Nov. 11, 1941. M. M. GRUBER ET AL 2,262,731

MOTOR CONTROL MECHANISM FOR SOUND RECORDING OR REPRODUCING APPARATUS

Filed Nov. 30, 1938 2 Sheets-Sheet 1

FIG. 1.

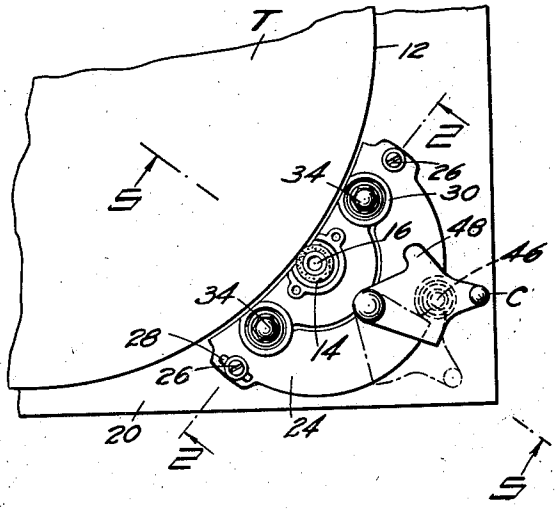


FIG. 2.

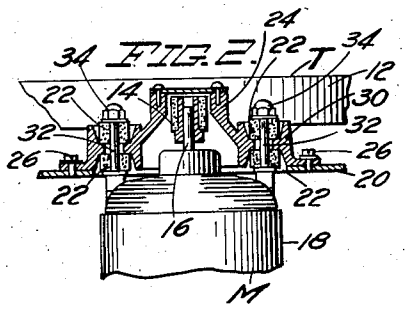


FIG. 3.

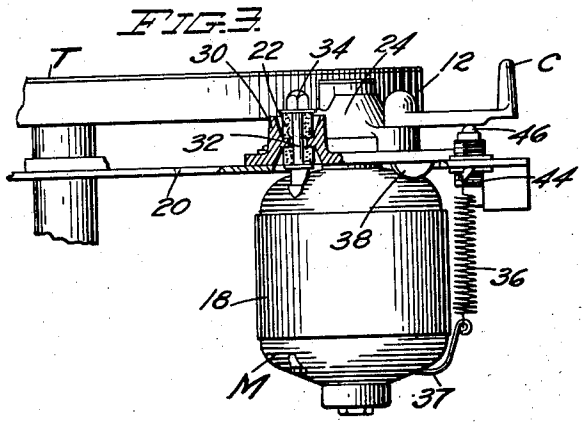


FIG. 4.

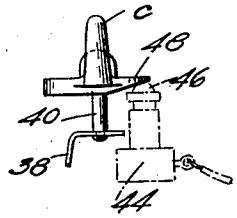


FIG. 5.

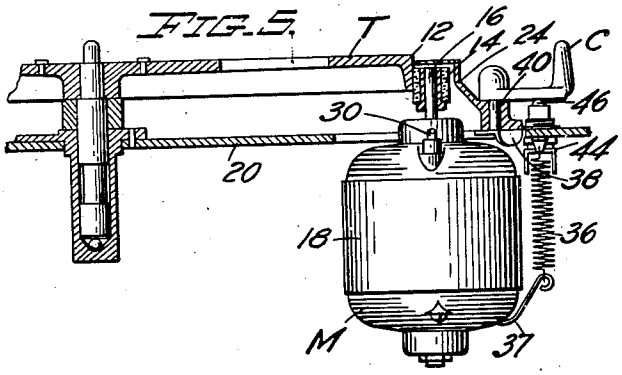
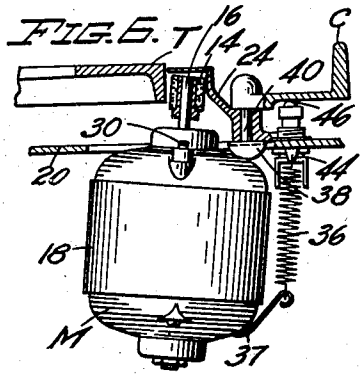


FIG. 6.



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Filed Nov. 30, 1938 2 Sheets-Sheet 2

FIG. 7.

