Oct. 28, 1941. J. J. HOEHN 2,260,319

PHONOGRAPHIC APPARATUS

Filed Nov. 30, 1939 2 Sheets-Sheet 1

Fig. 1.

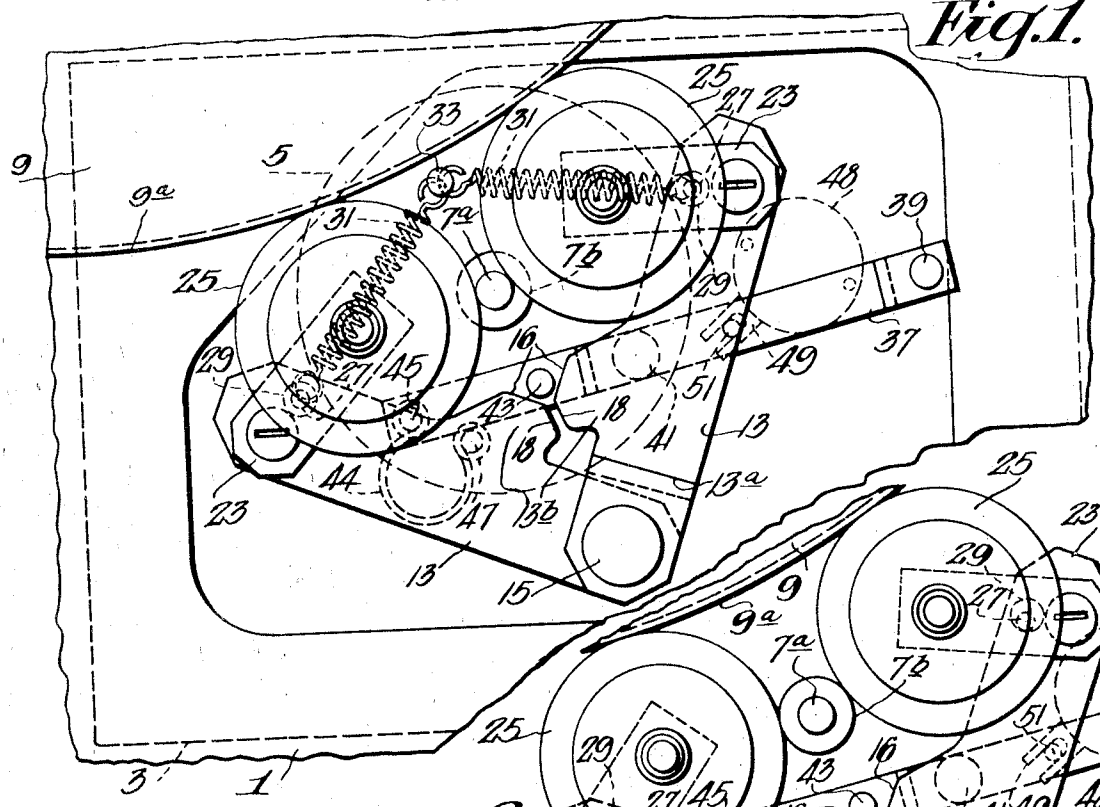
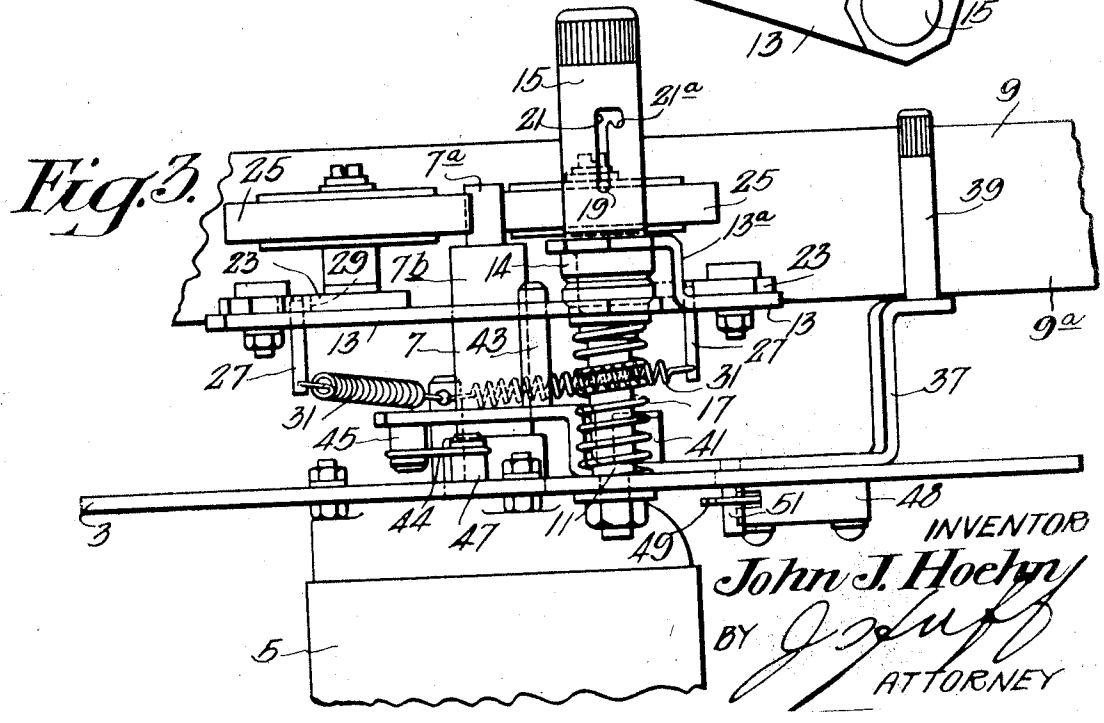


