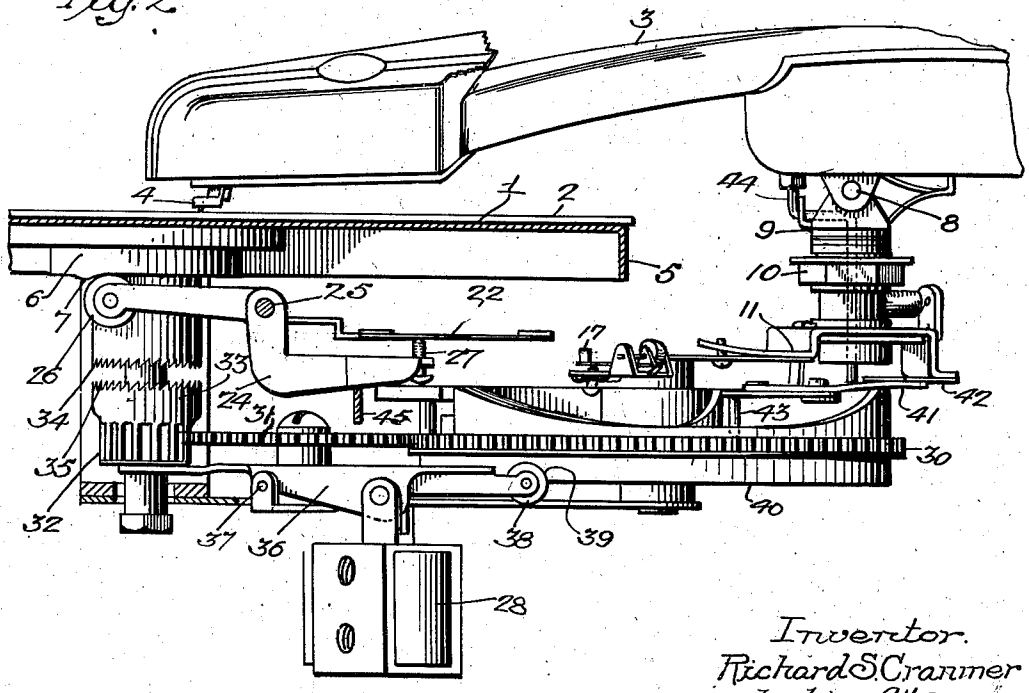



Fig. 2.




Inventor.
Richard S. Cranmer
By his Attorneys.
Howson & Howson

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2,287,726

# UNITED STATES PATENT OFFICE

2,287,726

## AUTOMATIC PHONOGRAPH

Richard S. Cranmer, Philadelphia, Pa., assignor to Philco Radio and Television Corporation, Philadelphia, Pa., a corporation of Delaware

Application August 21, 1941, Serial No. 407,787

8 Claims. (Cl. 274—15)

This invention relates to automatic phonographs of the type wherein the record-changing cycle is initiated by a trip mechanism responsive to the rate of movement of the tone arm pickup over the record being reproduced.

More particularly, the invention relates to that type of trip which is adapted to function at the end of a recording, as the pickup stylus moves out of the reproducing grooves into a spiral of greater pitch, or an eccentric groove; or in the event that the tone-arm moves too rapidly at any time during the playing of a recording. By way of example, the trip itself may be of the type which is triggered by the more rapid than normal movement of the pickup and which, in turn, serves to trigger a suitable mechanism adapted to lift the pickup and swing it off the record, in order that a succeeding recording may be placed upon the turntable.

Many of the trip mechanisms of this general character, which have been employed heretofore, have been of a more or less complicated nature, embodying a large number of moving parts. The use of many parts not only raises the manufacturing cost of the trip mechanism, but has an additional disadvantage in that the trip mechanism, normally in operation, requires considerable energy for its actuation. This energy must come from the movement of the tone-arm, which movement is, in turn, brought about by the cooperation between the stylus and the record groove. Thus, it can be seen, especially with the very light stylus pressures now in use, that there may be a tendency toward bad tracking, that is, the needle point will often ride up one side of the groove and thereby distort the recorded signal.

The principal object of the present invention is to overcome the aforesaid difficulties by the provision of a trip mechanism which is simple to manufacture, embodies relatively few moving parts, and which requires very little energy to operate its trip restraining means.

A further object of the invention is to provide a novel trip mechanism of the type wherein electrical contacts are closed to energize a solenoid or the like which initiates actuation of suitable tone arm moving means.

