Sept. 7, 1943. W. C. EDDY 2,328,628

CONTROL MECHANISM

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Fig. 1

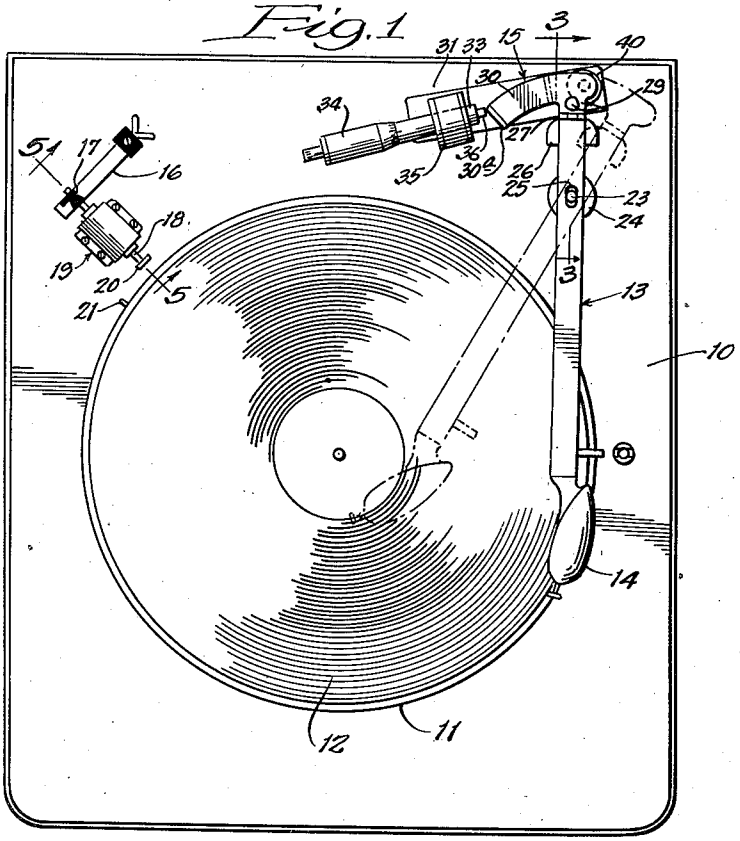


Fig. 2

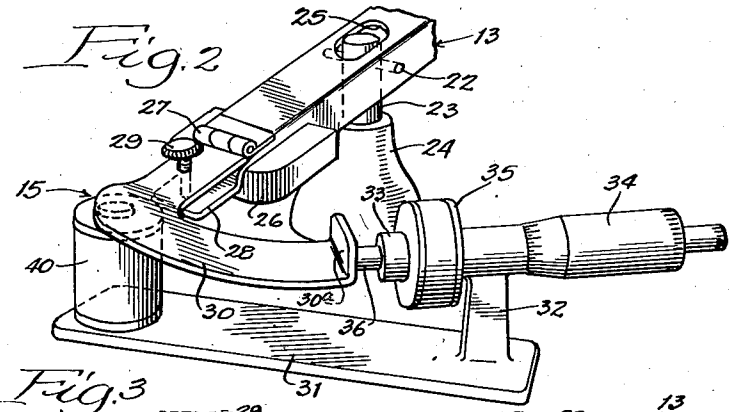
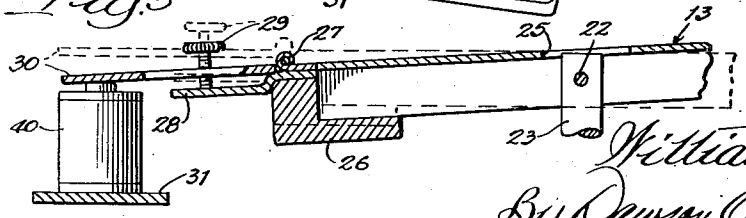


Fig. 3



Inventor:
William C. Eddy,
By Dawson, Orms and Booth
Attorneys.

