SPECIFICATION

Gramophone record players

This invention relates to gramophone record players, and more particularly, but not exclusively, to toy-like record players for use with a stationary record disc.

Conventional record players ordinarily include a motor driven turntable on which a gramophone record disc is rotated. By placing the stylus of a pick-up or cartridge on the rotating record, signals are picked up from the latter and, after suitable amplification, issue as audible sounds from a loudspeaker. However, such a record player is complex in construction, rather large, and difficult to minaturise.

Record players without rotating turntables have been proposed in which a cartridge, a loudspeaker, an amplifier, and the like are assembled into a movable body which moves on a stationary record disc to reproduce the signals recorded thereon. However, a problem with these devices is that they require specially constructed gramophone record discs provided with a spiral sound groove formed between a pair of guide rails on the record disc for guiding the movable body as it moves relative to the record disc. Providing each record disc with such guide rails obviously increases the cost thereof. Furthermore, it is impossible to use the record playing device on a conventional record disc which lacks the guide rails.

According to the present invention there is provided a record player for use on a stationary gramophone record disc having a surface on which signals are recorded in a spiral sound groove, the record player comprising: a movable body to be supported on the record disc;
drive means operatively associated with said movable body for driving said movable body relative to the record disc;
sound pick-up means for engaging and tracking said sound groove of the record disc and reproducing the signals recorded therein as said movable body is driven;
means mounting said sound pick-up means with respect to said movable body for movement in a plane substantially parallel to the plane of the surface of the record disc; and
control means for controlling the direction of movement of said movable body on the record disc in response to movement of said sound pick-up means relative to said movable body while engaging and tracking said spiral groove on the record disc.

According to the present invention there is also provided a record player for use with a stationary gramophone record disc having signals recorded in a spiral groove in a surface of the record disc, said record player comprising:
a body to be movably supported on said surface of the record disc;
drive means for causing movement of said body over the record disc;
pick-up means depending from said body for engaging and tracking said spiral groove and reproducing the signals recorded in the latter;
means mounting said pick-up means for movement relative to said body in a plane parallel to said surface of the record disc; and
control means for controlling the movement of said body over the record disc in response to said movement of said pick-up means relative to said body.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an embodiment of record player according to the invention in use;

Figure 2 is an enlarged, longitudinal sectional view of the record player;

Figure 3 is an enlarged bottom view of the record player;

Figure 4 is a schematic plan view of a record disc to which reference will be made in explaining the operation of the record player; and

Figure 5 is a circuit diagram of a control circuit for the record player.

Referring first to Figures 1 to 3, a record player 10 comprises a movable body 11, shown in the form of a toy bus or van, which can be placed on a conventional gramophone record disc 12 having a spiral groove 13 at least on the upper surface, in which sound or audio signals are recorded. The body 11 has a base or chassis 14 (Figures 2 and 3) at the bottom thereof, and the chassis 14 is formed with cut-outs 15 and 16 at the opposite sides of the rear portion, and a fan-shaped cut-out 17 which is laterally centred with respect to the forward portion of the chassis 14 (Figure 3). A raised frame 18 extends over the cut-out 17 (Figure 2) and is suitably secured to the chassis 14.

The body 11 is supported for rolling movement over the upper surface of the record 12 by means of a steerable guide wheel 19 which is laterally centred under the forward portion of the body 11, a rear wheel 20 disposed at one side of the body 11 and a drive wheel 21 disposed adjacent to the opposite side of the body 11 also at the rear portion of the latter. In addition to the foregoing, operative wheels 19, 20 and 21 which are intended to make rolling contact with the upper surface of the record 12, the body 11 is provided with front wheel simulations 22 and 23 at opposite sides of the front portion of the body 11, and a rear wheel simulation 24 disposed laterally outside of the drive wheel 21 at the side of the body 11 remote from the rear wheel 20. The front wheel simulations 22 and 23 and the rear wheel simulation 24 are dimensioned and positioned so as to be inoperative by being raised from the upper surface of the record 12 when the wheels 19, 20 and 21 are in rolling engagement therewith.

In order to drive the body 11 along the surface of the record 12, an electric motor 25 is suitably mounted within the body 11 on the chassis 14 and has a motor shaft 26 connected by way of a gear transmission 27 with one end portion of a

shaft 28 which extends laterally under the rear portion of the chassis 14 in a sleeve bearing 29. The drive wheel 21 is secured to the end of the shaft 28 remote from the rear transmission 27. A battery or batteries 30 mounted above the motor 25 in the body 11 (Figure 2) supplies power for driving the motor 25, as hereinafter described in detail. Thus, the body 11 is driven by the rotation of the drive wheel 21 which is at the side of the body 11 facing towards the centre of the record 12 when placed on the latter. The rear wheel 20 is suitably mounted on the body 11 so as to be freely rotatable by reason of the rolling contact with the record disc when the body 11 is made to move by the drive wheel 21.