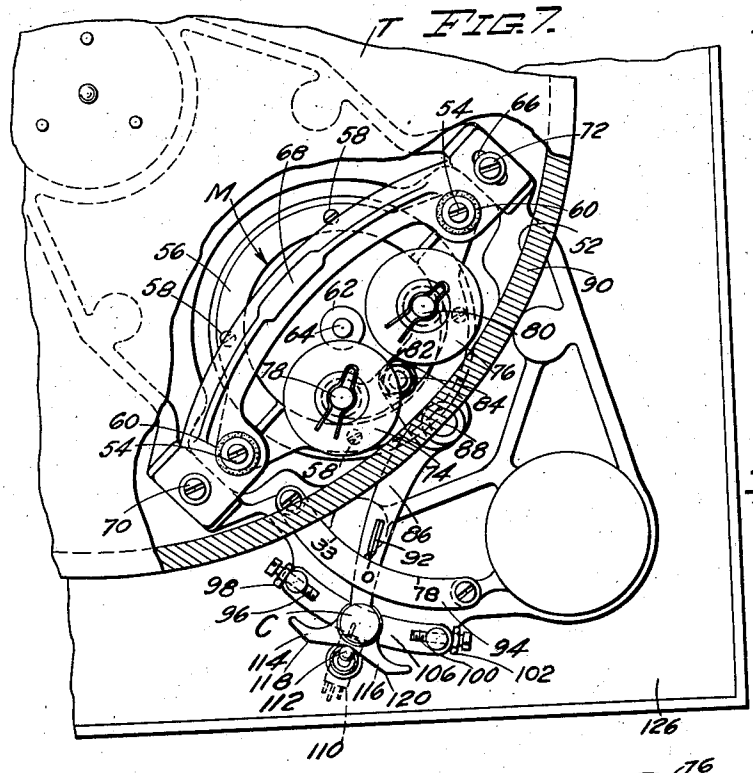


FIG. 8.

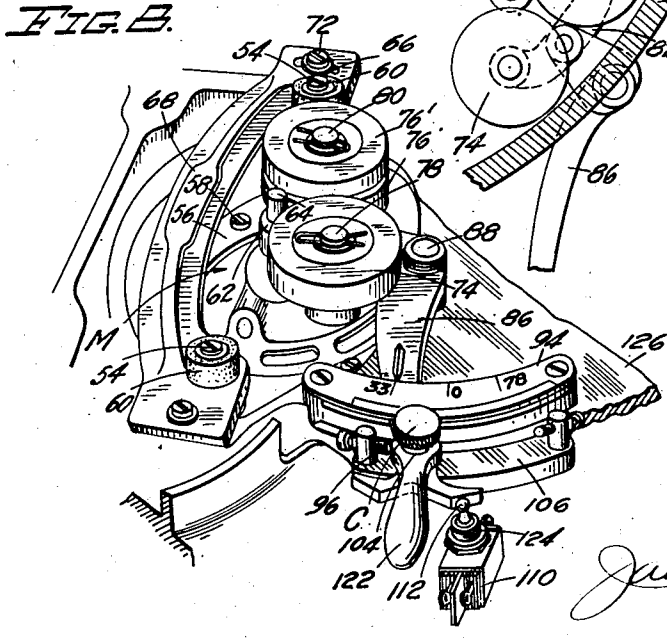


FIG. 9.

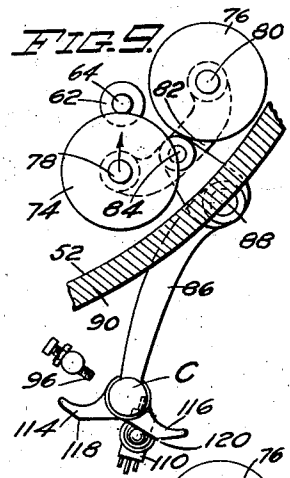


FIG. 10.

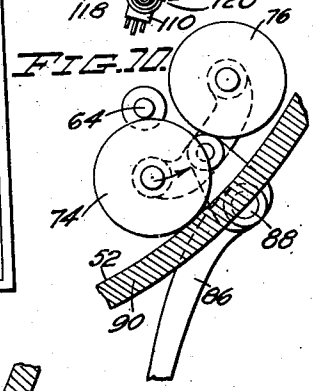
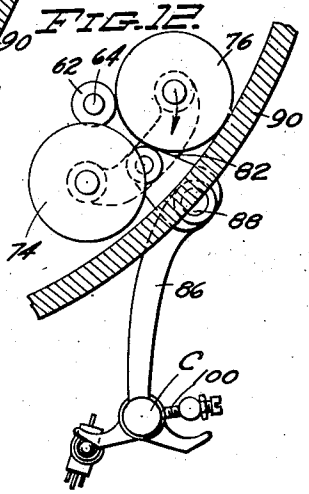


FIG. 11.