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Fig. 4

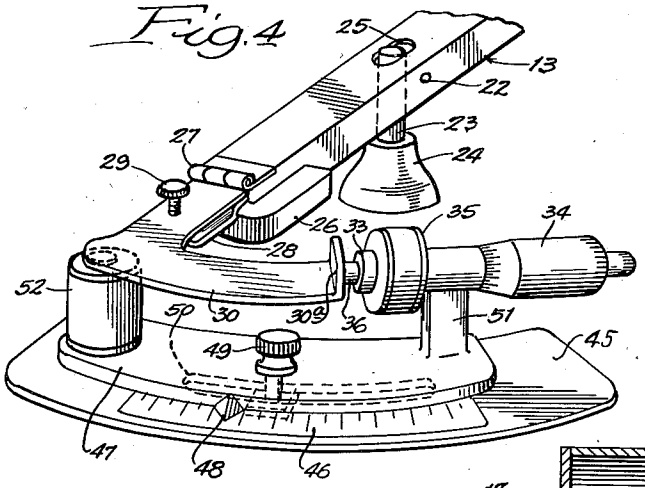


Fig. 5

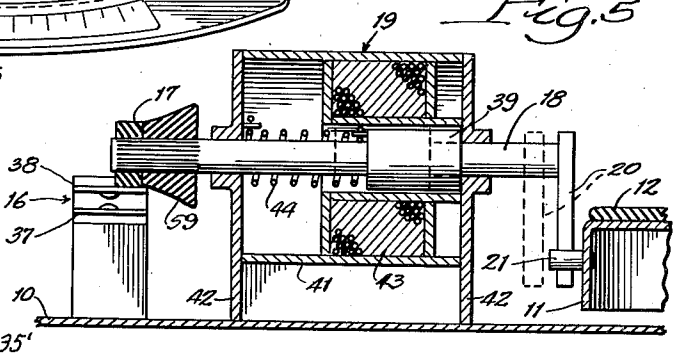


Fig. 7.

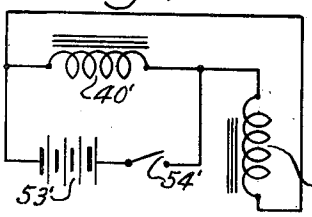
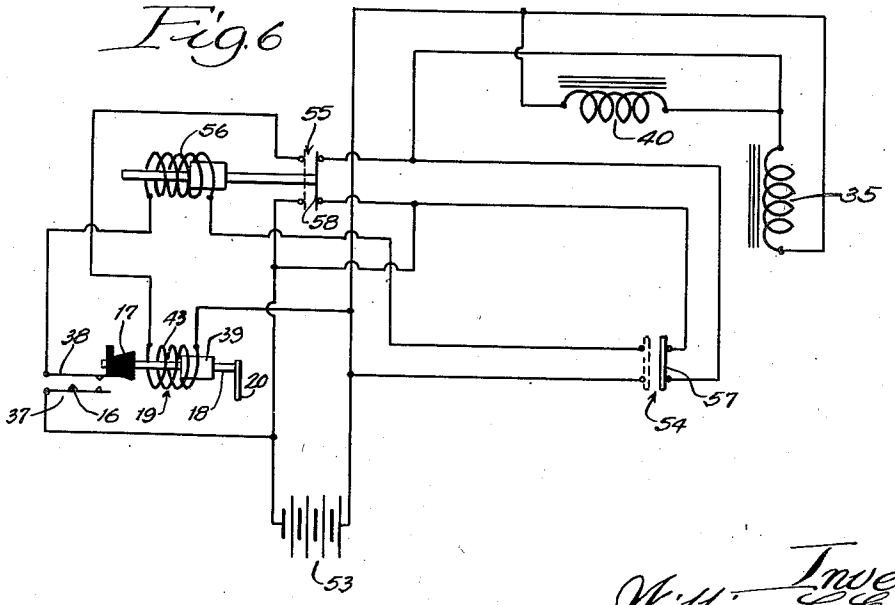


Fig. 6



Inventor.
William C. Eddy,
By Dawson, Dowell & Booth
Attorneys.