Fig. 2.

Fig. 3.



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Fig. 4.

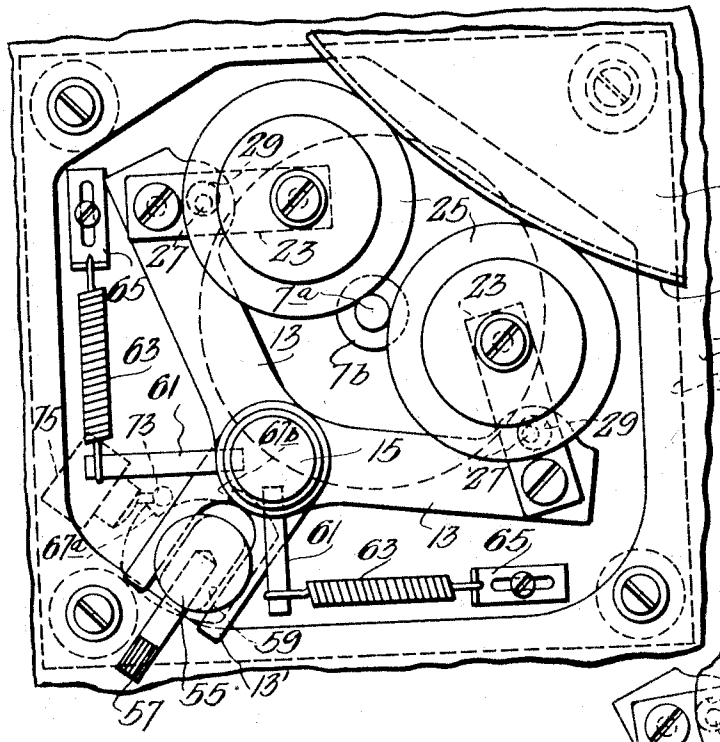


Fig. 5.

