J. T. SIBLEY.

PHONOGRAPH.

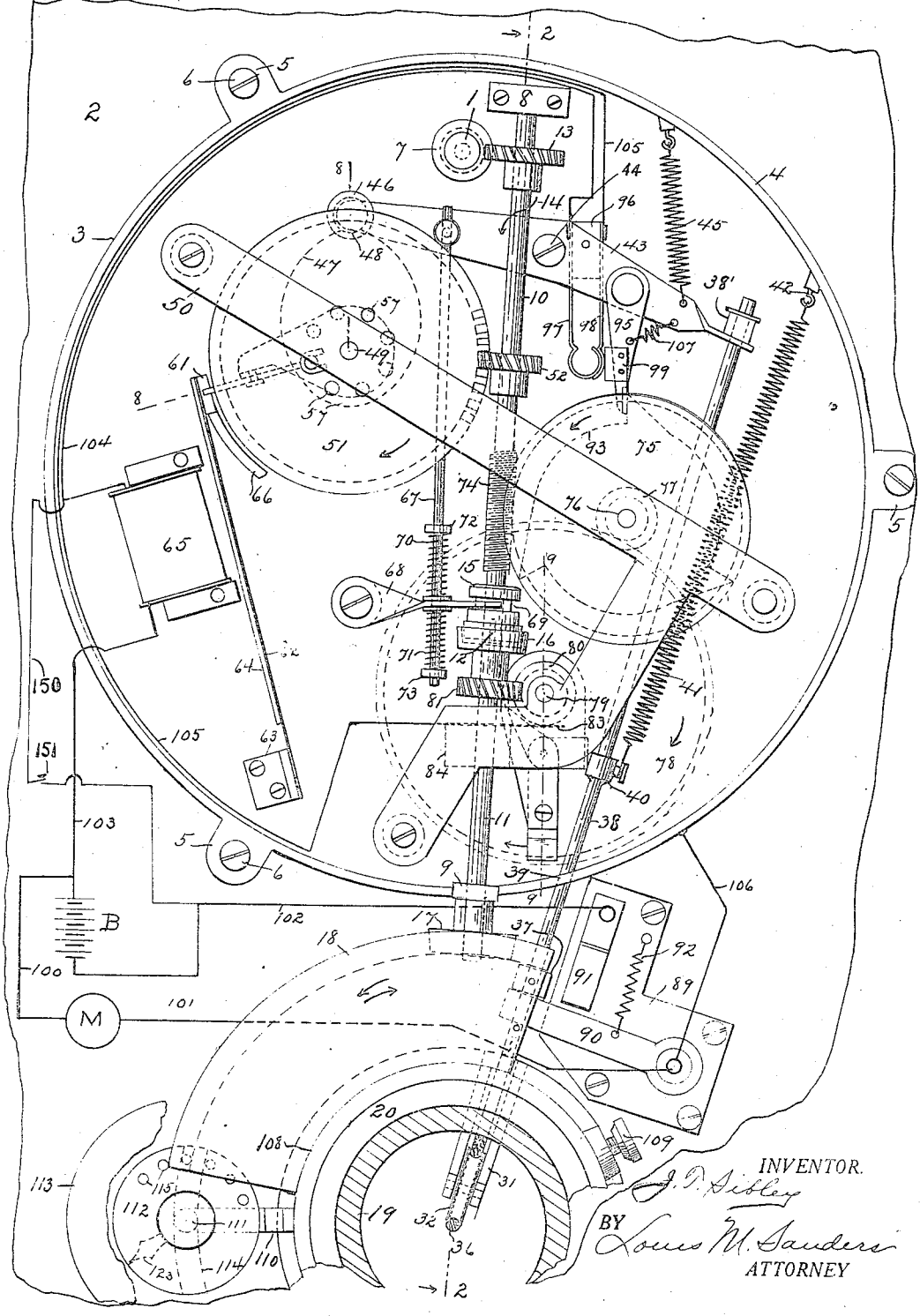
APPLICATION FILED NOV. 19, 1917.

1,371,984.

Patented Mar. 15, 1921.

4 SHEETS—SHEET 1.

Fig. 1.



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BY Louis M. Sanders

ATTORNEY

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4 SHEETS—SHEET 2.