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CONTROL MECHANISM

William C. Eddy, Kenilworth, Ill.

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14 Claims. (Cl. 274—9)

This invention relates to a control mechanism for sound reproducing apparatus for reproducing sound from sound tracks carried upon sound track carriers such as phonograph records and sound films, and more particularly to a mechanism for controlling the operation of such apparatus whereby a predetermined portion of the sound record may be automatically played.

In the use of phonographs and other sound reproducing apparatus it is often desirable to begin the operation of the phonograph at an intermediate portion of the recording and at a precise point of the sound track. Thus it is often necessary to play only a particular portion of the record on the phonograph commencing at a certain sound. To accomplish this purpose the pickup mechanism must be brought into engagement with the portion of the record which carries the recording to be played at a precise point of the sound track.

An object of the invention is to bring the pickup mechanism of sound reproducing apparatus into operative engagement with a predetermined portion of the sound track on the record and to produce such engagement automatically. Another object is to provide a micrometer adjustment of the lateral position of the playing arm and needle of the phonograph with respect to the sound track so that the needle will be in exact alignment with the sound track which is to be engaged. Still another object is to provide means to maintain the needle of the playing arm in fixed relation with a selected portion of the record and, when the predetermined portion of the record is about to pass the needle, to bring the needle automatically into engagement with that portion of the record at a precise point thereon. Another object is to provide electro-magnetic means for maintaining the playing arm in a desired lateral and vertical position with respect to the record and to provide means for automatically releasing the playing arm when the predetermined portion of the record is to be engaged.

Another object of the invention is to provide means associated with the record for actuating the releasing mechanism for the solenoids which hold the playing arm in position. A further object is to provide a relay circuit in connection with the releasing of the solenoids which hold the playing arm in position. A further object is to provide in the electrical circuit of said solenoids a pair of switches, one of the switches being manually operable and the other being operated by the relay, the switches being arranged so that the solenoids are not released until both switches have been opened.

Other features and advantages of the invention will appear from the following specification and drawings of a preferred embodiment of the invention, in which—

Figure 1 is a plan view of a phonograph table showing the apparatus of the invention mounted thereon; Fig. 2 is a perspective view of one end of the playing arm and the solenoids for maintaining it in position; Fig. 3 is a fragmentary vertical sectional view taken along the line 3—3 of Fig. 1; Fig. 4 is a perspective view of a portion of the playing arm in a modified form of the invention, the view corresponding to the view of Fig. 2; Fig. 5 is a vertical sectional view of one of the solenoids used in this apparatus taken along the line 5—5 of Fig. 1; Fig. 6 is a circuit diagram of the apparatus of this invention; and Figure 7 is a modified circuit diagram.

In the specific embodiment of the invention described herein a phonograph table or base 10 is provided with a rotatable turntable 11 which supports a disk record 12. Above the record 12 is a playing arm 13 carrying at one end a pickup mechanism 14 and at the other a plate 15. Adjacent the turntable 11 on the phonograph base 10 is a leaf spring switch 16 which is adapted to be operated by the movement of a cam 17 on a shaft 18. The cam 17 is formed with a small outer end portion of non-circular outline such as by providing extensions on one side thereof as shown in Fig. 6 and with a flaring cam surface 59. In its normal position as shown in Figures 5 and 6, the cam 17 allows the leaf spring switch 16 to open but when the cam is turned as explained hereinafter, the extension thereon engages and closes the switch. The shaft 18 extends through a solenoid 19 and is equipped at its other end with a finger 20 adapted to be engaged by a pin 21 mounted on the periphery of the turntable 11.