The guide wheel 19 is also freely rotatable on an axle 31 which extends horizontally and has opposite end portions mounted in the opposite sides of a yoke or mounting bracket 32. The mounting bracket 32 is suitably mounted under the raised frame 18 for turning about a vertical axis, that is, an axis perpendicular to the surface of the record 12. For example, the mounting bracket 32 is secured, as by a set screw (not shown), on a vertical shaft 33 which extends downwardly through a hole 34 in the frame 18 from a potentiometer or variable resistor 35 secured on the frame 18, and having the resistance value thereof varied in response to turning of the shaft 33 with the mounting bracket 32. A cartridge support arm or frame 36 extends forwardly from the mounting bracket 32 below the frame 18, and the back end of the cartridge support arm 36 is pivotally mounted on the ends of the axle 31, so that the cartridge support arm 36 is mounted for pivoting about a horizontal axis parallel to the surface of the record 12. A cartridge or pick-up 37 is suitably mounted in the cartridge support arm 36 ahead of the axle 31, and has a stylus 38 depending therefrom. Naturally, the action of gravity on the cartridge support arm 36 and the cartridge 37 therein tends to pivot the cartridge support arm 36 downwardly about the axis of the axle 31 so that the stylus 38 is urged into engagement with the upper surface of the record 12 for tracking the groove 13 and reproducing the signals recorded therein as the body 11 is driven around the record 12. As hereinafter described in greater detail, due to the positioning of the stylus 38 ahead of the guide wheel 19, the tracking of the stylus 38 in the groove 13 will cause suitable turning of the cartridge supporting arm 36 and mounting bracket 32 about the vertical axis of the shaft 33 so as to ensure that the guide wheel 19 makes the body 11 follow a spiral path corresponding to the groove 13.

Referring now to Figure 5, a speed control circuit for the motor 25 includes, in addition to the battery 30 and the potentiometer 35, an on-off switch 39, a speed-selecting switch 40, a PNP-type transistor 41, an NPN-type transistor 42, a capacitor 43 and resistors 44, 45 and 46. The transistors 41 and 42, capacitor 43 and resistors 44 to 46 may be provided on a printed circuit board 47 mounted within the body 11 above the frame 18, and having suitable electrical connections to the battery 30, motor 25 and potentioneter 35, as well as to the switches 39 and 40 whch are also mounted in the body 11 and have switch actuators 39*a* and 40*a*, respectively, extending out of the body 11 for operation by the user of the record player 10. The circuit board 47 may also carry the usual amplifier circuits or the like by which signals reproduced by the cartridge 37 are suitably amplified to drive a loudspeaker 48 mounted against the top of the body 11 for emitting audible sounds or music through perforations 49 therein (Figure 1). The loudness of the reproduced sounds may be controlled as is usual, by a variable resistor 50(Figure 2) which is adjustable by manual actuation of a knob 51 simulating a spare tire or wheel at the front of the body 11.

Referring again to Figure 5, the emitter of transistor 41 is connected through the on-off switch 39 with the positive side of the battery 30, while the collector of the transistor 41 is connected through the motor 25 to the negative side of the battery 30. The capacitor 43 is connected across the switch 39 and battery 30, and the base of the transistor 41 is connected to the collector of the transistor 42 which has the emitter connected through the resistor 46 to the negative side of the battery 30. The base of the transistor 42 is connected to a movable tap 35*a* of the potentiometer 35 which is connected between resistors 44 and 45 for forming a voltage divider with the latter. Finally, the speed-selecting switch 40 is connected in parallel with the resistor 44 so as to shunt the latter when the switch 40 is closed. It will be appreciated that the tap 35*a* of the potentiometer 35 is moved along the resistance element in response to turning of the shaft 3 with the mounting bracket 32.

The record player 10 operates as follows:

Initially, the user places the body 11 on the stationary record 12 at any desired location where a reproducing operation is to be started, for example, at the position A in Figure 4 which is at a relatively large radial distance from the centre of the disc 12. After the stylus 38 of the cartridge 37 has been engaged with the groove 13, and the speed-selecting switch 40 has been opened or closed so as to select a speed of movement of the body 11 suitable for playing the record 12, for example, at 33 1/3 or 45 rpm, the switch 39 is closed so as to start the motor 25. The rotation of the shaft 26 is transmitted through the gear transmission 27 to the shaft 28, and thence to the drive wheel 21 for driving the body 11 in a counter-clockwise direction around the record 12, as viewed in Figure 4. With such movement of the body 11, the corresponding movement of the stylus 38 along the groove 13 causes reproduction by the cartridge 37 of the sound signals recorded in the groove 13, whereupon the reproduced signals are amplified and applied to the loudspeaker 48 to provide audible sounds, the volume of which is controlled by adjustment of the knob 51.