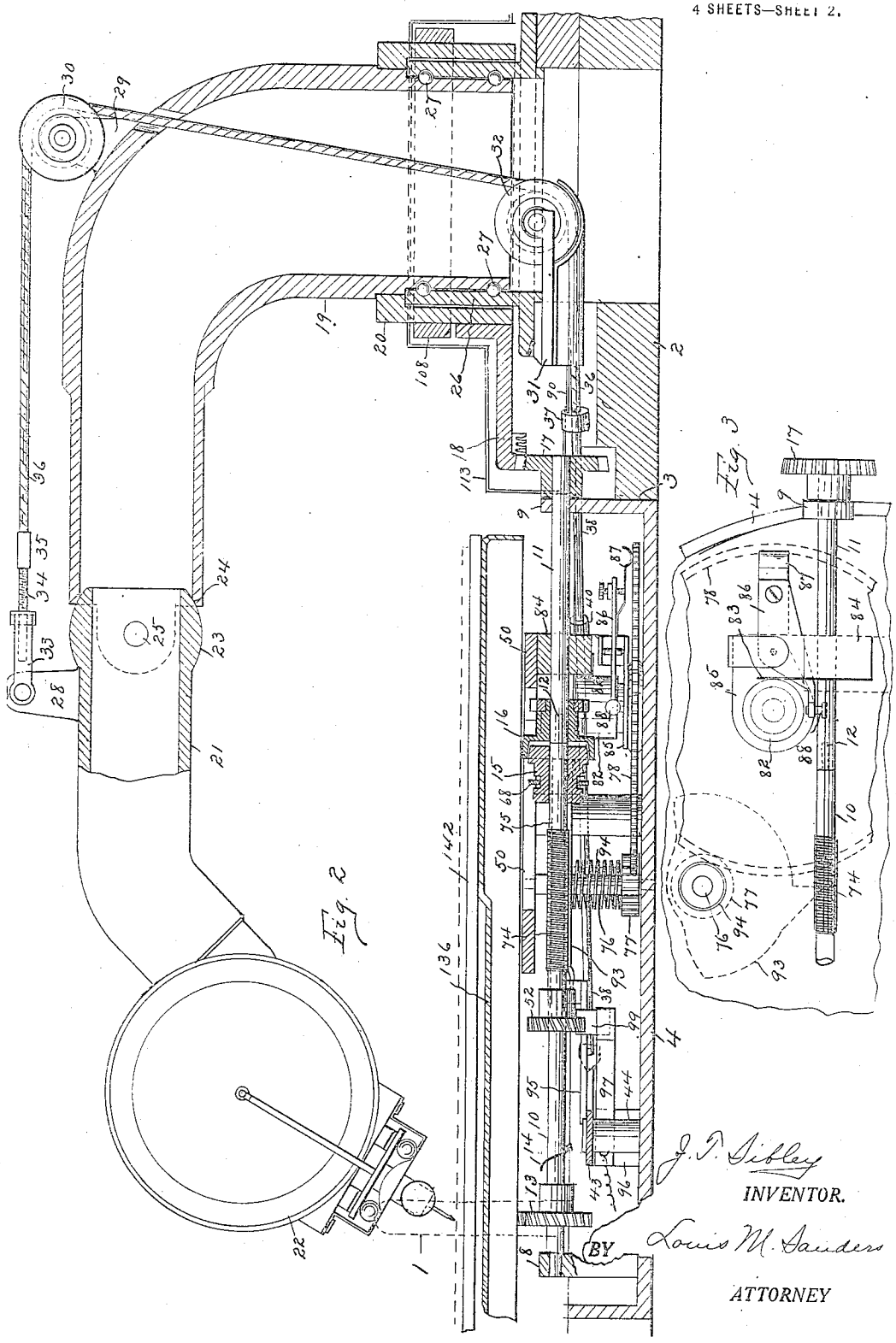


Fig. 2

Fig. 3

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4 SHEETS—SHEET 3.

Fig. 4.

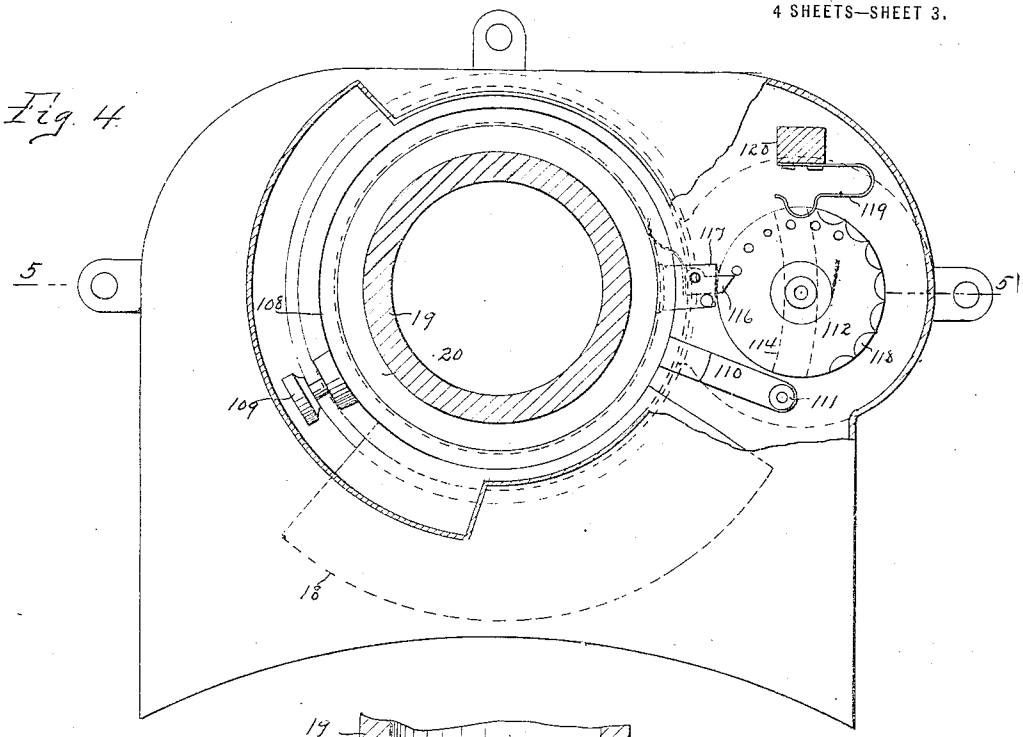


Fig. 5.

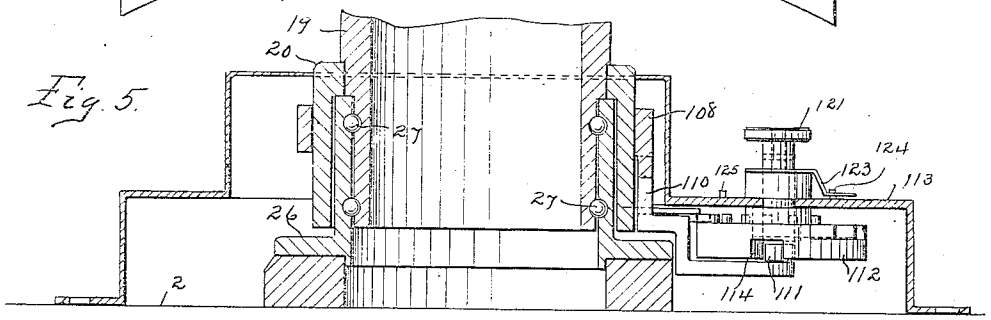


Fig. 7.

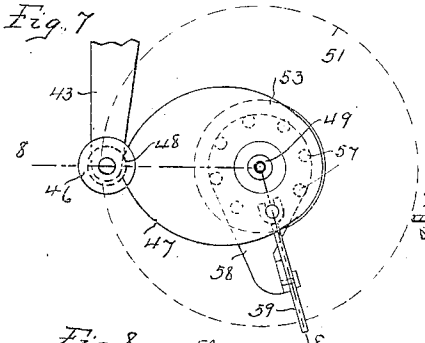


Fig. 9.

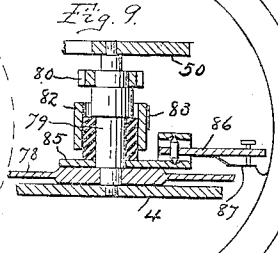


Fig. 6.