The playing arm 13 is pivotally mounted in conventional manner on a horizontal fulcrum pin 22 which extends through a vertical shaft 23. The shaft 23 in turn is rotatably mounted in the standard 24 supported by the base 10. The playing arm is provided with an elongated slot 25 in the upper portion thereof which permits movement of the arm in a vertical plane without interference from the shaft 23. A weight 26 is attached to the end of the playing arm in order to counterbalance the arm about the fulcrum pin 22. The end of the arm which carries the pickup mechanism 14 is, of course, slightly heavier than the end carrying the counterbalance weight 26 and

will thus normally cause the pickup mechanism to be brought into engagement with the record 12 on the turntable 11.

The pickup mechanism is of the usual well-known construction and will not be described in detail herein. Operative engagement of the pickup mechanism with the sound track of the described record 12 is brought about by a needle or stylus (not shown) of the conventional type.

The end of the playing arm 13 bearing the weight 26 is equipped with a hinge 27 to which is attached the plate 15. An extension 28 of the playing arm is disposed beneath the portion of the plate 15 adjacent the hinge 27. A thumb screw 29 threadedly engaging the plate 15 provides for adjustment of the vertical position of the plate 15 with respect to the extension 28.

The plate 15 is provided with a lateral extension 30 which in turn is equipped at its end with an upwardly turned flange 30a.

Beneath the extension 30 of the plate 15 and supported on the phonograph table 10 is a base 31 equipped at one end with a fixed vertical standard 32 which supports a shaft 33. The shaft 33 is equipped with a long set screw which may be in the form of a micrometer 34 for adjusting the longitudinal position of the shaft with respect to standard 32. The micrometer may be of conventional construction and will not be described in detail herein. The other end of the shaft 33 supports a solenoid 35 which is adapted, when energized, to magnetize the shaft 33 and cause the reduced end 36 thereof to hold the flange 30a of the plate 15 in engagement therewith.

The base 31 also supports a solenoid or electro-magnet 40 which is adapted to engage the plate 15. When energized, the solenoid 40 draws the plate 15 downwardly into contact with it, and thus holds the playing arm up with the pickup mechanism 14 out of engagement with the record.

As seen particularly in Fig. 5, the leaf switch 16 is provided with a pair of contact points 37 and 38 which are brought into contact by the movement of the cam 17 to close the switch 16. The shaft 18 which extends through the solenoid 19 is provided with a sleeve 39 fixedly attached thereto. The sleeve 39 acts as the solenoid armature.

The solenoid 19 is provided with a cylindrical casing 41 mounted on supports 42 which may, if desired, be integral with the end walls of the casing as shown. Within the casing 41 is the usual field coil 43 wound around the armature 39 on the shaft 18. A spring 44 arranged around the shaft 18 urges the shaft towards the end of the casing opposite the switch 16. The finger 20 on the shaft 18 is adapted to be engaged by the pin 21 carried by the turntable 11.

In the modified form of the invention shown in Fig. 4 a base plate 45 is mounted on the table 10 of the phonograph. The base plate 45 is for convenience provided with a scale 46. The base plate 45 supports the movable platform 47 which is equipped with a projection 48 adapted to be brought into registration with the markings of the scale 46. A bolt 49 extends through the elongated slot 50 in the platform 47 to permit movement of the platform along the scale 46 on the base plate 45. The bolt 49 may be tightened to lock the platform in any selected position on the base plate.

The platform 47 supports a vertical standard 51 and a solenoid 52 which correspond to the standard 32 and solenoid 40 shown in Fig. 2. In other respects the modified form of the invention shown in Fig. 4 corresponds to the structure shown in Fig. 2.

In the wiring diagram as seen in Fig. 6 a source of current 53 leads to a circuit in which the solenoids 35 and 40 are arranged in parallel. In the same circuit are a manually operable switch 54 and a double-pole double-throw switch 55, which is arranged in the circuit of the solenoid 19 and is adapted to be operated by a relay circuit containing the solenoid 56.