FIG. 12.



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Patented Nov. 11, 1941 2,262,731

UNITED STATES PATENT OFFICE

2,262,731

MOTOR CONTROL MECHANISM FOR SOUND RECORDING OR REPRODUCING APPARATUS

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Application November 30, 1938, Serial No. 243,104

15 Claims. (Cl. 74—190)

This invention relates to motor control mechanism, and more particularly to such mechanism for controlling the operation of sound recording or/and sound reproducing apparatus. The present application is a continuation-in-part of our co-pending application Serial No. 200,926, filed April 8, 1938, and entitled "Sound recorder."

The primary object of the present invention is to generally improve sound recording and sound reproducing apparatus, especially of the disc record type, and more particularly the motor control mechanism therefor.

The apparatus comprises a turntable for carrying the record and a motor driving a wheel for frictionally engaging the periphery of the turntable. This wheel is preferably made of rubber. If the soft wheel is left in engagement with the turntable during long periods of non-use, it will acquire a permanently flattened side, and in accordance with our invention the aforesaid wheel is movably mounted to afford release of the wheel from the turntable. The energization of the motor is controlled by a switch. The use of separate controls raises several difficulties. The operator may shut off the switch, but neglect to release the wheel, thus creating a "flat" on the wheel. The operator may shut off the switch and hold the turntable in order to stop it quickly. With the motor still spinning under its own momentum, there is resulting wear on the wheel. The operator may first engage the wheel with the turntable and later turn on the switch, thus placing a large starting load on the motor because of the tight frictional engagement between the wheel and the turntable.

A further object of the present invention is to overcome these difficulties, and with that object in view, the motor control mechanism includes a single control device for operating both the wheel release and the motor switch. This control device is preferably so arranged that the motor switch is closed before the wheel engages the turntable when starting the apparatus, and conversely, the wheel is disengaged from the turntable before the motor switch is opened when stopping the apparatus. There is no danger of anyone not moving the control device to stop the motor, hence the wheel is safely moved away from the turntable when the apparatus is not in use.

Still another object of our invention is to produce a desired frictional driving force between the motor and the turntable and to determine and limit the amount of the frictional driving force. With this object in view, the motor is pivotally supported with the motor wheel bearing against the part which is to be frictionally driven thereby, and the disposition of the parts is such that the weight of the motor produces a desired frictional drive force.

Still another object of our invention is to apply the foregoing features and advantages to apparatus intended for operation at two speeds. At the present time, recording and reproducing of sound is performed not only at the old standard speed of 78 R. P. M., but also at the newer "long-playing record" speed of 33⅓ R. P. M. In accordance with the present invention, the speed control or selector is arranged to also act as a starting and stopping device, and this device is further combined with the motor switch and friction wheel release means, all as above described, so that the friction wheel or wheels are normally disengaged from the turntable when the apparatus is stopped, and so that the motor switch is closed before a friction wheel engages the turntable when starting the apparatus, said wheel being disengaged from the turntable before the motor switch is opened when stopping the apparatus.

To the accomplishment of the foregoing and other objects which will hereinafter appear, our invention consists in the motor control elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawings in which:

Fig. 1 is a plan view of a part of the turntable and associated driving and control mechanism with a small plate over the motor wheel removed to expose the wheel;

Fig. 2 is a section taken in the plane of the line 2—2 of Fig. 1, and is explanatory of the mounting for the driving motor;

Fig. 3 is a partially sectioned elevation of the mechanism of Fig. 2;

Fig. 4 is an elevation of the control handle with its associated cams for releasing the friction wheel and for controlling the motor switch;

Fig. 5 is a section taken in elevation at the driving motor, and shows the motor control mechanism in driving position, this section being taken in the plane of the line 5—5 of Fig. 1;

Fig. 6 is a similar section but with the parts in stopped position;

Fig. 7 is a partially sectioned plan view of a modified form of the invention in which the turntable is arranged to operate at either of two speeds;

Fig. 8 is a perspective view showing the control

mechanism of Fig. 7 with the turntable removed;

Fig. 9 is a diagrammatic plan view showing the first stage in shifting to low speed operation of the phonograph;

Fig. 10 is a similar view showing the completion of the movement of the parts into low speed operating condition;

Fig. 11 is a similar view showing the relation of the parts as they are shifted partially toward high speed operation; and

Fig. 12 is a similar view showing the relation of the parts when moved all the way into high speed driving position.

