

May 3, 1938.

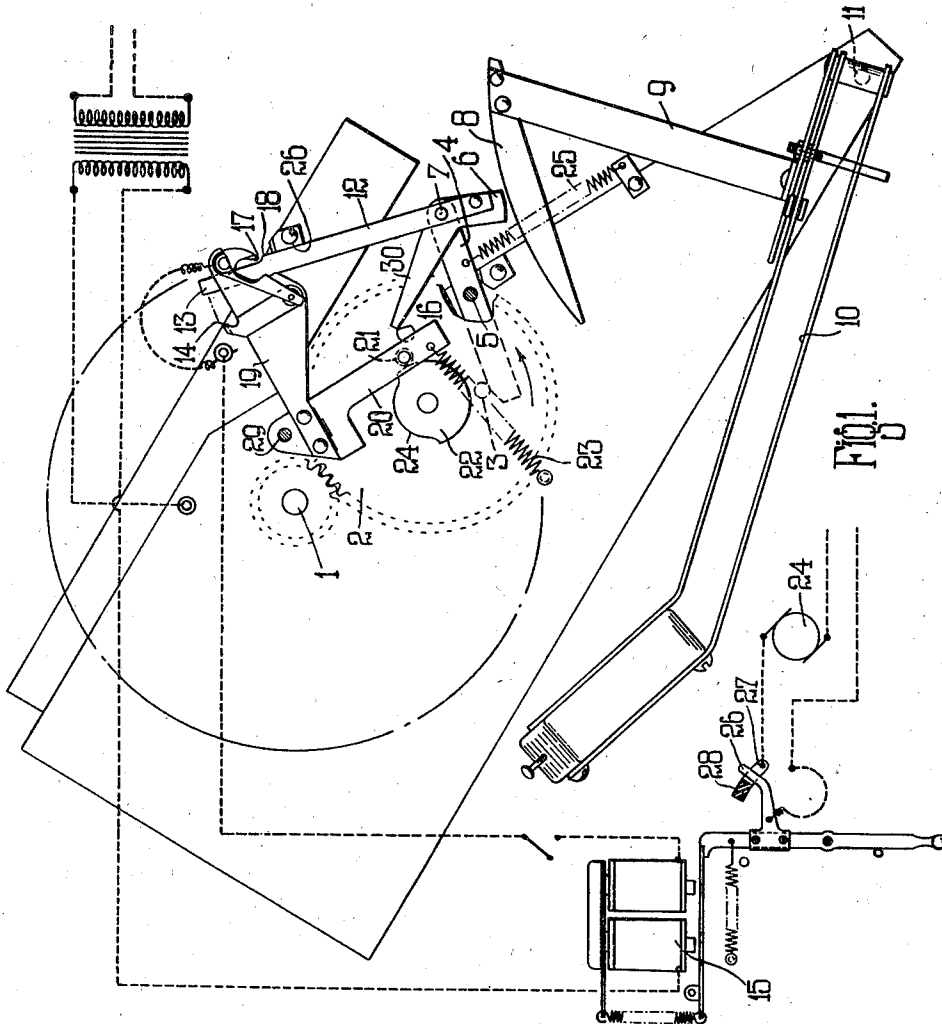
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2,116,056

GRAMOPHONE AND THE LIKE SOUND REPRODUCTION DEVICE

Filed Sept. 23, 1936

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

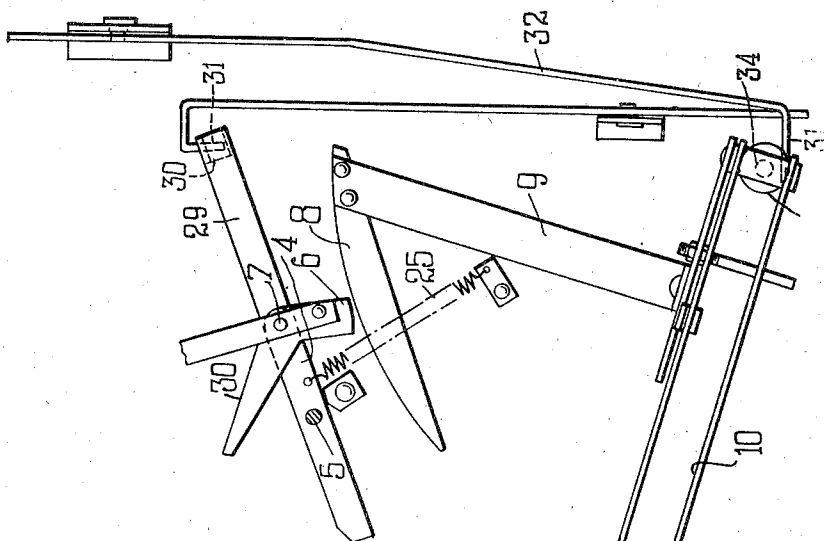


FIG. 4.