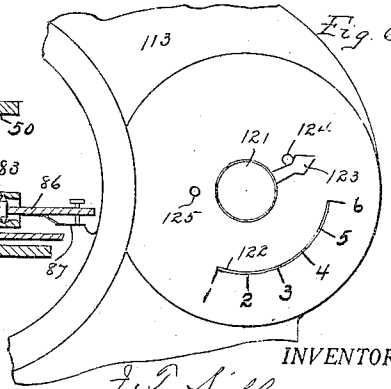
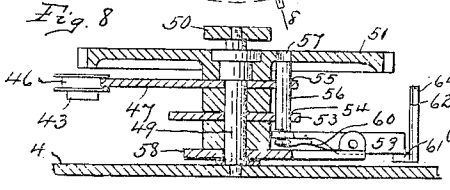


Fig. 8.



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PHONOGRAPH.

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4 SHEETS—SHEET 4.

Fig. 10.

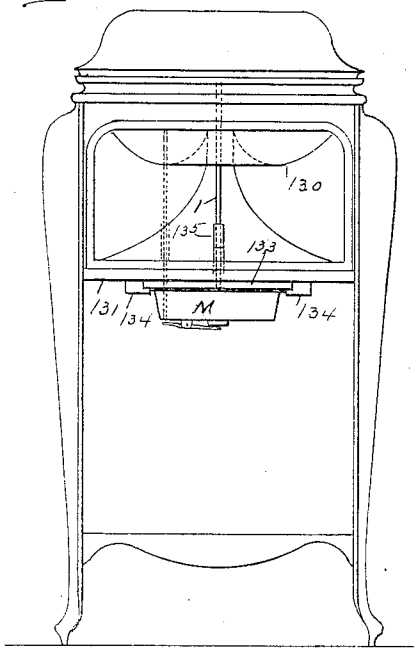


Fig. 11.

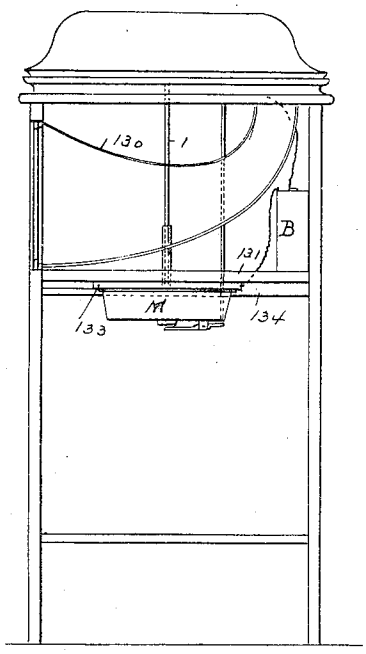
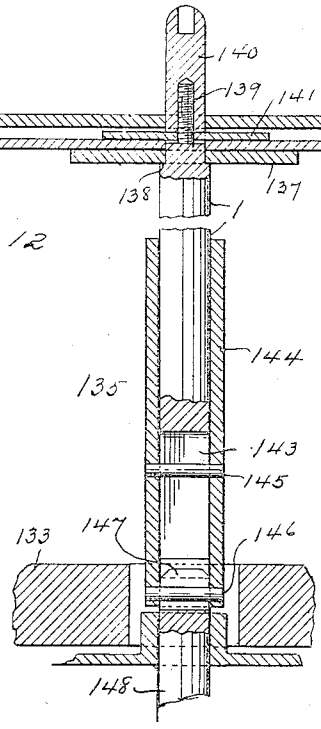


Fig. 12.



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UNITED STATES PATENT OFFICE.

JAMES T. SIBLEY, OF PATERSON, NEW JERSEY.

PHONOGRAPH.

1,371,984. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed November 19, 1917. Serial No. 202,772.

To all whom it may concern:

Be it known that I, JAMES T. SIBLEY, a citizen of the United States, residing in the city of Paterson, county of Passaic, and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

Many more or less successful stop devices for phonograph or talking machine motors have been in use for a considerable time past. These devices almost invariably depend upon automatic brake mechanism, which is set in operation at a predetermined point in the playing of a record, or by engagement of some projecting part of the sound-box with an adjustable arm mounted upon the motor spindle and connected in some way with the brake mechanism. In each of such devices, it is necessary to set or index the mechanism before beginning to play the record; this is usually done by moving the sound-box across the face of the record with the needle immediately adjacent with the inner groove of the record; the sound-box is then moved back to playing position at the beginning of the record, and the motor started. The initial setting of the device is always necessary.

It is the purpose of my invention to provide a stop mechanism for a talking machine motor, which operates, not upon a predetermined setting, but solely upon the completion of the record, regardless of the location of the end of the groove upon the record tablet.

My invention also contemplates the provision of means in conjunction with the stop mechanism for repeating the record two or more times up to six complete repetitions before the stop mechanism becomes effective. It also contemplates the provision of means for an indefinite number of repetitions, depending solely upon the life of the power which drives the motor.

In carrying out my invention, I make use of the structures substantially as described in the following detailed description, and illustrated in the accompanying drawings: Wherein,

Figure 1, is a plan view of so much of a phonograph as is necessary to gain a full understanding of my improvement. In this figure, the turntable is removed to expose the working parts of the stop and repeat mechanism.

Fig. 2, is a section on line 2—2 of Fig. 1.

Fig. 3, is a plan view of the differential mechanism.

Fig. 4, is a plan view, partly in section, of the parts surrounding the base of the tonearm, whereby repetitions from one to six times or more, are made.

Fig. 5, is a section on line 5—5, of Fig. 4. but with the stop arm in a slightly shifted position.

Fig. 6, is a fractional plan view of the cover, showing the index mechanism for setting the device up for repeating.

Fig. 7, is a detail of the stop mechanism.

Fig. 8, is a section on line 8—8 of Figs. 1 and 7.

Fig. 9, is a vertical section on line 9—9, of Fig. 1.

Fig. 10, is a front elevation of a phonograph cabinet, showing the location of the motor within the cabinet.

Fig. 11, is a central vertical section of the cabinet.

Fig. 12, is a vertical section of the driving spindle, showing the means for supporting the turntable thereon, and also the detachable mechanism for coupling the spindle to the driving shaft of the motor.