It will be appreciated that the engagement of the stylus 38 in the groove 13 also serves to steer the body 11 in the movement around the record 12. More particulary, as the body 11 is driven around the record 12, the assembly constituted by the cartridge support arm 36, mounting bracket 32 and guide wheel 19 is turned about the vertical axis of the shaft 33 so as to maintain coincidence between a tangent to the groove 13 at the point of engagement by the stylus 38 with a line extending from the stylus 38 through the axis of the shaft 33. Thus, as the stylus 38 engages inwardly successive turns of the groove 13, which turns have progressively decreasing radii of curvature, the assembly of cartridge support arm 36, mounting bracket 32 and guide wheel 19 is progressively turned around the vertical axis of the shaft 33, for example, from a position at an angle θ_1 with respect to the longitudinal axis of the body 11 when the latter is disposed at A, to a position at an angle θ_2 with respect to the longitudinal axis of the body 11 when the latter is disposed at B in Figure 4. Accordingly, as the body 11 is driven around the record 12, the guide wheel 19 is gradually turned about the vertical axis of the shaft 33, so as progressively to decrease the radius of curvature of the path followed by the body 11 in correspondence to the progressively decreasing radii of curvature of the successive turns of the groove 13.

Since the gramophone record disc 12 is of conventional form, it will be appreciated that the sound signals recorded in the groove 13 are intended to be reproduced during relative movement of the stylus 38 and record 12 at a constant angular or rotational speed, for example, at 33 1/3 or 45 rpm. However, such constant angular or rotational speed of the stylus 38 relative to the record 12 requires that the relative linear speed be greater when the stylus 38 engages an outer turn of the spiral groove 13 than when the stylus 38 engages a radially inner turn of the spiral groove 13. Thus, in the record player 10, turning of the assembly of the cartridge support arm 36, mounting bracket 32 and guide wheel 19 about the vertical axis of the shaft 33, for example, from the position defined by the angle θ_1 to the position defined by the angle θ_2 in Figure 4 in response to the movement of the body 11 from the outer position A to the inner position B, causes corresponding turning of the shaft 33 of the potentiometer 35. Such turning of the shaft 33 causes downward movement of the tap 35*a* of the potentiometer 35, as viewed in Figure 5, so that the base voltage applied to the transistor 42 is decreased and results in a corresponding decrease in the supply of current through the transistor 41 to the motor 25. By reason of the foregoing, the speed of movement of the body 11 is progressively decreased as the latter moves along the inwardly successive turns of the groove 13.

From the above it will be apparent that the movement of the body 11 over the record 12 is controlled, both as to direction and speed, in response to the movement of the cartridge 37 and stylus 38 relative to the body 11 in the horizontal direction, that is, parallel to the plane of the record 12.

It will further be appreciated from Figure 5, that closing of the switch 40 for shunting the resistor 44 increases the level of the potentials applied to the base of the transistor 42 apart from the variation of such potentials resulting from movement of the tap 35*a*, whereby the motor 25 is driven at relatively high speeds, for example, suitable for obtaining movement of the body 11 around the record disc 12 at 45 rpm. On the other hand, when the switch 40 is opened so as to place the resistor 44 in series with the potentiometer 35 and resistor 45, the varyng potentials aplied to the base of the transistor 42 are correspondingly lowered with the result that the motor 25 is rotated at speeds suitable for causing the body 11 to move around the record 12 at 33 1/3 rpm.

Although the record player 10 described above with reference to the drawings has the loudspeaker 48 and the amplifier and any other circuits required for obtaining audible sounds from the signals reproduced by the cartridge 37 all contained in the body 11, embodiments of record player according to the invention may have a transmitter within the movable body 11 by which the recorded signals, after being reproduced by the cartridge 37 and modulated, are transmitted to an external receiver. In such external receiver, which may be stationary, the received modulated signals are demodulated and then supplied to a loudspeaker for emission from the latter as audible sounds. The foregoing arrangement makes it possible to reduce the size of the movable body 11 by removing therefrom relatively bulky components, such as, the loudspeaker 48.