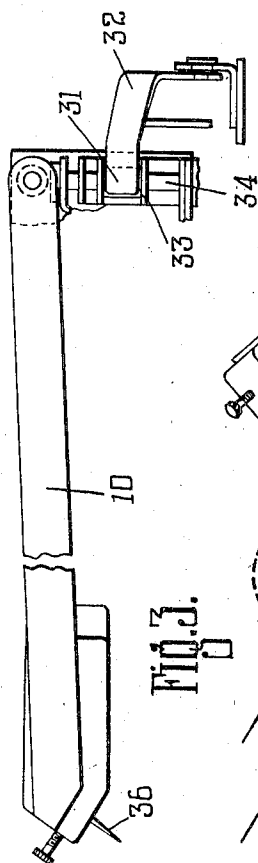


FIG. 3.

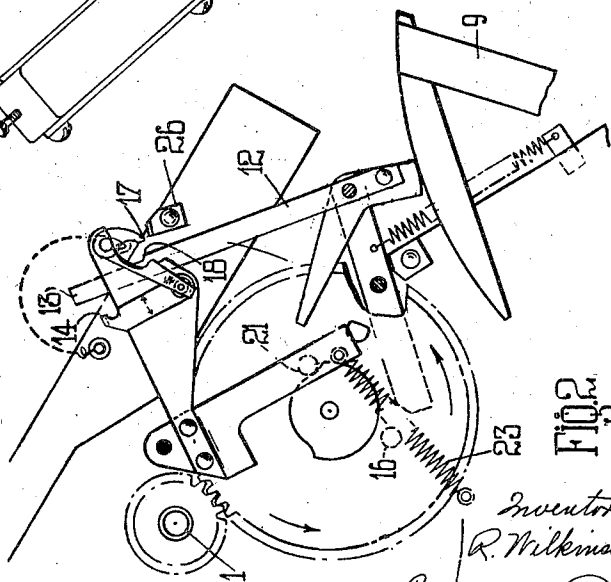


FIG. 2.

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UNITED STATES PATENT OFFICE

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GRAMOPHONE AND THE LIKE SOUND RE-
PRODUCTION DEVICE

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Application September 23, 1936, Serial No. 102,238
In Great Britain September 26, 1935

19 Claims. (Cl. 192—123)

The present invention relates to improvements in gramophone and the like sound reproduction devices using sound records of disc form.

According to the present invention a control is provided, whereby variation in the rate of progression of the end of the tone arm relatively to the centre of the disc record, from a predetermined normal rate is adapted to arrest further travel of the needle on the tone arm over the record disc.

The control may be operated therefore, either by an excessive movement of the tone arm; that is to say, a rate of movement about its vertical pivot greater than that of its normal rate of progression between consecutive convolutions of the record, such as will occur in the case of the playing of records having a spiral or eccentric run-off groove at their centre, or alternatively, the control may be effective to stop further relative movement between record and needle whenever normal progression of the tone arm radially of the record disc has ceased for a predetermined number of revolutions of the disc.

The control may be effective to stop the turntable motor, lift the needle from the record disc, displace the tone arm back clear of the edge of the record disc, and effect a replaying, changing or reversal of the record as desired.

In the device of this invention, the position of a movable contact of an electric switch is controlled by the displacement of the tone arm by the record, whilst an element displaced periodically by the revolution of the turntable, controls the completion of an electric circuit through said contact, whenever the displacement of said movable contact, varies from a predetermined rate.

The invention is more particularly described with reference to the accompanying drawings in which:—

Figure 1 is a plain view.

Figure 2 is a partial corresponding view with the parts in a different position of adjustment.

Figure 3 is a part side elevation.

Figure 4 is a detail.

In one form of construction, the shaft 1 of a turntable motor is in geared connection with a control disc 2, this geared connection being three to one or any other desired ratio to give a slow motion of rotation of the control disc. The control disc 2 has a cam stop 3 on its lower side which displaces a pivoted arm 4 about its pivot 5 every predetermined number of revolutions of the turntable. This pivoted arm 4 carries in turn loosely pivoted upon it an arcuate frictional shoe 6 adapted to be turned about its pivot 7 on the arm 4 by a

corresponding arcuate friction member 8 rigidly mounted on a bracket 9 on the tone-arm 10, so that as the tone-arm 10 turns about its pivot 11 it will turn by friction the shoe 6 pivoted on the arm 4. This shoe 6 carries by means of an arm 12, one contact 13 of a switch including a contact 14.