Referring to the drawings, the apparatus comprises a turntable T and a motor M, said motor being arranged to frictionally drive the turntable through frictional engagement with the periphery of the turntable. A single control device C is provided, said control device being arranged to control not only the operation of the motor switch, but also the movement of the friction drive mechanism into or out of engagement with the turntable. Moreover, in the case of the two-speed arrangement shown in Figs. 7 through 12, this control device is also used for speed selection.

Referring now to Figs. 1 through 6, the turntable T is given a broad machine-trued periphery 12, and this is frictionally engaged by a comparatively soft rubber motor wheel 14. Wheel 14 is mounted at the upper end of motor shaft 16, the motor 18 being disposed in upright position and being of the alternating current induction type which operates for the present purpose as a synchronous motor. The reduction ratio between the small motor wheel 14 and the large turntable disc, together with the winding of the motor, is so selected as to produce a turntable speed of 78 R. P. M., and no speed regulator or governor mechanism is needed or used. The motor is mounted in rubber cushions 22, as is best shown in Fig. 2, and is suspended from the top plate 20 on which the parts of the phonograph are mounted. More specifically, we provide a motor housing 24 best shown in Figs. 1, 2 and 3. This motor housing is secured to top plate 20 by adjusting screws 26, one of which is received in a slot 28 (Fig. 1), thereby affording adjustment of the entire motor housing toward or away from the turntable. This determines the frictional driving pressure between the motor wheel 14 and the turntable. Motor housing 24 is provided with frustroconical cups or seats 30 which receive the rubber sleeves or cushions 22. Motor 18 is provided with hollow upwardly projecting rods 32 which pass through the rubber pads 22 and the upper ends of which receive nuts 34 bearing on appropriate washers. The significant thing about this arrangement is not merely the provision of a soft cushioned mounting for the motor, but even more importantly, the provision of an oscillatable mounting affording bodily oscillation of the motor between the driving position shown in Fig. 5 and the disengaged or released position shown in Fig. 6. The motor is nearly but not quite upright in the driving position of Fig. 5, and thus the desired driving force is obtained by reason of gravitational attraction on the body of the motor itself. This driving pressure may, if desired, be increased by the use of a tension spring 36 connected between the lower end of the motor at 37 and any convenient point of connection on the plate 20.

The motor may be oscillated to the position of Fig. 6 by means of a motor release cam 38. Cam 38 is secured at the lower end of a pin 40 to the upper end of which the motor control handle C is connected. Pin 40 passes through a suitable bearing in the motor housing 24 previously referred to. It will be manifest that by swinging the control handle C from the solid line position to the broken line position shown in Fig. 1, the cam 38 will be shifted from the position shown in Fig. 5 to the position shown in Fig. 6, thus causing the same to bear against a cooperating part of the motor housing acting as a cam follower, and thereby tilting the motor to the position shown in Fig. 6, at which time the motor wheel 14 is disengaged from the turntable T.

The motor housing 24 is made of a single piece of metal except for a small cover plate 42 which is secured in place by two small screws as is clearly shown in Fig. 2. This cover plate has been removed in Fig. 1 in order to expose the motor wheel 14.

The control handle C also controls the energization of motor 18. For this purpose we provide an electric switch 44 mounted on plate 20 by means of the conventional threaded bushing and nut construction, the body of the switch and the electric wires leading thereto being disposed beneath plate 20, while a plunger 46 for operating the switch projects upwardly through the threaded bushing above plate 20. This switch is so designed that it is normally open, and is provided with resilient means to keep it so. When plunger 46 is depressed and held in depressed condition, the switch is closed. In accordance with the present invention, this is done by the control handle C, and more particularly, by a camming projection 48 at one side of the control handle, as is best shown in Figs. 1 and 4. In Fig. 4 the switch is open, and the same applies to Fig. 6. In Fig. 5 the switch is closed, and the same applies to Fig. 1. In Fig. 1, however, when the control handle is moved to the broken line position, the switch is opened. A moment's reflection will show that as the control handle C is moved from the "stop" position shown in dotted lines, toward the starting position shown in solid lines, the switch is closed, thus starting the motor. As the movement of the control handle C is continued, the switch remains closed, and the motor release cam 38 is moved away from the motor far enough to permit the motor wheel to engage the periphery of the turntable. Because of this sequence of operation, the motor starts without any load and is already spinning when it frictionally engages the turntable. In stopping the machine, the motor is released from the turntable and there is no wear on the motor wheel if the turntable is stopped quickly with the hand. Most importantly, it is impossible to neglect to release the motor wheel from the turntable when stopping the machine, and this prevents the motor wheel from being left pressing against the turntable over long periods of non-use with resulting production of a flat side on the periphery of the motor wheel.