Similar reference numerals refer to like parts throughout the specification and drawings:

In my prior application Ser. No. 175,565, filed June 19, 1917, I have shown an improved form of an electric motor, and my present invention is designed as an improvement for use in connection with said motor, although the improvement is equally applicable as a stop mechanism for spring motors.

In Fig. 1, the spindle 1, is driven by the electric motor, above referred to, or by the ordinary spring motor. In practice, such spindle projects upwardly through what is usually termed, the motor board 2. In the present case, the board 2 is provided with a large circular aperture 3, into which is fitted the shallow cup-shaped circular support 4, secured in place by the laterally projecting lugs 5, through which the screws 6, are inserted. The spindle 1 is journaled in the bottom of the support 4. Upon the upper end of the spindle, and within the support 4, is the small spiral gear 7. Jour-

naled in bearings 8 and 9, are the sectional shafts 10 and 11, in alinement with each other and connected together by means of the pin 12, the arrangement being such that the shafts 10 and 11, may be rotated independently of each other. The spiral gear 13, is rigidly secured upon the sectional shaft 10, for engagement with the spiral gear 7, so that when the spindle 1 is rotated clockwise, the shaft 10 is rotated in the direction of the arrow 14. Upon the end of the sectional shaft 10, is the sliding male clutch member 15, for engagement with the female clutch member 16, which latter is rigidly secured to the sectional shaft 11. Upon the free end of the sectional shaft 11 is rigidly secured a bevel gear 17, in position for engagement with a segmental bevel gear 18, which latter is rigidly secured to the tonearm 19, through the overhanging sleeve 20.

From the structure, thus far described, it will be seen that when the clutch members 15 and 16 are engaged, the rotation of the spindle 1, will produce a counter-clockwise movement of the tonearm 19; and that when the two clutch members 15 and 16 are disengaged, the tonearm 19 is free to swing in either direction.

The free end of the tonearm is provided with a vertically oscillating section 21, which carries the sound-box 22. The connection between the tonearm 19 and the section 21, consists of the ball 23 fitted into the socket 24, the whole being pivoted for its vertical operation about lateral trunnions or pins 25. The tonearm 19 is pivoted to swing in a horizontal plane in the usual or any preferred manner. I have shown a supporting thimble 26 mounted upon the motor board 2, said thimble being provided with ball bearings 27, running in registering raceways in the interior of the thimble and the adjacent exterior of the tonearm 19. Projecting upwardly from the tonearm section 21, is the arm 28. Projecting upwardly from a point near the vertical axis of the tonearm 19, is a pair of bearing brackets 29, which carry the small sheave 30. At the base of the thimble 26, I provide a pair of brackets 31, projecting inwardly toward the axis of the thimble and carrying at their inner ends, the sheaves 32. To the arm 28 is pivotally secured the U-shaped clevis 33, from which extends the adjustable screw section 34, to a connection 35, and from the said connection the cable or chain 36 passes over the sheaves 30 and 32, and is connected by the collar 37 with the reciprocating rod 38, which latter slides through an aperture 39 in the flange of the support 4. Upon the rod 38 is rigidly secured a collar 40, from which the long contractile spring 41 is led to the hook 42, at the side of the support 4. The collar 40 may be adjusted along the rod 38, to such a point that the strength of the spring 41 will be sufficient to relieve a portion of the weight of the sound-box and oscillating section 21, and yet insufficient to support it independently.

The free end of the rod 38 passes through, and is guided by, an aperture in the free end of the lever 43, which latter is pivoted upon a stud 44, projecting from the bottom of the support 4. The buffer 38′, of rubber is secured to the end of the rod 38, outside of the lever and serves as a stop for the endwise movement of said rod. The strong contractile spring 45, is connected to the support 4 and to the lever 43, in such a position, that when free to act, the spring 45 will oscillate the lever 43, about its pivot, and thus pull the rod 38 endwise, and through the chain or cable 36, raise the section 21 and the sound box 22. The opposite end of the lever 43 carries a small flanged roller 46, which bears upon the edge of an oval cam 47, said cam being provided with a small notch 48 at the end of its major diameter to receive said roller under conditions hereinafter set forth. The cam 47 is rigidly mounted upon a shaft 49, pivoted in the bottom of the support 4, and the upper pivot plate 50. Loosely mounted upon the upper end of the shaft, for independent rotation, is the large spiral gear 51, which latter is driven by the spiral pinion 52 on the shaft 10. On the shaft 49, is also mounted a disk 53, provided with an aperture 54, registering with a corresponding aperture 55, in the oval cam 47. In these two apertures is the vertically reciprocating pin 56, in registering position to enter any one of a series of holes 57, in the spiral gear 51. Projecting from the lower end of the shaft 49, is a laterally extending arm 58, carrying at its free end, the vertically oscillating lever 59, the inner end of which is forked to engage the lower reduced end of the pin 56. From this structure it will be seen that when the lever 59 is vertically oscillated, the pin 56 will enter one of the apertures 57, as the same is presented in registry therewith. If however, the outer end of the lever 59 is elevated, and the inner end lowered, the pin 56 will be withdrawn from the aperture 57 in the gear wheel 51. In order to insure the upward movement of the pin 56, when the lever 59 is released, I provide the arm 58 with a flat spring 60, bearing upon the lower end of the pin 56, to force the same upwardly. Normally, the pin 56 is withdrawn from the aperture 57, and the means for withdrawing said pin consists of a cam 61, secured to the free end of the long flat spring 62, which latter is supported upon the bracket 63, from the bottom of the support 4. Upon the back of the spring 62, the armature 64 is located, in position for engagement with the poles of the electro-magnet 65, whenever the same is

energized. In order that the lever 59 shall always engage the cam 61, I provide a guide 66, substantially concentric with the spiral gear 51, inclining the same gradually from the bottom of the support 4 to the upper face of the cam 61; in fact the cam 61 and the guide 66 are integral. In operation, it will be understood that the spindle 1, rotating clockwise, will communicate its motion through the gears 7 and 13, to the shaft 10, spiral pinion 52, to the spiral gear 51, so as to rotate it clockwise. If the parts are in the position illustrated in Figs. 1 and 8, the spiral gear 51 will be rotated while the shaft 49 and the other parts mounted thereon remain stationary. If however, the magnet 65 is energized, the cam 61 is withdrawn from the lever 59, whereupon the spring 60 will force the pin 56 upwardly against the under face of the rotating spiral gear 51, until such time as the pin 56 shall enter one of the apertures 57. This serves to lock the rotating spiral gear 51 and the cam 47 together, and thereafter they rotate together. But the rotation of the cam 47 carries the notch 48, free from the convex face of the roller 46, whereupon the spring 45 pulls the lever 43, so that the roller 46 follows the contour of the cam 47.