It will consequently be seen that as the tone-arm 10 turns about its pivot 11 and is progressed radially across a gramophone record the frictional drive between the element 8 on the tone-arm and the shoe 6 will turn this latter about its pivot 7 on the said arm 4 to bring the contact 13 upon it gradually towards the contact 14, thus tending to complete the circuit of the relay or the like device 15 controlling either the turntable motor 44 or any other control mechanism of the gramophone.

The completion of these two contacts is however, periodically prevented by the action of the stop 3 on the disc 2 engaging the arm 4 to move the shoe 6 out of range of the frictional element 8 on the tone-arm 10, the second stop 16 then immediately in sequence turning the shoe 6 back to its original angular position on its pivot 7 on the said arm 4 in which the arm 12 abuts against stop 26, prior to frictional re-engagement of the shoe 6 and frictional drive element 8 on the tone-arm 10, whereupon shoe 6 and element 8 re-engage and a gradual movement of the contact 13 towards contact 14 recommences.

The control will however, be effective in the event that the tone-arm moves so rapidly about its pivot 11 as to displace the movable contact 13 on to engagement with the contact 14 (by reason of the frictional drive through the arcuate members 6, 8) before the cam or control disc 2 can have turned sufficiently to bring its first stop 3 into engagement with the arm 4, to turn this about its pivot and bring one frictional member 6 out of engagement with the frictional member 8 on the tone-arm 10 (and so cause re-setting of the contacts); that is to say, bringing the movable contact 13 again to its extreme position away from the contact 14, as shown in Figure 1, whereupon it is gradually moved again forward towards the contact 14 by further progressive motion of the tone-arm. By this means it is ensured that the control relay or the like 15 operated by the closing of the said contacts 13, 14, is not operated except at such times as the tone-arm 10 receives a large angular movement as compared to a predetermined restricted number of revolutions of the turntable. This will occur whenever the stylus runs into the usual run-

off groove of high eccentricity in a record, where so provided. Certain types of disc records are not however, provided with run-off grooves, the stylus running in a substantially concentric groove at the end of the playing part of a record.

In order to obtain an automatic stopping of the gramophone turntable under these conditions, a second insulated contact 17 is provided, adapted to cooperate with contact arm 12 at the point 18, and the contacts 14, 17, are mounted on the arm 19 of a bell crank lever, the other arm 20 of which has a roller 21 cooperating with a cam 22 on the wheel 2. A spring 23 holds the roller 21 in contact with cam 22.

The arm 4 is drawn by spring 25 to bring the shoe 6 into the necessary frictional engagement with element 8, when said arm 4 is of course free of the stop 3.

It will consequently be seen that should further radial progress of the tone arm radially of the record be arrested, for instance, by the stylus coming to the end of a playing groove in the record which is concentric or substantially concentric with the turntable centre 1, then rotation of the cam 22 will eventually (at the most, within three revolutions of the turntable in the arrangement shown) bring the roller 21 on to the part 24 of the cam 21 allowing contacts 17, 18 to be completed and the gramophone turntable motor 24 to be stopped thereby. At other times the cam 22 will rock arm 20 to bring contact 17 away from contact 18 just prior to the raising of shoe 6 from element 8 and the resetting of arm 12 with contact 13 against stop 26 which takes place near or at the end of a complete cycle of operation of the disc 2. It will be obvious if the finger 12 is not progressed away from stop 26 during the time roller 21 is pulled by spring 23 into cut away part 24 of the cam, circuit is completed at contacts 17, 18.

Should the groove of the record be somewhat eccentric, the resetting of one shoe 6 on element 8 might tend to move the arm 12 clockwise about its pivot, but no damage will result, as the shoe 6 will then skid or slip slightly on the surface of element 8.

Whenever it is desired to restart the gramophone turntable motor 44, this may be effected by turning hand lever 45 into position shown in Figure 1, bringing contact 46 on to contact 27 in the motor circuit in which position this lever 45 is locked by the armature 50 of relay 15. Operation of the relay 15 by completion of contacts 13, 14, or 17, 18 allows this hand lever 45 to turn by action of spring 47 counter-clockwise to bring contact 46 on to the insulated piece 28.