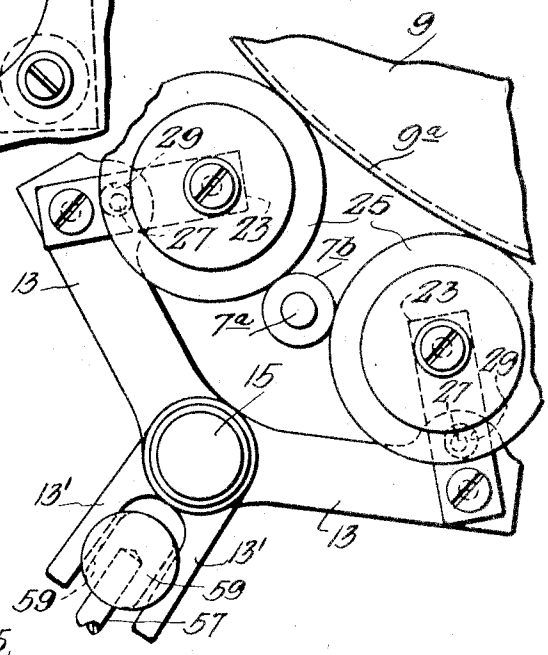
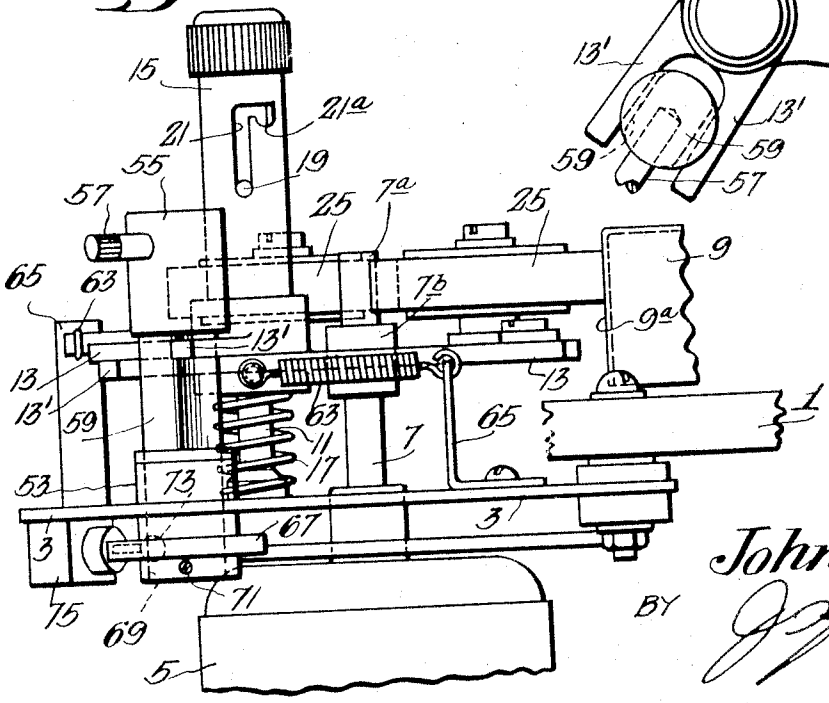


Fig. 6.



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UNITED STATES PATENT OFFICE

2,260,319

PHONOGRAPHIC APPARATUS

John J. Hoehn, Indianapolis, Ind., assignor to Radio Corporation of America, a corporation of Delaware

Application November 30, 1939, Serial No. 306,832

8 Claims. (Cl. 74—192)

This invention relates to phonographic apparatus, and more particularly to the turntable driving mechanism thereof, the present invention being an improvement over that disclosed and claimed in the copending application of Raymond F. Brady and Paul Weathers, Serial No. 260,282, filed March 7, 1939, and assigned to Radio Corporation of America.