Connected to the upper face of the lever 43, is the rod 67, leading to the oscillating clutch lever 68, the free end of which is bifurcated, and extends into the groove 69, in the clutch member 15. In order to provide a strong but yielding connection between the lever 43 and the clutch lever 68, I mount upon the rod 67 a pair of springs 70 and 71, between the collars 72 and 73, and upon each side of the lever 68.

Let it be understood that the mechanism, thus far described, is in full operation with the cam 61 in the position shown in Fig. 1. Now upon energizing the magnet 65, the cam 61 will be withdrawn from the lever 59, whereupon the cam 47 will be locked to the rotating spiral gear 51, and rotate with it. As the cam 47 rotates slowly clockwise, the spring 45, by its superior contractile force will cause the roller 46 to hug the contour of the cam 47, during the revolution thereof, so that the lever 43 will swing upon its pivot slowly, and carry with it the rod 38 longitudinally. But since the rod 38 is connected to the chain or cable 36, the section 21 of the tonearm, together with the sound-box 22, will be lifted vertically from the record tablet.

Simultaneously with the operation just described, the rod 67 will be moved endwise and carry with it the clutch lever 68, thereby shifting the clutch member into engagement with the clutch member 16, and thereby connecting the shaft 10 with the shaft 11. But the rotation of the shaft 11 will cause a horizontal swing of the tonearm through the bevel gear connections 17 and 18. The gear ratio is such that by the time the spiral gear 51 and the cam 47 have made a complete revolution, so as to bring the notch 48 back into engagement with the circumference of the roller 46, the tonearm 19 will have been swung so as to carry the sound-box completely clear of the turntable, and as the roller 46 begins to ride upon the increasing diameter of the cam 47, the lever 43 will gradually swing back into the position shown in Fig. 1, thereby permitting the rod 38 and the cable 36 to move longitudinally, and thereby lower the tonearm section 21 and the sound-box 22. The longitudinal movement of the rod 38 is utilized to break the circuit from the source of electric supply, not only to the magnet 65, but also to the motor M, which drives the spindle 1, in a manner to be described.

The shaft 10 is provided with a worm 74 of very fine pitch for engagement with a worm wheel 75 mounted upon a shaft 76, the latter being supported in bearings, one in the bottom of the support 4 and the other in the plate 50. The shaft 76 has the spur gear pinion 77 rigidly secured to its lower end for engagement with a spur gear 78, the latter loosely mounted to rotate upon a shaft 79, in bearings in the plate 50 and support 4. Upon the upper end of the shaft 79 the spiral pinion 80 is rigidly secured in position for engagement with the spiral gear 81, the latter rigidly mounted upon and rotating with the shaft 11. Upon the shaft 79, I mount the collector ring 82, insulating the same from the shaft. Bearing upon this collector ring is a collector brush 83, supported upon and insulated from the shaft bearing 84; in fact the shaft bearing 84 may be made of insulating material, so that the brush 83 may be insulated from the other metallic parts of the structure. Rigidly secured to the lower end of the shaft 79, to rotate therewith, is the supporting arm 85, which latter extends radially away from the shaft 79 and carries upon its outer end the pivoted contact arm 86, said arm having an outwardly extending projection carrying the adjustable friction spring 87 for engagement with the face of the spur gear 78. The inner end of the contact arm 86 extends tangentially to the collector ring 82, and is provided with an adjustable contact 88 in position to engage the face of said collector ring.

From the description thus far given, with the motor in operation and with the tonearm 19 swinging across the face of the record propelled by the record groove, it will be seen that the shaft 79 is rotated by the shaft 11 in a clockwise direction. The spur gear is also rotated, receiving its motion from the shaft 10 through the worm 74 and worm wheel 75. The rotational ratios are so cal-

culated that the shaft 79 rotates slightly faster than the spur gear 78, with the result that the friction spring 87 drags upon the face of the spur gear 78, thereby swinging the arm 86 with its contact 88 free from the collector ring 82. If for any reason, as for example, the stopping of the swing of the tonearm 19 the rotation of the shaft 11 is stopped, then the shaft 79 will be stopped, but the spur gear 78 continues to rotate and its frictional engagement with the spring 87, causes said spring to drag with a consequent swing of the contact arm 86 to bring its contact 88 into metallic contact with the collector ring 82.

Upon the board 2, adjacent to the base of the tonearm 19, I locate a block of insulating material 89, upon which is mounted the pivoted switch arm 90, with its free end in position for engagement with the collar 37 upon the rod 38. Adjacent to the switch arm 90 is a contact piece 91, so arranged that upon the reciprocation of the rod 38, through the means hitherto described, the switch arm 90, through the influence of the contractile spring 92 is made to open and close contact with the piece 91.

Upon the shaft 76 is mounted a three tooth ratchet 93 in frictional engagement with the under surface of the worm wheel 75, such engagement being maintained by the coil spring 94 which surrounds the shaft 76, and bears against the upper face of the spur pinion 77 and the under face of the ratchet 93. Pivotally mounted upon the lever 43 is a spring pawl 95 with its upturned free end in position for engagement with the teeth of the ratchet 93. Beneath the lever 43, and secured to the bottom of the support 4, is a block of insulating material 96, upon the sides of which are secured the contact springs 97 and 98, their free ends being in position for engagement with each other, but with their normal tendency to separate. Upon the pawl 95, is a block of insulating material 99, in position to engage the contact spring 98 and press it into engagement with the spring 97. The friction between the ratchet 93 and the worm wheel 75 is sufficient to cause the teeth of the ratchet to press the pawl 95 with sufficient force to normally maintain the contact between the springs 97 and 98.