Operation of the apparatus

The operation of the apparatus of this invention is as follows: The disk record contains a single continuous sound groove which extends in a spiral from the outer to the inner periphery of the record and its respective portions thus form a plurality of peripheral sound tracks. The playing arm must therefore be adjusted laterally or radially with respect to the record to overlie a selected sound track. This adjustment is made by means of the micrometer 34 which moves the shaft longitudinally with respect to the standard 32 and shifts the position of the flange 30a of the plate 15 and the playing arm 13 attached thereto. A disk record which contains the portion sought to be played is placed upon the turntable 11 and by manual operation of the tone arm and the phonograph is played in the conventional manner. When the desired portion of sound track is located the turntable is stopped and the position of the tone arm radially is fixed by means of the micrometer 34.

The record is then placed on the turntable 11 in such a position that the pickup mechanism 14 engages the sound track of the record 12 at the predetermined portion thereof immediately after the pin 21 engages the finger 20. In other words, the record is rotated on the turntable in such a position that after engagement of the pin 21 with the finger 20, the playing arm will be released and will move towards the record 12 until the pickup mechanism 14 engages the record. The record should therefore be placed on the turntable 11 in such a position that the portion of the sound track of the record which is to be played will be moved to a point directly beneath the pickup mechanism by the time the pickup mechanism is brought into engagement with the record. The relation of the tone arm to the record is thus fixed both radially and peripherally so that the pickup mechanism engages the moving record at the precise point of the sound track selected.

When manual switch 54 is in closed position the solenoids 35 and 40 are energized. This causes the flange 30a to be held in contact with the extension 36 of the shaft 33 and the plate 15 to be held in contact with the solenoid 40.

When it is desired to reproduce the selected portion of the record, the turntable is set into operation and the disk is rotated at its running speed. When the sound is desired the manual switch 54 is opened and the blade 57 is shifted to the dotted line position shown in Fig. 6 partially to close the circuit indicated. Because of the separation of the contact points 37 and 38, the circuit is not completely closed. When the pin 21 engages the finger 20 as the turntable revolves, the cam 17 will be turned to close the contacts 37 and 38 of switch 16 and to cause the relay solenoid 56 to be energized and plate 58 to be drawn to the dotted line position shown in Fig.

6. The circuit of the solenoids 35 and 40 is now open and the solenoids are de-energized. At the same time, the solenoid 19 is energized and draws the shaft 18 towards the switch 16 thus bringing the extended surface 59 of the cam 17 into engagement with the leaf spring switch 16 and maintaining the switch 16 in closed position.

As soon as the solenoids 35 and 40 are de-energized the playing arm is released and moves towards the record 12 until the needle of the pickup mechanism 14 is brought into contact therewith. As soon as the needle is brought into contact with the record 12 the playing of the record begins and continues until the record is completed or the mechanism is stopped.

The mechanism may be reset for operation by merely closing the manual switch 54. This will cause the solenoids 35 and 40 to be energized and engage the plate 15. The same movement of the manual switch 54 will de-energize the solenoid 56 of the relay and cause the blade 58 of the switch 55 to return to normal position. The movement of the switch 55 opens the circuit of the solenoid 19 and causes it to be deenergized.

In the event great precision in bringing the pickup mechanism into engagement with a precise point on the sound track is not required, a simpler form of the apparatus can be employed as indicated. This would eliminate the use of the relay switch 55, the solenoid 56, the solenoid 19 and the leaf switch 16, with their associated parts. All of the apparatus (see Fig. 2) for adjusting and maintaining the lateral position of the tone arm would be retained. By means of the micrometer 34 this position could be accurately set so that the needle would engage a selected groove in the sound track.

The simplified circuit as shown in Figure 7 comprises solenoids 35′ and 40′ corresponding to the solenoids 35 and 40 of Figure 6 connected in parallel to the battery 53′ through a manually operable switch 54′. When the switch is closed, the two solenoids are energized to raise the pickup from the record and move it against the adjustable stop above the selected groove in the record. Upon opening the switch 54′ the solenoids will be de-energized to release the tone arm so that the pickup can move into engagement with the record.

Thus the record would be engaged in a selected track, but without discrimination as to the precise point at which the engagement would be effected.