In the aforesaid application, there is disclosed a turntable driving mechanism comprising a motor having a drive shaft formed with a stepped pulley between which and the turntable rim a floating idler wheel may be interposed to transmit torque from the motor shaft to the turntable at one or another of two speeds, as may be desired, the drive mechanism constituting a part of phonographic apparatus which may be used both for recording sound on a blank disc and then playing the recorded disc back. While this drive mechanism is very satisfactory for the transmission of torque to the turnable, one of the weaknesses inherent in a system of this kind is that the speed of the turntable is reduced in direct proportion to the friction or load which is applied to the turntable. This loss in speed is not due to the frictional losses or slippage between the idler wheel and the turntable but is caused partly by the displacement or stretching of the rubber of the rubber-tired idler at the periphery of the idler pulley where it engages the motor shaft. Since the drag on the turntable exerted by the reproducing stylus of a pick-up device is much smaller than that exerted by the recording or cutting stylus in recording sound upon a disc, the displacement of the rubber on the idler pulley is greater during the recording process that it is when the record is being reproduced.

The primary object of my present invention is to provide an improved driving mechanism for the turntable of the type set forth above by means of which the foregoing difficulties will be obviated.

More particularly, it is an object of my present invention to provide an improved turntable driving mechanism as aforesaid by means of which the speed differential between the recording and reproducing speeds of the turntable is minimized.

Another object of my present invention is to provide an improved turntable drive mechanism of the type set forth above which is smooth in operation and which operates at great efficiency both during recording and reproduction.

A further object of my present invention is to provide an improved turntable driving mechanism of the type set forth wherein the pressure loading against the motor pulley or shaft is approximately balanced, thereby reducing the one-sided bearing loading in the motor which is inherent in the driving mechanism disclosed in the aforementioned copending application.

It is also an object of my invention to provide an improved driving mechanism as set forth above in which the load on the frictional idlers is greatly reduced, thereby resulting in increased life thereof.

Still another object of my present invention is to provide an improved turntable driving mechanism as above described which is simple in construction, which is easy to manipulate in changing speeds, and which is relatively inexpensive in cost.

In accordance with my present invention, I provide a second idler pulley or friction wheel between the driving motor shaft and the turntable and mount this friction wheel on a separate lever arm symmetrically opposite to the conventional single idler pulley relative to the motor driving shaft. The transmitted load is thus divided between the two idler pulleys. Separate tension springs may be employed, one for each idler or friction wheel, to hold the two friction wheels in engagement with the single motor shaft and the turntable. A single control lever which is common to both of the friction idler supporting arms is arranged to effect a camming action upon said arms to move them away from torque transmitting position. This control lever may also be made to operate a switch in circuit with the driving motor. When the arms which support the friction wheels are in separated relation, that is, in "open" position, these levers, together with their friction wheels, may be shifted longitudinally along the motor shaft by means of an adjusting knob to bring the friction wheels opposite preselected portions of the driving motor shaft corresponding to the respective speeds at which it is desired to operate the turntable.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof, will best be understood from the following description of several embodiments thereof, when read in connection with the accompanying drawings, in which

Figure 1 is a plan view of one form of my invention adjusted for operation at a relatively slow speed, for example, 33⅓ R. P. M.

Figure 2 is a similar fragmentary view (certain of the parts being omitted for the sake of clearness) showing the coupling idlers in the position to drive the turntable at a relatively high speed, for example, 78 R. P. M.

Figure 3 is a side elevation of this form of my invention with the parts corresponding to the position shown in Figure 1, and

Figures 4, 5 and 6 are, respectively, views similar to Figures 1, 2 and 3 but showing a somewhat different form of my invention.

Referring more particularly to the drawings, wherein similar reference characters represent corresponding parts throughout, there is shown a motorboard 1 to which is secured a motor plate 3 carrying a motor 5. The motor plate 3 is provided with an opening through which extends the motor shaft 7, the latter being formed with a relatively small diameter driving portion 7a at its upper extremity and a relatively large diameter driving portion 7b immediately below the portion 7a. Above the motorboard 1 is mounted in conventional manner a turntable 9 having an annular rim or flange 9a.