Referring now to Figs. 7 through 12 of the drawings, the turntable is in this case engaged on its inner periphery 52. The motor M is thus located substantially beneath the turntable. Here again, the motor is preferably suspended from above, as by means of rods or screws 54 connected at their lower ends to a ring 56. This ring is secured directly on the upper end of the motor housing, as by means of screws 58. The supports 54 are preferably received in four rubber bushings which afford oscillation of the motor body. Only the upper two bushings are visi-

ble, these being shown at 60. The lower bushings are similar, but disposed beneath member 68. The motor shaft carries at its upper end a preferably stepped or two-speed motor wheel, the large step being numbered 62, and the small step, 64. The parts are so relatively located that the application of any excessive drive pressure on the motor wheel 62, 64 may be relieved by oscillation of the massive motor body therebeneath. The location of the motor shaft may be adjusted much as before described, by using a slotted connection 66. More specifically, the rubber bushings 60 are carried on a movable frame member 68 one end of which is secured to the main stationary frame at 70, and the other end of which is secured at 72, the screw 72 passing through a slot 66 to afford adjustment of the motor shaft toward or away from the periphery of the turntable.

The drive of the motor to the turntable is in this case an indirect one, it taking place through either of two intermediate wheels 74 and 76. These wheels are freely rotatable on pins 78 and 80 carried on opposite ends of a connecting yoke 82. Yoke 82 is pivotally mounted at 84 on one end of an angle lever 86, said angle lever being pivotally mounted on the stationary frame of the machine at 88. Intermediate wheel 74 is a slow speed wheel which is so disposed in elevation as to engage the upper or smaller step 64 of the motor wheel. The intermediate wheel 76 is a high speed wheel which is so elevated as to engage the lower and larger diameter step 62 of the motor wheel. If the flange 90 of the turntable is wide enough and comes low enough, it may be engaged by either of the wheels 74 or 76 despite the difference in elevation thereof. However, in the present case these wheels are caused to engage the turntable flange 90 at the same elevation by increasing the axial dimension of the wheel, or by adding another similar wheel 76', as is most clearly shown in Fig. 8. The wheels 76 and 76' are preferably equal in diameter and in fact, may be similar in all respects. They are secured together and act as a single wheel. The upper wheel 76' does not interfere in any way with the motor wheel 64 because the upper step 64 is of small diameter and is never reached by upper intermediate wheel 76', such movement being prevented by engagement of the lower intermediate wheel 76 with the large diameter step 62 of the motor wheel.

The motor wheel 62, 64 is preferably made of metal. The same applies to the turntable T. The desired yieldability and frictional surface for the turntable drive is provided by the intermediate wheels 74 and 76, which are preferably made of rubber. While the high speed wheel is shown in Fig. 8 as comprising two similar superposed wheels 76 and 76', this will, for the sake of simplicity in the ensuing description, be referred to as a single intermediate wheel 76, as though a single wheel of increased axial dimension were being used.

The operation of the control mechanism may best be described in successive stages. Fig. 7 shows the parts in neutral or stopped position. At this time the control C is in mid-position, as is indicated by the pointer 92 on lever 86, said pointer being disposed at the center or zero mark on the indicating scale 94. It will be noted that at this time the intermediate wheels 74 and 76 are both out of engagement with the turntable flange 90. They are also out of engagement with the motor wheel 62, 64, though this is not so important, and depends on the angular disposition of yoke 82 with respect to the control lever. In any event, ample clearance is provided, and none of the parts of the driving train engage under pressure.