In the illustrated record player 10, the simulated spare wheel or tire is used as the knob 51 for adjusting the variable resistor 50 and thereby controlling the volume of the reproduced sounds. However, if desired, such function could be performed by either one of the front wheel simulations 22 and 23 or the rear wheel simulation 24.

As previously mentioned, in the illustrated embodiment of the invention, both the direction of movement and the speed of movement of the body 11 on the record 12 are controlled in response to movements of the stylus 38 and cartridge 37 in the horizontal direction relative to the body 11. However, it is not necessary that both the direction and speed of movement of the body 11 be thus controlled. For example, if desired, only the direction of movement of the body 11 may be controlled in response to horizontal movements of the stylus 38 and cartridge 37, while the speed of movement is otherwise controlled or reduced with travel of the body 11 along inwardly successive turns of the spiral groove 13. In the latter case, a timer may be provided to generate signals at intervals from the commencement of the reproducing operation, and such signals may be supplied to a speed control

circuit which progressively reduces the speed of movement of the body 11 in response to the successive signals.

CLAIMS

1. A record player for use on a stationary gramophone record disc having a surface on which signals are recorded in a spiral sound groove, the record player comprising:
a movable body to be supported on the record disc;
drive means operatively associated with said movable body for driving said movable body relative to the record disc;
sound pick-up means for engaging and tracking said sound groove of the record disc and reproducing the signals recorded therein as said movable body is driven;
means mounting said sound pick-up means with respect to said movable body for movement in a plane substantially parallel to the plane of the surface of the record disc; and
control means for controlling the direction of movement of said movable body on the record disc in response to movement of said sound pick-up means relative to said movable body while engaging and tracking said spiral groove on the record disc.

2. A record player according to claim 1 further comprising speed controlling means operatively associated with said movable body for controlling the speed of movement of said movable body on the record disc.

3. A record player according to claim 2 wherein said speed controlling means is responsive to said movement of said sound pick-up means relative to said movable body while engaging and tracking said spiral groove on the record disc.

4. A record player according to claim 1 wherein said control means includes a mounting bracket pivotally coupled to said movable body for movement about an axis substantially perpendicular to said plane of said surface of the record disc and guiding said movable body.

5. A record player according to claim 4 wherein said sound pick-up means includes a cartridge with a stylus depending therefrom for engaging and tracking said spiral groove of the record disc, a support having first and second ends, said first end having the cartridge mounted thereon, and said second end being coupled to said mounting bracket of said control means for pivoting movement relative to said bracket in a plane substantially perpendicular to said surface of the record disc.

6. A record player according to claim 5 wherein said drive means includes an electric motor and speed controlling means including variable resistor means connected to said motor for gradually reducing the speed of said motor in response to pivoting of said mounting bracket.

7. A record player according to claim 6 wherein said variable resistor means includes a shaft which is rotatable for varying the resistance of said variable resistor means, said shaft being coupled for rotation with said mounting bracket.

8. A record player according to claim 5 wherein said driving means includes an electric motor and speed controlling means having switch means operatively associated with said electric motor for selectively driving said movable body at one of two predetermined speeds.

9. A record player according to claim 8 wherein said speed controlling means incudes resistor means operatively connected to said electric motor for reducing the speed of said electric motor, and switch means connected between said resistor means and said electric motor for selectively connecting and disconnecting said resistor means with respect to said electric motor.

10. A record player according to claim 8 wherein said speed control means further includes variable resistor means connected to said motor for gradually reducing the speed of said motor, shaft means rotatable for varying the resistance of said variable resistor means, said shaft means being fixed to said mounting bracket for pivoting with the latter and forming the means by which said mounting bracket is coupled to said movable body.

11. A record player for use with a stationary gramophone record disc having signals recorded in a spiral groove in a surface of the record disc, said record player comprising:
a body to be movably supported on said surface of the record disc; drive means for causing movement of said body over the record disc;
pick-up means depending from said body for engaging and tracking said spiral groove and reproducing the signals recorded in the latter;
means mounting said pick-up means for movement relative to said body in a plane parallel to said surface of the record disc; and
control means for controlling the movement of said body over the record disc in response to said movement of said pick-up means relative to said body.

12. A record player according to claim 11 wherin said control means includes means responsive to said movement of the pick-up means for varying the speed of said movement of said body over the record disc.

13. A record player according to claim 12 wherein said control means further includes means responsive to said movement of said pick-up means for varying the direction of said movement of said body over the record disc.

14. A record player according to claim 13 wherein said means for varying the direction of movement of said body includes a steerable wheel, and means interconnecting said pick-up means with said steerable wheel for progressively turning the latter in the direction decreasing the turning radius of said body as said pick-up means tracks said spiral groove.