Fixed to the motor plate 3 is a post 11 (see Fig. 3) on which are pivotally carried a pair of supporting levers or arms 13, one of the arms being formed with a bend 13a therein so that the free ends of the arms 13 are both on the same level, as clearly shown in Fig. 3. A tubular member 15, which is rotatably and slidably mounted on the post 11, rests on a collar 14 to which the two levers 13 are connected, and a coil spring 17 which surrounds the post 11 constantly urges the levers 13 and the tubular member 15 to an elevated position. A pin 19 secured to the post 11 cooperates with a bayonet slot 21 in the tubular member 15 to limit the movement of the member 15 on the post 11.

Pivotally mounted on each of the levers 13 is another lever 23 on the free end of which is rotatably mounted a rubber-tired friction wheel or idler 25 which acts as a coupling idler between the shaft 7 of the motor and the turntable flange 9a. Each of the levers 13 has a pin 27 thereon which fits up into an opening 29 in the associated lever 23 to limit the movement of the levers 23 with respect to the levers 13. A pair of tension springs 31, each having one end secured to a post 33, which is fixed on the motor plate 3, and having their other ends secured to the lower ends of the downwardly extending pins 27 on the lever arms 13, serve to constantly urge the supporting arms 13 into a position such that the friction wheels 25 will engage the motor shaft 7 and the turntable flange 9a. Since the levers 23 are free to float on the supporting arms 13 within the limits determined by the pins 27 and the openings 29, the friction wheels 25 will both be able to center themselves between the turntable periphery and the motor shaft. The parts are so arranged that, when the friction wheels 25 are in torque transmitting position, that is, in engagement with both the motor driving shaft 7 and the turntable periphery 9a, as clearly shown in Figs. 1 and 2, the friction wheels are symmetrically disposed on opposite sides of the motor shaft 7 with respect to a line joining the axes of the motor pulley 7 and the post 11.

Each of the supporting levers 13 is provided with a lateral extension 13b formed with a cam edge 16 and a side edge 18, the edges 18 being in substantially parallel relation when the lever arms 13 are in the positions shown in Figs. 1 and 2. A control lever 37 having an upwardly extending operating handle 39 is pivotally mounted on a post 41 fixed to the motor plate 3 and is provided with an upwardly extending pin 43 which occupies a position midway between the cam edges 16 of the supporting arms 13. When it is desired to effect disengagement of the idler pulleys 25 from the motor shaft 7, the handle 39 is manipulated to move the control lever 37 in a counter-clockwise direction, as viewed in Figs. 1 and 2, whereupon the pin 43 is forced down along the cam edges 16 to cam the two supporting levers 13 away from each other, and thereafter in between the substantially parallel edges 18 to hold the arms 13 in separated relation and the friction wheels 25 out of engagement with the turntable flange 9a and the motor shaft 7. To reengage the idler wheels 25 with the motor shaft and the turntable, it is merely necessary to move the control lever 37 back in a clockwise direction, whereupon the pin 43 is withdrawn from between the edges 18 and the springs 31 pull the supporting arms 13 toward each other until the idler pulleys 25 are in firm engagement with the motor shaft 7 and the turntable flange 9a.

To drive the turntable at 33⅓ R. P. M., the cylindrical sleeve 15 is permitted to remain in its most elevated position, as shown in Fig. 3, with the pin 19 engaging the lowermost extremity of the slot 21. All this time, of course, the lever 37 must be in its most counter-clockwise position so that the friction wheels 25 will be clear of the motor shaft 7. With the sleeve 15 in its most elevated position, the spring 17 will hold the supporting arms 13 in a position such that the friction wheels 25 are opposite the small diameter portion 7a of the motor shaft 7. Hence, when the control lever 37 is moved to its most clockwise position, as shown in Fig. 1, the springs 31 will immediately draw the arms 13 toward each other so that the friction wheels 25 will be brought into engagement with the small diameter portion 7a of the motor shaft 7 and the peripheral flange 9a of the turntable. An over-center spring 44 having one end connected to a downwardly extending post 45 on the control lever 37 and its other end connected to an upwardly extending post 47 on the motor plate 3 serves to releasably lock the control lever 37 in either one or the other of its extreme positions, as above described.