For slow speed operation, control C is moved toward the left as viewed in the drawings. During the first part of its movement, the intermediate wheel 74 is brought into engagement with motor wheel 64, as is clearly shown in Fig. 9. This is caused by the fact that the connection of yoke 82 at the point 84 has an appreciable amount of friction which causes the yoke 82 to turn bodily with control lever 86. Continued movement of control C toward the left causes a movement of loke 82 toward the right. The resulting movement of the yoke is guided by the already-established engagement between intermediate wheel 74 and motor wheel 64, and results in intermediate wheel 74 being drawn into engagement with the turntable flange 90 as well as motor wheel 64. The other intermediate wheel 76 is at the same time moved well out of engagement and is free of both the motor wheel and the turntable, as is clearly shown in Fig. 10. The limit of movement may, if desired, be determined by means of adjustable stop screw 96 (Fig. 7), the position of said screw being locked by a nut 98. Of course, the maximum frictional driving pressure is also limited by the pendulum-like floating mounting of the motor, previously described.

If the control C is moved from the mid-position of Fig. 7 toward the right for high speed operation of the turntable, the parts first assume the position shown in Fig. 11, in which the intermediate wheel 76 has been moved into engagement with the high speed motor wheel 62, but is not yet in engagement with the turntable flange 90. Continued movement of control lever C toward the right brings the parts into the relation shown in Fig. 12, the link 82 being drawn toward the left and carrying the intermediate wheel 76 around motor wheel 62 and against turntable flange 90. It will also be noted that the other intermediate wheel 74 has moved free of both motor wheel 64 and the turntable. The movement of control C toward the right may, if desired, be limited by a stop screw 100 (Figs. 7 and 12) the adjustment of which may be locked by a nut 102. Moreover, the control knob C may, if desired, be made in the form of a knurled head for a lock screw 104 (Fig. 8) which is threadedly received in the end of lever 86 so that rotation of knob C causes the lock screw to bear against arcuate surface 106. This refinement is not essential, but inasmuch as the two-speed apparatus here disclosed is intended for high-grade recording of records fifteen minutes in length, the precaution of locking the control lever may be taken in order to prevent any possibility of accidental movement of the lever from its terminal position during the recording period.

To summarize, a movement of the control member toward the left draws the intermediate wheels toward the right, thus wedging the intermediate wheel 74 between the motor and the turntable, while moving intermediate wheel 76 well out of engagement. A movement of the control member C toward the right moves the intermediate wheels generally toward the left, thus wedging the intermediate wheel 76 between

the motor and the turntable, and at the same time moving the intermediate wheel 74 well out of engagement with either.

The supply of current to the motor M is controlled by means of a switch 110. In the particular form here shown, this is a toggle switch the internal construction of which is somewhat unusual in that it is biased at all times toward one side, that side being the open position of the switch. By moving the toggle arm 112 from the upwardly tilted position of Fig. 7 to the downwardly tilted position of Fig. 8, the switch is changed from open to closed position. The control lever 86 is formed at its ends with two outwardly projecting or wing-like cams 114, 116. These are so shaped that when the control lever is in mid-position, the switch 110 is open, as shown in Fig. 7. When the control lever is moved only partially toward either side, the switch is already changed from its open to its closed position, as is shown in Fig. 9. When the control arm is moved all the way to its driving position, the switch remains closed, as is shown in Figs. 8 and 12. The outer portions of the cams 114 and 116 may be curved on an arc struck about the center 88, but in the present case the cam shape is slightly modified to provide high points 118 and 120, which points are moved past the toggle switch lever when the control member reaches either driving position. The restoring spring of the toggle switch then functions to keep the parts securely in driving relation.

Fig. 8 discloses a minor modification of the control lever in which the control lever is extended outwardly to form a special handle 122. This is not essential, and in Fig. 7 the knurled knob C is itself grasped when moving the control lever. It will also be understood that the threaded bushing 124 of the switch 110 passes through a cover plate 126 forming a part of the apparatus. The body of switch 110 is located beneath plate 126, while the toggle arm 112 is located above plate 126. The double cam 114, 116 is located above plate 126 in proper position to engage the rounded or ball-like end of the toggle lever.