Although the mechanism has been described in connection with the operation of a phonograph with a disk record mounted on a turntable, it will be obvious that the mechanism is adapted for use with other types of sound reproduction apparatus and devices. The invention can readily be adapted to carriers of recorded sound, whether in the form of circular disk records, cylindrical records, and photographic sound tracks. Accordingly when the terms "carrier" and "sound track" are used, they will be understood to refer to carriers and sound tracks of all kinds.

Although the invention has been disclosed in connection with the specific details of a preferred embodiment thereof, it is to be understood that such details are not intended to be limitative of the invention except insofar as set forth in the accompanying claims.

I claim:

1. Control mechanism for the operation of apparatus for reproducing sound from sound records comprising a rotatable turntable, a record supported and rotated thereby, pickup mechanism adapted to engage the record, adjustable means mounted adjacent and engaging the pickup mechanism to fix its lateral position with relation to the record, means to maintain the pickup mechanism in fixed lateral position with relation to the record and out of engagement therewith, and means operated by the turntable at a predetermined rotative position thereof to control engagement of the pickup mechanism with the record.

2. Control mechanism for the operation of apparatus for reproducing sound from sound track carriers comprising, a traveling sound track carrier, a sound track thereon, pickup mechanism adapted to engage said sound track, adjustable means engaging the pickup mechanism for retaining said pickup mechanism in fixed relation to but out of engagement with a predetermined portion of said sound track, and means including a part carried by and travelling with the sound track carrier for releasing said pickup mechanism and bringing said pickup mechanism into engagement with said sound track when a predetermined point thereon is brought into alignment with said pickup mechanism.

3. In sound reproducing apparatus for the reproduction of sound from a traveling sound track carrier, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm and adapted to engage said sound track, means to retain the pickup mechanism spaced from said carrier, means engaging the playing arm for adjusting and maintaining in a predetermined lateral relation with respect to said carrier, and means including a part movable with the sound track carrier for controlling engagement of said pickup member with said sound track carrier when a predetermined point thereof travels beneath said pickup member at a position to be engaged thereby.

4. In sound reproducing apparatus equipped with a rotatable turntable bearing a disk provided with a traveling sound track, control mechanism comprising, a playing arm, a pickup mechanism carried by said arm and adapted to engage said disc, means engaging the playing arm for limiting its lateral position with respect to the sound track, means for holding said playing arm with the pickup mechanism out of engagement with said disk, means for releasing said holding means to bring the pickup mechanism into engagement with said disk, and means carried by the turntable and associated with a predetermined peripheral portion of the disk for actuating said releasing means when the predetermined portion of the disk is brought into such relation with the pickup mechanism as to be engaged thereby when said holding means is released.

5. Apparatus as set forth in claim 4 wherein the means for adjusting the lateral position of the playing arm with respect to the disk includes a micrometer for bringing the pickup mechanism into accurate alignment with any desired portion of the sound track.

6. In a phonograph equipped with a rotatable turntable and a disk record carried thereby, said disk being provided with a spiral sound track, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm, said arm being movable to and from a position wherein the pickup mechanism engages said disk, an electrical circuit

provided with a source of current, a solenoid in said circuit adapted when energized to hold said arm out of engaging position, a second solenoid in said circuit adapted when energized to hold said arm in a predetermined lateral position with respect to said disk, and means including a part carried by the turntable for opening said circuit to de-energize said solenoids when a predetermined peripheral portion of said sound track is brought into such relation with the pickup mechanism as to be engaged thereby upon the opening of said circuit.

7. In a phonograph equipped with a rotatable turntable and a disk record carried thereby, said disk being provided with a spiral sound track, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm, said arm being movable to and from a position wherein the pickup mechanism engages said disk, an electrical circuit provided with a source of current, a solenoid in said circuit adapted when energized to hold said arm out of engaging position, a second solenoid in said circuit adapted when energized to hold said arm in a predetermined radial position with respect to the sound track, a control switch in the circuit, and means operated by a part carried by said turntable to actuate the control switch when a predetermined peripheral portion of the record is brought into such relation with the pickup mechanism as to be engaged thereby upon the operation of the second of said switches.