To enable the tone-arm to progress freely to engage with the record without frictional disengagement between parts 6 and 8, it will be desirable to provide an extension 29 on the arm 4 having a cam surface 30 on it engaged by a bevelled surface on a projection 31 on a lever 32 pivoted at 47 and extending under one end of a lever 48 which engages a collar 33 on a spindle 34 having a flange 49 supporting the tone-arm 10 revoluble about its horizontal supporting axis 35, so that as the lever 32 is turned about its pivot it will keep arm 4 displaced with shoe 6 out of engagement with element 8 against the action of the spring 25 until the stylus 36 on the tone-arm 10 actually contacts with the record, or approximately so.

A master switch isolating contacts 13-14 and 17-18 can be provided on the tone-arm 10 to prevent automatic operation of the control 6-8

until the tone-arm has moved a predetermined radial distance, that is to say, until the stylus 36 has passed over the ungrooved rim of the record and has been progressed by the record over a controllable number of the beginning convolutions of the sound groove.

It is obvious that instead of providing a wheel 2 in geared connection with a gramophone turntable spindle 1 itself, a disc similar to the wheel 2 can be driven by any independent motor, thus ensuring that small fluctuations in its speed due to inertia of parts it is controlling have no effect whatsoever upon the wholly uniform speed of the gramophone turntable.

For this purpose, the tone arm may carry a pin 51 adapted to hold a spring mounted contact 38 out of engagement with a contact 37 until there has been, at a predetermined angular displacement of tone arm 10 relatively to its carrier, when the contact 37 will be allowed to drop on to the contact 38 and complete this series switch 37, 38 in the circuit of the relay 15. This can be effected of course, at any desired spacing from the edge of a record, and, further, may be adjustable.

I declare that what I claim is

1. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means driven from the tone arm to displace said contacts relatively to one another, and means to periodically restore the said contacts to their original relative disposition.

2. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means driven from the tone arm to displace said contacts relatively to one another, and means driven from the turntable to restore the said contacts to their original relative disposition.

3. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means driven from the tone arm to displace one of said contacts towards the other, and means to periodically restore said contact to its initial spacing relatively to the other contact.

4. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a pair of contacts in the motor circuit, means to displace one of said contacts in synchronism with the movement of the tone arm, and means driven from the turntable to periodically restore said contacts to their initial disposition.

5. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a contact in the circuit of said motor, a co-operating contact in said circuit, a pivoted arm carrying said contact, means to displace said arm periodically from the record turntable in one direction, and means to clutch said pivoted arm to the tone arm to displace it at other times in the opposite direction.

6. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a contact in the circuit of said motor, a co-operating contact in said circuit, a pivoted

arcuate shoe carrying said contact, an arcuate element on the tone arm engaging therewith to impart movement to said contact, proportional to the movement of the tone arm, and means operated in synchronism with the turntable to interrupt said engagement and then restore the pivoted shoe to its original position.

7. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a pair of contacts in the circuit of said motor, a pair of pivoted arms carrying said contacts, a shoe on one of said arms, an arcuate element on the tone arm, a spring tending to draw said shoe into contact with said arcuate element, a stop adapted to displace said shoe out of contact with said arcuate element, and means driven in synchronism with the turntable to bring said stop periodically into engagement with the arm carrying the shoe to displace it against the spring.

8. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record comprising an electric driving motor, a contact in the circuit of said motor, a pair of contacts cooperating therewith and connected in parallel, an arm carrying the first contact and disposed between said parallel contacts, a pivoted lever supporting said arm, a shoe on said arm, a pivoted lever carrying said arm, an arcuate element on the tone-arm, a spring on said lever drawing said shoe into contact with said arcuate element, a stop adapted to periodically displace said lever against said spring, means moving in synchronism with the turntable to displace said stop, a second stop moving in synchronism therewith and adapted to turn said arm about its pivot.

9. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record comprising an electric driving motor, a contact in the circuit of said motor, a pair of contacts cooperating therewith and connected in parallel, an arm carrying the first contact and disposed between said parallel contacts, a pivoted lever supporting said arm, a shoe on said arm, a pivoted lever carrying said arm, an arcuate element on the tone-arm, a spring on said lever drawing said shoe into contact with said arcuate element, a stop adapted to periodically displace said lever against said spring, means moving in synchronism with the turntable to displace said stop, a second stop moving in synchronism therewith and adapted to turn said arm about its pivot, a second arm carrying said parallel contacts, a fixed stop, a spring holding said second arm against said stop, a third movable stop, and means moving in synchronism with the turntable to displace said third movable stop to periodically move the arm carrying the paralleled contacts against its spring.

10. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means driven from the tone-arm to displace said contacts relatively to one another, and means to periodically restore the said contacts to their original relative disposition, a second pair of contacts in series with said first contacts and means to complete circuit through said contacts when the tone-arm has moved a predetermined distance over the edge of a record.