When it is desired to drive the turntable 9 at 78 R. P. M., the control lever 37 is again moved counter-clockwise on its pivot post 41 until the over-center spring 44 holds the lever 37 in its extreme counter-clockwise position, at which time the pin 43 will have been wedged in between the edges 18 to separate the arms 13, and thus hold the friction idiers 25 out of engagement with the motor shaft 7 and the turntable flange 9a and clear of even the largest diameter of the motor shaft 7. At such time, the cylindrical sleeve 15 may be pressed downwardly as far down as it will go against the action of the spring 17 and then turned slightly clockwise, as viewed in Figs. 1 and 2, so that the portion 21a of the bayonet slot 21 will be brought into engagement with the pin 19. This brings the friction wheels 25 down to the level of the large diameter portion 7b of the motor shaft, and when the control lever 37 is next returned to the position shown in Fig. 2, the coupling idlers 25 will be brought into engagement with the driving shaft portion 7b and with the turntable periphery 9a under the influence of the coil springs 31.

The circuit to the motor 5 is preferably controlled by means of a toggle switch 48 which has

a forked operating lever 49. A pin 51 on the control lever 37 extends down through an opening in the motor plate 3 and is received by the forked lever 49. Thus, when the control lever 37 is moved to its extreme counter-clockwise position, the switch lever 49 is caused to move to a position to open the switch 48 and thereby break the motor circuit, whereupon the motor shaft 7 ceases rotation. However, when the control lever 3 is moved to its extreme clockwise position, it will automatically move the switch lever 49 to a position to close the circuit of the motor 5 and thereby once more automatically effect rotation of the motor shaft 7.

In the modification of my invention shown in Figs. 4, 5 and 6, I have shown a construction similar to that described above. In this modification, however, the supporting arms 13 are formed with extensions 13' which combine to provide a fork. A bushing 53 on the motor plate 3 rotatably receives a control member 55 which is provided with an operating handle 57 and is formed with a cam 59 received between the fork formed by the supporting arm extensions 13'.

Each of the arms 13 has a pin 61 thereon to which one end of a separate tension spring 63 is secured in each case, the other ends of the springs 63 being respectively secured to brackets 65 slidably mounted on the motor plate 3 for adjustment thereon, so that the tension in the springs 63 may be varied. The springs 63 constantly tend to turn the supporting arms 13 in directions such that the friction idlers 25 will be biased into engagement with the motor shaft 7 and the flange 9a of the turntable. The cam portion 59 of the control member 55 is narrower, in transverse section, than the distance between the arm extensions 13' when the idlers are in torque transmitting position, as clearly shown in Figs. 4 and 5. However, when it is desired to disconnect the friction wheels 25 from the motor shaft 7 and the turntable flange 9a, the control member 55 may be turned in its bushing 53 in a counter-clockwise direction whereupon the cam 59, which has a length in cross-section greater than the distance between the arm extensions 13', will force the arm extensions 13' apart against the action of the springs 63 and thereby remove the friction idlers 25 from driving engagement with the motor shaft and the turntable. At the same time, a cam plate 67 on a collar 69 which is secured to the lower end of the control member 55, as by means of a set screw 71, serves to operate the toggle arm 73 of a motor switch 75 in circuit with the driving motor 5. For this purpose, the cam plate 67 is formed with two high portions 67a and 67b, the portion 67b engaging the toggle arm 73 when the control member is turned to its most counter-clockwise position to turn the switch to "off" position, and the portion 67a engaging the toggle arm 73 to turn the switch back to "on" position when the control member 55 is moved back to its most clockwise position, as shown in Figs. 4, 5 and 6. In other respects, the modification of the invention shown in Figs. 4 to 6 is similar to that shown in Figs. 1 to 3.