A more specific object of the invention is to provide a trip mechanism of this character wherein a contact element is moved by the tone arm in a predetermined path during the playing of a record, a second contact element is disposed in closely spaced transverse relation to said path, and novel means are provided for actuating the said contact elements in a manner to effect engagement thereof only when the tone arm moves at a greater than normal rate.

The invention may be fully understood by reference to the accompanying drawing illustrating one form of the invention.

In the drawing:

Figure 1 is a perspective view illustrating the trip mechanism in association with certain elements of a tone arm moving device;

Fig. 2 is a sectional view of a phonograph embodying the invention, showing the trip mechanism in elevation, and

Figs. 3 and 4 are detail sectional views illustrating a part of the trip mechanism.

Referring to the drawing, there is illustrated in Fig. 2 an automatic phonograph comprising the usual turntable 1, on which there is disposed a record 2, and the usual tone arm 3 carrying a stylus 4 which is adapted to engage the uppermost record on the turntable during the playing thereof. In the specific device illustrated, the turntable is provided with a peripheral flange 5, thus adapting it to be driven by a motordriven roller (not shown) engaging the said flange. It will be understood, therefore, that the turntable is rotated at a substantially constant speed during the operation of the phonograph. The turntable 1 is provided with a central hub 6 having a depending cam projection 7, the purpose of which will be explained presently.

The tone arm 3 is mounted for pivotal movement both vertically and horizontally to permit the necessary movement thereof during the playing of successive records. To this end, the tone arm is mounted on a horizontal pivot 8 carried by a support 9, which in turn is rotatably mounted in a hollow bearing structure 10. In accordance with the present invention, the rotatable tone arm support member carries an extending arm 11 which is moved through a predetermined sector about the vertical pivot axis of the tone arm during the record-playing movement of the latter. At its free end, arm 11 carries a supporting bracket 12 which is insulated from arm 11 and has upturned ears 13 supporting a pivot pin 14. On the pivot pin there is mounted a contact arm 15 and a frictional roller 16 joined thereto. Thus the elements 15 and 16 constitute a single member rotatably carried by the pivot pin 14. At its free end, arm 15 carries a contact element 17. The arm is urged gravitationally against an adjustable screw stop 18 carried by bracket 12. Preferably a small piece

of rubber 19 is provided on arm 15 to weight the same and also to act as a cushion cooperating with the stop 18. A small wire 20 is wound about the pivot pin 14 and has one end soldered to the contact arm 15, while its other end is fastened to a terminal lug 21. This wire serves as an electrical connection to the contact element 17, and it also serves to a small degree as a spring urging arm 15 against the stop 18.

During the movement of the tone arm while playing a record, the contact element 17 moves in a predetermined arcuate path. A contact plate 22 is carried by a resilient arm 23 which is mounted upon a stationary part of the phonograph. For example, the arm 23 may be mounted on the under side of the usual base plate. Plate 22 is disposed in closely spaced transverse relation to the path of movement of contact element 17. Moreover, the parts are so designed that as arm 11 moves in the manner above described, the friction roller 16 engages the under side of plate 22, as shown in Fig. 4. Contact element 17 is normally out of engagement with the contact plate, but the rolling engagement of roller 16 with plate 22 tends to move arm 15 about the pivot pin 14, thereby moving contact element 17 toward plate 22. At regular intervals, however, plate 22 is pulsed away from contact element 17 by means of lever 24 which is operated by the cam projection 7 previously mentioned. Lever 24 is pivoted at 25 and carries a roller 26 at one end which rides over the under surface of hub 6 on which the cam projection 7 is provided. At its opposite end, lever 24 carries an adjustable screw or stud 27 which engages the under side of plate 22. Each time the cam projection 7 engages roller 26, lever 24 is pivoted counterclockwise, as viewed in Fig. 2, thus raising plate 22 out of engagement with roller 16, and thus permitting arm 15 to drop against its stop 18. The parts are so constructed that during the movement of the tone arm at its normal speed, while playing a record, the contact element 17 is not moved with sufficient rapidity by roller 16 to enable engagement of the said element with plate 22 during the fixed interval between pulsings of the plate. However, when the tone arm moves at a greater than normal speed, as it will when the stylus engages the spiral groove of greater pitch at the end of the record, contact element 17 is moved upward with sufficient rapidity to cause engagement thereof with plate 22 within the interval between pulsings of the said plate, as shown in Fig. 3. Engagement of the contact element 17 with plate 22 completes an energizing circuit for solenoid 28. To this end, the elements 17 and 22 are connected serially in a simple energizing circuit for the solenoid, as illustrated.