11. A device for automatically arresting rota-

tion of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a contact in the circuit of said motor, a cooperating contact in said circuit, a pivoted arm carrying said contact, means to displace said arm periodically from the record turntable in one direction, and means to clutch said pivoted arm to the tone-arm to displace it at other times in the opposite direction, means to gradually lower the tone-arm about a horizontal pivot into playing contact with a record, and means interconnected therewith to hold said pivoted arm out of engagement with the tone arm until this has been lowered by a predetermined amount towards the record.

12. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record comprising an electric driving motor, a contact in the circuit of said motor, a pair of contacts cooperating therewith and connected in parallel, an arm carrying the first contact and disposed between said parallel contacts, a pivoted lever supporting said arm, a shoe on said arm, a pivoted lever carrying said arm, an arcuate element on the tone-arm, a spring on said lever drawing said shoe into contact with said arcuate element, a stop adapted to periodically displace said lever against said spring, means moving in synchronism with the turntable to displace said stop, a second stop moving in synchronism therewith and adapted to turn said arm about its pivot, a second arm carrying said paralleled contacts, a fixed stop, a spring holding said record arm against said stop, a third movable stop, means moving in synchronism with the turntable to displace said third movable stop to periodically move the arm carrying the paralleled contacts against its spring, a second pair of contacts in series with said first contacts, means to complete circuit through said contacts when the tone-arm has moved a predetermined distance over the edge of the record, means to gradually lower the tone-arm about a horizontal pivot into playing contact with a record and means interconnected therewith to hold said pivoted arm out of engagement with the tone-arm until this has been lowered by a predetermined amount towards the record.

13. An automatic device for closing the control circuit for an electric motor whenever the rate of progression of a gramophone tone-arm over a record differs from the normal pre-determined rate including in combination a switch in the control circuit, an arm carrying said switch, a frictional coupling between said arm and said switch, a second contact co-operating with the contact on said arm, means to move said arm away from said second contact during the normal progression of the tone-arm over the record, means to automatically move back said arm at pre-determined intervals of time towards the second contact and means to move said second contact out of range of the contact on said arm at differing intervals of time, whereby the contacts come into effective engagement whenever the second contact comes again into the range of the contact on the arm before said arm has been displaced by the tone-arm.

14. An automatic device for closing the control circuit of an electric motor whenever the rate of progression of a gramophone tone-arm over a record differs from a normal pre-determined rate, including in combination a contact of a switch in the control circuit, a movable arm carrying said contact, a frictional coupling between said

arm and the tone-arm, a second contact in said control circuit co-operating with the contact on said arm, means to displace said arm away from said second contact, means to periodically positively disengage said frictional coupling, and means to displace said contact arm towards such second contact during the period of disengagement of said coupling.

15. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means yieldably driven from the tone-arm to displace said contacts toward each other, and means to periodically restore said contacts to their initial spaced relation, said first means being operable to bridge the contacts of the circuit for automatically stopping the motor through any increase of movement of the tone-arm.

16. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a pair of spaced contacts in the circuit of the motor, an oscillating switch alternately actuated by the tone-arm and the turntable for alternately engaging the spaced contacts upon either an increase or cessation of angular speed of said tone-arm relatively to the speed of rotation of the turntable.

17. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, relatively displaceable contacts in the circuit of said motor, means driven from the tone-arm to displace one of said contacts towards the other to complete the circuit for automatically stopping the motor through an increase over the normal forward movement of the tone-arm, means to periodically restore said contact to its

initial spacing relatively to the other contact during normal forward movement of the tone-arm, and means driven from the turntable to displace another one of said contacts relatively to said first movable contact to complete the circuit for automatically stopping the motor through the cessation of movement of the tone-arm.

18. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, a movable tone-arm, spaced contacts in the circuit of said motor, an oscillating switch between said contacts alternately actuated by the tone-arm and the turntable, said oscillating switch being operable to complete the circuit with one of said contacts to stop the motor upon an increase of angular speed of said tone-arm relatively to the speed of the turntable, and means operative in the rotation of the turntable to complete the circuit through the switch and the other spaced contact for automatically stopping the motor through cessation of movement of the tone-arm.

19. A device for automatically arresting rotation of a gramophone turntable on completion of playing of a record, comprising an electric driving motor, spaced contacts in the circuit of the motor, a pair of oscillating elements carrying said contacts and moving in unison, one of said elements being operable by the tone-arm to bridge the contacts of the circuit to stop the motor through any increase of movement of said tone-arm, said other element being adapted to continue its motion, on stopping of the tone-arm, in response to continued rotation of the turntable, to bridge said contacts of the circuit for automatically stopping the motor.

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