From the foregoing description, it will be apparent to those skilled in the art that I have provided an improved turntable driving mechanism which will drive the turntable at a very uniform and accurate speed both during recording and reproduction, and that the variation between the recording and reproducing speeds will be a minimum. The use of a single motor with a plurality of coupling idlers has the advantage of insuring more uniform speed, since each of the idlers is driven by the same motor. Moreover, with a construction such as described above, the pressure loading against the motor shaft is fairly balanced and bearing loading on the motor shaft inherent in driving mechanisms employing a single friction wheel is practically eliminated. This greatly improves the bearing rumble condition. Another advantage of my improved driving mechanism is that the load on each rubber tire of the friction wheels 25 is reduced when two idlers are used, and this results in increased tire life.

Although I have shown and described but two embodiments of my invention, it will be apparent to those skilled in the art that many other modifications, as well as changes in those described, are possible. I therefore desire that my invention shall not be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In phonographic apparatus, the combination of a motor having a driving shaft, a turntable, a pair of supporting members, a friction wheel carried by each of said supporting members, said friction wheels being floatingly mounted with respect to their respective supporting members, said supporting members being mounted for movement from and to a position such that said friction wheels will engage the periphery of said turntable and said shaft to provide a plurality of driving couplings therebetween, and control means common to both of said supporting members for simultaneously controlling the movement of said members into and out of said position.

2. In phonographic apparatus, the combination of a motor having a driving shaft formed with portions of different diameters, a pair of supporting members, a friction wheel carried by each of said supporting members, said supporting members being movably mounted for adjustment along the length of said shaft, means for adjusting said members along said shaft to bring said friction wheels into alignment with any preselected one of said shaft portions and said turntable periphery, said members being also mounted for movement from and to a position such that said friction wheels will engage the periphery of said turntable and the preselected portion of said shaft to provide a plurality of driving couplings between said shaft and said turntable, and control means common to both of said supporting members for simultaneously controlling the movement of said members into and out of said position.

3. In phonographic apparatus, the combination of a motor having a driving shaft, a turntable, a pair of supporting arms mounted for pivotal movement relative to said shaft, a friction wheel carried by each of said arms, said friction wheels being floatingly mounted with respect to their respective supporting arms, said arms being movable toward said shaft to bring each of said friction wheels into engagement with said shaft and said turntable to provide a plurality of torque-transmitting couplings therebetween and being movable away from said shaft to break said couplings, and means common to both of said arms for controlling the movement of said arms into and out of said torque-transmitting position.

4. In phonographic apparatus, the combination of a motor having a driving shaft, a turntable, a pair of supporting arms mounted on a common axis for pivotal movement relative to said shaft, a friction wheel carried by each of said arms, said

friction wheels being floatingly mounted with respect to their respective supporting arms, said arms being movable on said axis toward said shaft to bring each of said friction wheels into engagement with said shaft and said turntable to provide a plurality of torque-transmitting couplings therebetween and being movable away from said shaft to break said couplings, and means common to both of said arms for controlling the simultaneous movement of said arms into and out of torque-transmitting position.

5. The invention set forth in claim 4 characterized by the addition of means constantly urging said arms into torque-transmitting position.

6. The invention set forth in claim 4 characterized in that said control means includes means for moving said arms away from said shaft whereby to break said coupling.

7. The invention set forth in claim 4 characterized by the addition of spring means arranged to constantly urge said arms into torque-transmitting position, and characterized further in that said control means includes means for camming said arms away from said shaft simultaneously to break said coupling.

8. In phonographic apparatus, the combination of a motor having a driving shaft provided with portions of different diameters, a turntable, a plurality of friction wheels adapted to transfer torque from said shaft to said turntable, said friction wheels being mounted for movement into engagement with the periphery of said turntable and any one of said shaft portions at will whereby to drive said turntable at any preselected one of a plurality of speeds, and means common to all of said friction wheels for simultaneously controlling the movement thereof into and out of torque-transmitting position at will.

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