The source of electric supply B, may be a series of dry battery cells and the circuits therefrom may be traced as follows: The wire 100 leads from the battery to the actuating motor M, which drives the spindle 1, the circuit continues through the wire 101, leading to the switch 90, the circuit being completed through the contact piece 91 and wire 102 back to the battery. A parallel circuit for energizing the magnet 65 may be traced as follows: The wire 103 leads to the magnet 65, thence the wire 104 leads to the contact spring 97. The wire 105 leads from the contact spring 98 to the brush 83, the circuit being completed through the collector ring 82, the contact arm 86, when its contact is in engagement with said ring; thence through the metal of the shaft 79, support 4, wire 106 to the switch 90, the circuit being completed when the switch 90 is closed, through the contact piece 91 and wire 102 to the battery.

The position of the parts illustrated in Fig. 1, is that assumed when the tonearm is swung free from the record and the overhanging weight of the sound-box 22 and tonearm section 21 is permitted to pull the rod 38 forward, so as to permit the collar 37 to break the contact between the switch 90 and the contact piece 91. If, now, the sound-box 22 and tonearm section 21 are elevated the contractile spring 41 will pull the rod 38 endwise and permit the spring 92 to close the switch 90, and since the circuit through the motor is completed, it will start and thus drive the spindle 1 and carry with it the turntable; the sound-box may then be lowered upon the record and the playing will continue until the sound-box needle shall have reached the innermost record convolution. During this period the movement of the tonearm 19 will be communicated through the shaft 11, to the shaft 79. Simultaneously the spur gear 78 will rotate in the same direction, but at a rate slightly less than the rate of rotation of the shaft 79, with a consequent frictional drag upon the spring 87 sufficient to hold the contact 88 free from the ring 82. There is consequently no current accessible to the magnet 65. When the stylus needle reaches the innermost record groove, there will be no further traverse movement for the tonearm 19, and in consequence the rotation of the shaft 11 will be arrested and with it the rotation of the shaft 79. The friction drag between the spur gears 78 and the friction spring 87 now becomes effective to close the contact 88 against the collector ring 82 and thereby close the circuit from the battery B, through the magnet 65. Instantly the armature 64 is attracted to the magnet thereby withdrawing the cam 61 from the lever 59, and permitting the spring 60 to press the rod 56 either into one of the apertures 57 of the spiral gear 51, or against the under face of said spiral gear only to await its revolution sufficiently to permit one of said apertures to register with the pin 56. Thereupon the cam 47 is locked to and rotates with the spiral gear 51, but the rotation of the cam 47, hitherto described, releases the lever 43 and permits the powerful contractile spring 45 to swing said lever and pull with it the rod 38, whereby the tonearm section 21 is elevated free from the record. At the same time the movement of the lever 43 sets the

clutch members 15 and 16, thereby causing the shaft 11 to rotate with the shaft 10, and thus swing the tonearm free from the record. During this swinging of the tonearm the cam 47 is slowly rotated, and when it has made a complete revolution, the lever 43 will be restored to the position shown in Fig. 1, and since there is nothing to support the overhanging weight of the tonearm section 21 and sound-box 22, except the comparatively weak spring 41, they will drop to their lowermost position, and sufficient to pull the rod 38 and the collar 37 into the position shown and thereby break the contact between the switch 90 and contact piece 91.

When the lever 43 is swung upon its pivot 44, under the influence of the spring 45, the pawl 95 will be withdrawn from engagement with the tooth of the ratchet 93; whereupon the pawl 95 will be swung upon its pivot under the influence of the spring 107, thereby permitting the separation of the springs 97 and 98. This effectually breaks the circuit through the magnet 65 and it cannot be restored until such time as the lever 43 shall have been returned to the position shown in Fig. 1, and also the ratchet 93 shall have rotated along with the worm 75 to bring the next tooth into contact with the pawl 95; then of course the frictional engagement between the ratchet wheel 93 and worm wheel 75 will cause the pawl 95 to be pressed with its insulation 99 against the spring 98, so as to close contact with the spring 97. The interval between the breaking of the engagement between a ratchet tooth and the pawl 95, and the next engagement thereof, is timed by the gear ratios to be about one minute. During this period, the tonearm 19 may be swung back and forth across the face of the record or held stationary, without fear of closing the circuit through the magnet 65, because of the differential movement between the friction spring 87 and the face of the spur gear 78. The break in the circuit being between the springs 97 and 98 makes the closing of the contact 88 against the collector ring 82 for the time being ineffective. This interval may be utilized for changing records upon the machine while the motor is still running, or for any other purpose.

I have found in practice, that if for any reason the reverse swing of the tonearm 19 is arrested short of its complete movement while the cam 47 is locked to the spiral gear 51, such spiral gear will continue to rotate, and as the cam 47 continues its rotation the lever 43 is restored while the rod 38 and cable or chain 36 are released to permit the sound-box 22 and tonearm section 21 to fall. If the sound-box needle under such conditions drops back upon a record groove the tonearm 19 will again begin to traverse the record and the selection will be repeated. I have made use of this particular feature in order to provide mechanism whereby a record may be repeated one, two or more times, or continuously repeated until the motive power shall have been completely exhausted, whether that power be a spring motor or an electric motor, such as described in my above entitled application. In order to accomplish this very desirable result, I employ the following mechanism: Upon the overhanging sleeve 20, which is rigidly secured to the tonearm 19, I secure the adjustable ring 108, providing for its circumferential adjustments by the set screw 109. From this ring the downwardly and laterally projecting arm 110 extends radially away from the tonearm. As the tonearm swings laterally this arm 110 will swing with it. At the outer end of the arm 110 I locate a small friction roller 111. In the path of the roller 111 I locate a disk 112, rotatably mounting the same upon the under face of the cover plate 113, which latter is utilized to inclose the working parts surrounding the base of the tonearm 19. On the under face of the disk 112 I provide a groove 114, making the same arcuate with the center of rotation of the tonearm 19 as its center of curvature. The disk 112 may be rotated upon its center so as to bring the solid circumference of the disk in the path of the roller 111, or it may be turned to the position illustrated in Fig. 4, in which position the roller 111 will find an unobstructed passage through the groove 114. Upon the upper face of the disk 112, I locate a series of five or more pins 115 spaced apart and in position to be engaged by the spring pawl 116, the latter being pivotally secured to an arm 117 projecting laterally from the overhanging sleeve 20. In order to retain the disk 112 in any set position, I provide a series of notches 118 in its upper edge, for engagement with a curved spring 119, secured to the adjacent lug 120 upon the under face of the cover 113.