8. In a phonograph equipped with a rotatable turntable and a disk record carried thereby, said disk being provided with a spiral sound track, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm, said arm being movable to and from a position wherein the pickup mechanism engages said disk, an electrical circuit provided with a source of current, a solenoid in said circuit adapted when energized to hold said arm out of engaging position, a second solenoid in said circuit adapted when energized to hold said arm in a predetermined lateral position with respect to said track, a switch in said circuit, a relay to control the switch, a pair of contacts in the circuit of said relay, and means on said turntable and associated with a predetermined peripheral portion of said disk for closing said contacts and operating said relay to open the switch and de-energize the solenoids.

9. In a phonograph equipped with a rotatable turntable and a disk record carried thereby, said disk being provided with a spiral sound track, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm, said arm being movable to and from a position wherein the pickup mechanism engages said disk, an electrical circuit provided with a source of current, a solenoid in said circuit adapted when energized to hold said arm out of engaging position, a second solenoid in said circuit adapted when energized to hold said arm in a predetermined lateral position with respect to said track, a switch in said circuit, a relay to control the switch, a pair of contacts in the circuit of said relay, a manual switch in the relay circuit, electro-magnetic means actuated by said relay for holding said contacts in closed position, said electro-magnetic means and relay being operable only when the manual switch is closed, and means on said turntable and associated with a predetermined peripheral portion of the disk for closing the contacts and operating the relay to deenergize said solenoids and to actuate said electro-magnetic means when the manual switch is closed.

10. In a phonograph equipped with a rotatable turntable and a disk record carried thereby, said disk being provided with a spiral sound track, control mechanism of the character described comprising, a playing arm, a pickup mechanism carried by said arm, said arm being movable to and from a position wherein the pickup mechanism engages said disk, an electrical circuit provided with a source of current, a solenoid in said circuit adapted when energized to hold said arm out of engaging position, a second solenoid in said circuit adapted when energized to hold said arm in a predetermined lateral position with respect to said track, a relay, a pair of contacts in the circuit of said relay, electro-magnetic means for holding said contacts in closed position, a double-throw switch actuated by said relay, said switch in one position closing the circuit of the solenoids and in the other position closing the circuit of the electro-magnetic means for holding said contacts in closed position, a cam for closing said pair of contacts, and means on said turntable and associated with a predetermined peripheral portion of said disk for closing the contacts for operating the relay to de-energize the solenoids.

11. In a sound reproducing apparatus of the type including a rotatable carrier for a record having a sound track thereon, control mechanism comprising an arm mounted for movement across the record and pivoted intermediate its ends for movement of one end toward and away from the record, a pickup carried by said one end for cooperation with the sound track on the record, a plate of magnetic material carried by the other end of the arm, magnetic means cooperating with the plate to move said one end of the arm away from the record, said plate having a flange portion extending substantially at a right angle therefrom, an adjustable stop engaging the flange portion to determine the position of the arm across the record, and means for urging the flange portion against the stop.

12. Apparatus as defined in claim 11 in which the last named means comprises a coil associated with the adjustable stop to magnetize it whereby it will attract the flange portion.

13. In a sound reproducing apparatus of the type including a rotatable turntable for a disc having a spiral sound track, control mechanism comprising an arm pivoted adjacent the disc for movement of one end substantially radially across the disc, a pickup carried by said one end of the arm for cooperation with the sound track, said arm being pivotally supported for movement of the pickup toward and away from the disc, a magnetic plate carried by the other end of the arm and having an angular flange portion, magnetic means cooperating with the plate to rock the arm about its support to raise the pickup from the disc, an adjustable stop engageable with the flange portion to limit movement of the pickup across the disc, and magnetic means for urging the flange portion into engagement with the stop.

14. Apparatus as defined in claim 13 including control means for simultaneously de-energizing both magnetic means to drop the pickup on the disc and to release the arm for free swinging movement across the disc.

WILLIAM C. EDDY.