The tone arm moving device whose operation is initiated by the above described trip mechanism may take any suitable form. In the specific illustration of the drawing, there is illustrated one form of tone arm moving device which is fully described and claimed in a copending application of Richard S. Cranmer and Charles Pittman, Serial Number 407,788 filed August 21, 1941. This device comprises a rotatable cam plate 29 having gear teeth 30 formed thereon and meshing with an idler gear 31, which in turn meshes with the gear section 32 of a slidable clutch member 33 cooperatively associated with the hub 6. The elements 6 and 33 are provided with complementary clutch teeth 34 and 35 which are normally out of engagement, as illustrated. The solenoid 28 has its armature connected to a lever 36, which is provided at 37. Energization of the solenoid rocks the lever 36 clockwise about its pivot, thereby bringing the clutch teeth 34—35 into engagement to drive the normal stationary cam plate 29. At one end, the lever 36 carries a roller 38 which is normally seated in a recess 39 in a depending flange 40 of the cam plate 29. The engagement of the roller and recess maintains the plate 29 in a normal predetermined position. The other end of lever 36 engages clutch member 33, the weight of which normally holds the lever in the position shown. Upon momentary energization of solenoid 28, the roller 38 is drawn out of the recess 29 and the clutch teeth are engaged as above described. Thereafter, roller 38 engages the lower surface of flange 40 and maintains the clutch teeth in engagement until the cam plate 29 has completed one revolution, at which time roller 38 again enters the recess 39 and the clutch teeth are disengaged.

The upper surface of cam plate 29 is constructed so as to effect the necessary movement of tone arm 3 off of one record and onto the next record. A plate 41 is secured to arm 11 by means of a resilient strip 42 so that the plate 41 may move relative to the arm 11. A cam follower in the form of a pin 43 is carried by plate 41 and engages the cam surfaces of plate 29. A bent rod 44 extends through the hollow tone arm-supporting structure, and the upper end of said rod engages a part of the tone arm, while the lower end thereof seats on plate 41. Therefore, when plate 41 is moved vertically by the action of cam plate 29 on the cam follower 43, the tone arm is moved vertically. Horizontal movement of the tone arm is effected when the cam follower 43 engages the cam grooves on cam plate 29. The cam plate is so designed that during a single revolution thereof the tone arm is lifted off a record, then moved outward to permit changing of records, then moved inward to a position over the marginal portion of the new record, and finally lowered onto the new record.

It will be understood, of course, that any other suitable form of tone arm-moving device may be employed in operative association with the trip mechanism provided by the invention. An example of a solenoid-operated tone arm-moving device which could be employed in conjunction with the present trip mechanism is that illustrated in my copending application Serial No. 393,636, filed May 15, 1941. It will be understood, also, that some suitable form of record-changing apparatus will usually be employed in combination with the trip mechanism and tone arm-moving device. In the above-mentioned Cranmer and Pittman application, there is illustrated a suitable form of record-changing apparatus which is actuated by the cam plate 29 shown in the present drawing. However, the present invention is not concerned with the record-changing apparatus.

In accordance with the present invention, there is further provided a manually-operable means for rendering the trip mechanism inoperative whenever it is desired to operate the phonograph manually. As illustrated in Fig. 1, such means comprises a lever 45 pivoted at 46 and having one end underlying lever 24, while its opposite end is engaged by a cam element 47 which is rotatable by means of a knob 48. The cam element 47 comprises a projection 49 which rotates

lever 45 in a direction to rock lever 24 counterclockwise and thus move plate 22 out of the path of roller 16. Thus, when knob 48 is in the position shown, the plate 22 is maintained in such position that the trip mechanism is inoperative.

While a specific form of the invention has been illustrated for the purpose of disclosure, it will be understood that the invention is not limited thereto, but is capable of other embodiments within the scope of the appended claims.

I claim:

1. In an automatic phonograph having a tone arm and means for moving the tone arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means comprising a member movable with said tone arm, an electrical contact element carried by said member and movable thereby in a predetermined path, a second contact element comprising a plane surface positioned in closely spaced parallel relation to said path, means operatively associated with said first contact element for moving the same toward said second contact element as the former traverses said path, means for rendering said last means momentarily inoperative at timed intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone arm exceeds its normal rate, and means operable by the engagement of said contact elements for actuating the tone arm moving means.