The making of the ring 108 adjustable circumferentially upon the sleeve 20 is for the purpose of taking care of records of different diameters, for it is obvious that the reverse swing of the tonearm 19 must be less for a ten inch record than for a twelve inch record, so that in playing ten inch records the ring 108 will be so adjusted that the roller 111 will just contact the solid circumference of the disk 112, when the tonearm is in position to begin playing the record. This of course, is equally true when playing twelve inch records.

Upon the upper face of the cover 113, and concentric with the turning knob 121, I locate a dial 122 and secure to the turning knob 121 a pointer 123. If now, the disk 112 is turned so that the pointer 123 is any-

where between the stop pin 124 and the first division of the dial, the first of the pins 115 upon the upper face of the disk will be in position to be engaged by the spring pawl 116 upon the reverse swing of the tonearm, and thereby the disk 112 will be carried one step ahead, so as to bring the groove 114 into registry with the swing of the roller 111, so that the tonearm is free to turn to the end of its swing as heretofore described and set in motion the stop mechanism. If the index pointer 123 is swung to the second division on the dial, the second of the pins will be brought into position for engagement with the spring pawl 116, while at the same time the solid portion of the disk 112 will be interposed against the advance of the roller 111, whereupon the tonearm will be arrested and the cycle will be repeated by the turning of the disk 112 and repeating the rendition of the record twice. Likewise if the stop is turned to the third, fourth, fifth or sixth divisions on the dial, the selection will be repeated, three, four, five or six times as the case may be; while if the pointer 123 is swung around against the stop pin 125, all of the pins 115 will be swung completely clear of the path of the pawl 116 and there will be nothing of the mechanism to engage the disk 112 to rotate it; with the result that with each reverse swing of the tonearm, the roller 111 will contact with the solid portion of the disk 112 and a continuous repetition of the record.

In Figs. 10 and 11, I have shown a form of cabinet and motor support adapted to carry out the particular features of my present invention to best advantage. The cabinet may be of any usual or preferred type wherein the sound amplifier 130 leads from the tonearm to the front opening and beneath the usual location of the motor. The space below the amplifier 130 is divided by the horizontal partition 131, so as to provide a receptacle for records. I prefer to utilize the partition 131 as a support for the electric motor M, said motor being mounted upon the board 133 and carried in the ways 134 upon the under side of the partition. The driving spindle 1 leads from the upper board 2, as illustrated in Fig. 1, down through the amplifier 130, and is provided with a telescoping connection 135 with the central shaft of the motor M, which in the present case is the motor described in my aforementioned prior application. In Fig. 12, I have illustrated the details of this spindle connection. The turntable 136 is supported upon the upper end of the spindle 1 by means of a washer 137 which rests upon the shoulder 138 of the spindle. The upper end of the spindle 1 is provided with a screw threaded extension 139, to receive the cap piece or extension 140, which is screwed down upon the washer 141 and thus holds the turntable 136 rigidly in place. The felt pad 142 may be then placed upon the top of the turntable and secured in any desired manner. As above indicated, the spindle 1 extends down through the amplifier 130 and is provided with an open ended slot 143. The sliding sleeve 144 is fitted to the lower end of the spindle 1 and is provided with a pair of cross pins 145 and 146, the pin 145 sliding in the slot 143, while the pin 146 is inserted in a corresponding slot 147 in the upper end of the motor shaft 148. In this manner the motor shaft 148 may be easily connected to and disconnected from the spindle 1, by simply lifting the sleeve 144 so as to free the pin 146 from the slot 147. In this manner the motor M, may be readily detached by sliding the same together with the motor board 133 forward and free from the ways 134. It may then be inspected or repaired and returned to place and the connecting sleeve 144 restored, as above described, when the mechanism will be ready for operation.

The placing of the motor M at a considerable distance from the turntable, as above described, serves a very important purpose in phonograph construction. Motors of all types are not absolutely noiseless, and the placing of the motor in close proximity to the sound reproducing and amplifying means only serves to blend the motor noises with the sound reproduction and amplify both accordingly. The location of the motor at as remote a point from the point of sound reproduction as possible is therefore desirable. Moreover, the placing of the motor in the position described affords a more ready method for detaching the same for inspection and repair.

From the above description it will be seen that I have provided a comparatively simple mechanism for stopping and starting the motor, and for repeating the rendition of phonograph selections a predetermined or an indefinite number of times. It will also be seen that the automatic means for stopping the motor does not depend upon an initial setting of the stop mechanism, but rather upon the change in the differential rate of rotation of two parts; one governed by the continuous rotation of the turntable spindle, and the other governed by the swinging horizontal movement of the tonearm, the stopping of which in its horizontal movement at the end of a record, no matter where that end may occur upon the face of the record, serves to vary the differential of such rotating parts and thereby automatically set in operation the stop mechanism.

Occasions may arise when it would be desirable to stop the playing of a record before its completion. This may be readily accomplished by leading the wire 150, from the wire 102, to the wire 104, through the

push-button switch 151. Whenever this switch is closed, the magnet 65 will be energized, and the cycle of operations hitherto described will be automatically performed, without the closing of the contact 88, upon the ring 82.

I claim:

1. In a phonograph, the combination of a horizontally swinging tonearm having a vertically movable sound-box pivoted at its free end, and a motor driven turntable carrying a sound record thereon, means actuated by the cessation of the swing of said tonearm due to the completion of the playing of said record, for elevating said sound-box, swinging said tonearm to initial position, and thereafter lowering said sound-box, and stopping the rotation of said turntable.

2. In a phonograph, the combination of a spindle having a turntable mounted thereon, means for rotating said spindle and turntable, a swinging tonearm having a sound-box section pivoted thereto for vertical oscillation, interconnecting means between said spindle and said tonearm, actuated by the stopping of the swing of said tonearm in one direction, first to elevate said sound-box section, then to swing said tonearm in the opposite direction to initial position thereafter to lower said sound-box section and finally stop said spindle rotating means.