15. A record player according to claim 14 wherein said drive means includes an electric motor and a circuit for energising the latter, and said means for varying the speed of movement of said body includes a variable resistor interposed in

circuit which progressively reduces the speed of movement of the body 11 in response to the successive signals.

CLAIMS

1. A record player for use on a stationary gramophone record disc having a surface on which signals are recorded in a spiral sound groove, the record player comprising:
a movable body to be supported on the record disc;
drive means operatively associated with said movable body for driving said movable body relative to the record disc;
sound pick-up means for engaging and tracking said sound groove of the record disc and reproducing the signals recorded therein as said movable body is driven;
means mounting said sound pick-up means with respect to said movable body for movement in a plane substantially parallel to the plane of the surface of the record disc; and
control means for controlling the direction of movement of said movable body on the record disc in response to movement of said sound pick-up means relative to said movable body while engaging and tracking said spiral groove on the record disc.

2. A record player according to claim 1 further comprising speed controlling means operatively associated with said movable body for controlling the speed of movement of said movable body on the record disc.

3. A record player according to claim 2 wherein said speed controlling means is responsive to said movement of said sound pick-up means relative to said movable body while engaging and tracking said spiral groove on the record disc.

4. A record player according to claim 1 wherein said control means includes a mounting bracket pivotally coupled to said movable body for movement about an axis substantially perpendicular to said plane of said surface of the record disc and guiding said movable body.

5. A record player according to claim 4 wherein said sound pick-up means includes a cartridge with a stylus depending therefrom for engaging and tracking said spiral groove of the record disc, a support having first and second ends, said first end having the cartridge mounted thereon, and said second end being coupled to said mounting bracket of said control means for pivoting movement relative to said bracket in a plane substantially perpendicular to said surface of the record disc.

6. A record player according to claim 5 wherein said drive means includes an electric motor and speed controlling means including variable resistor means connected to said motor for gradually reducing the speed of said motor in response to pivoting of said mounting bracket.

7. A record player according to claim 6 wherein said variable resistor means includes a shaft which is rotatable for varying the resistance of said variable resistor means, said shaft being coupled for rotation with said mounting bracket.

8. A record player according to claim 5 wherein said driving means includes an electric motor and speed controlling means having switch means operatively associated with said electric motor for selectively driving said movable body at one of two predetermined speeds.

9. A record player according to claim 8 wherein said speed controlling means incudes resistor means operatively connected to said electric motor for reducing the speed of said electric motor, and switch means connected between said resistor means and said electric motor for selectively connecting and disconnecting said resistor means with respect to said electric motor.

10. A record player according to claim 8 wherein said speed control means further includes variable resistor means connected to said motor for gradually reducing the speed of said motor, shaft means rotatable for varying the resistance of said variable resistor means, said shaft means being fixed to said mounting bracket for pivoting with the latter and forming the means by which said mounting bracket is coupled to said movable body.

11. A record player for use with a stationary gramophone record disc having signals recorded in a spiral groove in a surface of the record disc, said record player comprising:
a body to be movably supported on said surface of the record disc; drive means for causing movement of said body over the record disc;
pick-up means depending from said body for engaging and tracking said spiral groove and reproducing the signals recorded in the latter;
means mounting said pick-up means for movement relative to said body in a plane parallel to said surface of the record disc; and
control means for controlling the movement of said body over the record disc in response to said movement of said pick-up means relative to said body.

12. A record player according to claim 11 wherin said control means includes means responsive to said movement of the pick-up means for varying the speed of said movement of said body over the record disc.

13. A record player according to claim 12 wherein said control means further includes means responsive to said movement of said pick-up means for varying the direction of said movement of said body over the record disc.

14. A record player according to claim 13 wherein said means for varying the direction of movement of said body includes a steerable wheel, and means interconnecting said pick-up means with said steerable wheel for progressively turning the latter in the direction decreasing the turning radius of said body as said pick-up means tracks said spiral groove.

15. A record player according to claim 14 wherein said drive means includes an electric motor and a circuit for energising the latter, and said means for varying the speed of movement of said body includes a variable resistor interposed in

said circuit, and means responsive to said movement of said pick-up means for changing the resistance value of said variable resistor.

16. A record player according to claim 12 wherein said drive means includes an electric motor and a circuit for energising the latter, and said means for varying the speed of movement of the body includes a variable resistor interposed in said circuit, and means responsive to said movement of said pick-up means for changing the resistance value of said variable resistor.

17. A record player substantially as hereinbefore described with reference to the accompanying drawings.

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