2. In an automatic phonograph having a tone arm and means for moving the tone arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means comprising a member movable with said tone arm, an electrical contact element carried by said member and movable thereby in a predetermined path, a second contact element comprising a plane surface positioned in closely spaced parallel relation to said path, said first contact element being biased to a position normally out of engagement with said second contact element, means operatively associated with said first contact element and engageable with said second contact element to move said first contact element toward said second contact element, means for periodically moving said second contact element out of engagement with said last-named means at time-spaced intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone arm exceeds its normal rate, and means operable by the engagement of said first contact element with said second contact element for actuating the tone arm moving means.

3. In an automatic phonograph having a tone arm and means for moving the tone arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means comprising a member movable with said tone arm, an electrical contact arm having one end pivotally mounted on said member and carrying a contact element at its free end, a second contact element comprising a plane surface disposed in closely spaced parallel relation to the path of movement of said first contact element, said first contact element being normally out of engagement with said second element, a friction roller mounted on the pivot of said contact arm and engageable with said second contact element to move said first contact element toward said second contact element, means for periodically moving said second contact element out of engagement with said roller at time-spaced intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone arm exceeds its normal rate, and means operable by the engagement of said first contact element with said second contact element for actuating the tone arm moving means.

4. In an automatic phonograph having a tone arm mounted on a vertical pivot and means for moving the tone arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means comprising an arm extending radially from the tone arm pivot and movable with the tone arm, whereby the free end of said radial arm moves in an arcuate path, a contact plate disposed in closely spaced parallel relation to said path, a friction roller mounted on the free end of said arm for rolling engagement with said contact plate, a contact arm attached to said roller and carrying a contact element, said contact arm being rotatable by the rolling engagement of said roller with said contact plate to move the contact element toward the contact plate, means for periodically moving said conact plate out of engagement with said roller at time-spaced intervals such that said contact element is prevented from engaging said contact plate until the movement of the tone arm exceeds its normal rate, and means operable by the engagement of said contact element with said contact plate for actuating the tone arm moving means.

5. In an automatic phonograph having a tone arm and means for moving the tone arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means, comprising a member movable with said tone arm, an electrical contact element carried by said member and movable thereby in a predetermined path, a second contact element comprising a plane surface positioned in closely spaced parallel relation to said path, said first contact element being normally out of engagement with said second contact element, means operatively associated with said first contact element and engageable with said second contact element to move said first contact element toward said second contact element, means for periodically moving said second contact element out of engagement with said last-named means at time-spaced intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone arm exceeds its normal rate, means operable by the engagement of said first contact element with said second contact element for actuating the tone arm moving means, and manual means operable at will to maintain said second contact element continuously out of engagement with the associated engaging means, thereby to render said trip mechanism inoperative.

6. In an automatic phonograph having a tone arm and means for moving the tone arm from a record-finishing position to a record commencing position, a trip mechanism for controlling said means comprising a member movable with said tone arm, an electrical contact element carried by said member and movable thereby in a predetermined path, a second contact element comprising a plane surface positioned in closely spaced parallel relation to said path, said first contact element being normally

out of engagement with said second contact element, means operatively associated with said first contact element and engageable with said second contact element to move said first contact element toward said second contact element, a lever engaging said second contact element and adapted to move the same out of engagement with said last-named means, means for periodically actuating said lever at time-spaced intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone arm exceeds its normal rate, means operable by the engagement of said first contact element with said second contact element for actuating the tone arm moving means, a second lever engageable with said first-named lever to move the same in a direction to maintain said second contact element continuously out of engagement with the associated engaging means, and manual means for operating said second lever at will, thereby to render said trip mechanism inoperative.

7. In an automatic phonograph having a tone-arm adapted to move across a recording and means for lifting the tone-arm from the recording, a trip mechanism for controlling said lifting means, comprising a switch having relatively movable contact members, means for moving one of said members toward another of said members during the movement of the tone-arm across the recording, means for moving the second member intermittently away from the first member at timed intervals such that the first member is prevented from engaging the second member until the movement of the tone-arm exceeds its normal rate, and means operable by the engagement of said members for initiating operation of said lifting means.

8. In an automatic phonograph having a tone-arm and means for moving the tone-arm from a record-finishing position to a record-commencing position, a trip mechanism for controlling said means comprising an electrical contact element movable by said tone-arm in a predetermined path during the reproduction of a record, a second contact element positioned in spaced relation to said path, means operatively associated with said first contact element for moving the same toward said second contact element as the former traverses said path, means for rendering said last means momentarily inoperative at timed intervals such that said first contact element is prevented from engaging said second contact element until the movement of the tone-arm exceeds its normal rate, and means operable by the engagement of said contact elements for actuating the tone-arm moving means.

RICHARD S. CRANMER.