3. In a phonograph, the combination of a rotating spindle, and a horizontally swinging tonearm, a shaft driven by said spindle, a shaft normally driven by said swinging tonearm in a direction opposite to that of said first named shaft, means for coupling said shafts together whereby said spindle driven shaft will produce a reverse swing of said tonearm.

4. In a phonograph, the combination of a motor driven spindle, a shaft driven thereby, a swinging tonearm, a shaft having a gear connection with said tonearm to be driven thereby, means for coupling said shafts together, to produce a reverse swing of said tonearm.

5. In a phonograph, the combination of a motor driven spindle carrying a record supporting turntable, a swinging tonearm and sound-box, a shaft driven by said spindle, a shaft normally rotated by said swinging tonearm, and means for coupling said shafts together and thereby produce a reverse swing of said tonearm.

6. In a phonograph, the combination of a turntable for supporting a sound record, a vertical motor driven spindle for rotating said turntable, a horizontally swinging tonearm having a sound-box connected therewith for vertical oscillation, and for engaging said sound record to traverse the same, interconnecting means between said spindle and tonearm, actuated by the stopping of the horizontal swing of said tonearm upon the completion of the record to elevate said sound-box from said record, reversely swing tonearm to initial position and permit said sound-box to be lowered to a point below normal playing position, and means actuated by the lowering of said sound-box for stopping said motor driven spindle.

7. In a phonograph, the combination of a vertical motor driven spindle, a horizontal shaft geared to said spindle, a horizontally swinging tonearm, a horizontal shaft driven by said tonearm, in alinement with said spindle-driven shaft, and clutch connections upon the adjacent ends of said shafts for coupling the same together whereby to produce a reverse swing of said tonearm.

8. In a phonograph, the combination of a vertical motor driven spindle, a horizontal shaft geared to said spindle, a horizontally swinging tonearm, a horizontal shaft driven by said tonearm, in alinement with said spindle-driven shaft, clutch connections upon the adjacent ends of said shafts for coupling the same together, and means actuated by the stopping of the normal swing of said tonearm for setting said clutch connections, whereby to produce a reverse swing of said tonearm.

9. In a phonograph, the combination of a vertical motor driven spindle, a horizontal shaft geared to said spindle, a horizontally swinging tonearm, a horizontal shaft driven by said tonearm, in alinement with said spindle-driven shaft, clutch connections upon the adjacent ends of said shafts for coupling the same together, and differential friction mechanism actuated by the stopping or checking of said tonearm driven shaft, whereby to produce a reverse swing of said tonearm.

10. In a phonograph, the combination of a motor driven spindle, a sound record carried thereby and a swinging tonearm propelled by the rotation of said record, a pair of rotating contacting friction elements, one driven by said spindle and the other driven at a slightly greater speed by said tonearm, and means actuated by arresting the rotation of said latter element, due to the stopping of the normal swing of said tonearm upon the completion of a record and the continued rotation of the spindle driven element in contact with the tonearm driven element for stopping said motor driven spindle.

11. In a phonograph, the combination of a rotating, motor-driven spindle, a friction element driven thereby, with swinging tonearm, a friction element driven thereby in contact with, but at different speed from, said first named friction element, and means

actuated by a variation of the differential of said speeds, for producing a reverse swing of said tonearm, and thereafter stop said motor-driven spindle.

12. In a phonograph, the combination of a motor-driven spindle, a friction element rotated thereby, a swinging tonearm, a friction element rotated thereby in contact with but at a higher rate than said first named element, and means actuated by a reduction of the speed of said second named friction element below the speed of said first named friction element for producing a reverse swing of said tonearm, and finally stopping said spindle.

13. In a phonograph, the combination of a motor-driven spindle, a friction element rotated thereby, a swinging tone arm, a friction element rotated thereby in contact with but at a higher rate than said first named element, means actuated by a reduction of the speed of said second named friction element below that of said first named friction element for producing a reverse swing of said tonearm, and means interposed in the reversal path of said tonearm to arrest the same, and means actuated by the stopping of the swing of the tonearm for producing a repetition of its forward swing.

14. In a phonograph, the combination of a rotating motor-driven spindle, a friction element driven thereby, a swinging tone arm having a friction element driven thereby in contact with but at a different speed from said first named element, means actuated by a variation of the differential of said speeds for producing a reverse swing of said tonearm, and means interposed in the reversal path of said tonearm to arrest the same and means actuated by the stopping of the swing of the tonearm for producing a repetition of its forward swing.

15. In a phonograph, the combination of a rotating spindle having a turntable driven thereby for rotating a sound record, a horizontally swinging tonearm and sound box normally propelled across said record by same, means actuated by the cessation of the forward swing of said tone arm for reversing the same to initial position to stop the rotation of said spindle, and means for interrupting said reverse swing before said initial position is reached and for automatically causing a repetition of the forward swing of said tonearm.

16. In a phonograph, the combination of a horizontally swinging tonearm having a vertically movable soundbox at its free end, a motor driven turntable carrying a sound record thereon, means actuated by the cessation of the swing of the tonearm due to the completion of the playing of the record for elevating the sound box and swing said tone arm to initial position to stop the motor, means for interrupting said reverse swinging before said initial position is reached and means for automatically lowering said sound box upon the record and for causing a repetition of the forward swing of the tonearm to repeat the playing of the record.

17. In a phonograph, the combination of a vertical motor-driven spindle, a horizontally swinging tonearm, a horizontal shaft driven by said tonearm, a horizontal shaft geared to said spindle, said shafts being in axial alinement and having clutch connections upon their adjacent ends for coupling the same together, means actuated by the stopping of the normal swing of said tonearm for setting said clutch connections to produce a reverse swing of said tonearm to initial playing position and for causing said soundbox to be lowered upon the record to automatically repeat the playing of the record.

18. In a phonograph, in combination with means for reproducing a sound record, including a swinging tonearm and means for automatically reversing the swing thereof, of a radial arm upon said tonearm, a disk in the normal path of said radial arm, said disk having a plurality of pins upon its upper face and an arcuate groove in its lower face, a spring pawl upon said tonearm in position to consecutively engage said pins upon each reverse swing of said tonearm and thereby rotate said disk upon its axis and thereby to bring said groove into registry with said radial arm to permit the same to pass through said groove, and means for arresting and stopping the swinging of said tonearm whenever said radial arm shall have traversed said groove.

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