It is believed that the construction and operation, as well as the many advantages of our improved motor control mechanism, will be apparent from the foregoing detailed description. By simply shifting a single lever, two different controls are caused to function in best time sequence. The comparatively soft rubber friction wheel is normally disengaged from the turntable, and there is no danger of its sticking to the turntable or acquiring a "flat." The motor is started before the wheel is brought into frictional engagement with the turntable. It is impossible to stop the motor without disengaging the wheel from the turntable because the motor switch is opened at the end of the movement of the control handle. In the two-speed apparatus the same control lever may be used for speed selection as well as for the other functions. The motor is suspended and cushioned in rubber, and the rubber mounting itself functions to permit some movement of the motor wheel. This is accompanied by bodily movement of the motor itself, and the weight of the motor may be used to provide or to determine and limit the engaging pressure in the friction drive between the motor and the turntable.

It will be apparent that while we have shown and described our invention in several preferred forms, many changes and modifications may be made in the structures disclosed, without departing from the spirit of the invention defined in the following claims.

We claim:

1. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable for supporting and driving a disc record, and a motor driving a wheel for frictionally engaging the rim of the turntable, said motor control mechanism including a wheel release means for disengaging the wheel from the turntable, a motor switch for controlling the energization of the motor, and a single control device for operating both the wheel release means and the motor switch, said control device being so arranged that the motor switch is closed before the wheel engages the turntable when starting the apparatus.

2. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable for supporting and driving a disc record, and a motor driving a wheel frictionally engaging the rim of the turntable, said motor control mechanism including a control handle movable to stop and start positions, means moved by said handle for bringing the aforesaid wheel into or out of engagement with the turntable, and a motor switch also moved by said handle, the arrangement being such that the switch is closed before the wheel engages the turntable during a starting movement of the handle, and the wheel is disengaged from the turntable before the motor switch is opened during a stopping movement of the handle.

3. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable for supporting and driving a disc record, and a motor driving a wheel frictionally engaging the rim of the turntable, said motor control mechanism including a control handle movable to stop and start positions, means moved by said handle for oscillating the aforesaid wheel into or out of engagement with the turntable, a motor switch, and a cam moved by said handle for operating said switch, the arrangement being such that the switch is closed before the wheel engages the turntable during a starting movement of the handle, and the wheel is disengaged from the turntable before the motor switch is opened during a stopping movement of the handle.

4. Motor control mechanism for sound recording or reproducing apparatus including a record turntable and an electrical motor having a motor wheel for frictionally engaging the turntable, said motor being movably mounted to permit said wheel to be moved into or out of engagement with the turntable, said motor control mechanism including a motor control means for so moving the motor as to engage or disengage the motor wheel from the turntable, a motor switch for controlling the electrical energization of the motor, and a single control device for operating both the motor wheel release and motor switch, the arrangement being such that the switch is closed before the motor wheel engages the turntable during starting movement of the handle, and the motor wheel is disengaged from the turntable before the motor switch is opened during stopping movement of the handle.

5. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor having a motor wheel for

frictionally engaging the turntable, said motor control mechanism including a control handle movable between start and stop positions, said motor wheel normally tending to move against said turntable, a cam moved by said control handle for releasing the motor wheel from the turntable, a motor switch, and a cam moved by said handle for operating said switch, the arrangement being such that the switch is closed before the motor wheel engages the turntable during the starting movement of the handle, and the motor wheel is disengaged from the turntable before the motor switch is opened during stopping movement of the handle.

6. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor having a motor wheel for frictionally engaging the turntable, said motor being oscillatably suspended in approximately upright position on vertical rubber bushings with the motor wheel uppermost, said motor being so mounted as to normally urge said motor wheel against said turntable, said motor control mechanism including a control handle movable between start and stop positions, a cam moved by said control handle for so oscillating the motor as to free the wheel from the turntable, a motor switch, and a cam moved by said handle for operating said switch, the arrangement being such that the switch is closed before the motor wheel engages the turntable during the starting movement of the handle, and the motor wheel is disengaged from the turntable before the motor switch is opened during stopping movement of the handle.

7. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor having a motor wheel for frictionally engaging the periphery of the turntable, said motor being oscillatably suspended in approximately upright position on vertical rubber bushings with the motor wheel uppermost, said motor being so mounted as to normally urge said motor wheel against said turntable, said motor control mechanism including a control handle movable between start and stop positions, a cam moved by said control handle for so oscillating the motor as to free the wheel from the turntable, a motor switch, and a cam moved by said handle for operating said switch, the cam arrangement being such that the switch is closed before the motor wheel engages the turntable during the starting movement of the handle, and the motor wheel is disengaged from the turntable before the motor switch is opened during the stopping movement of the handle.

8. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor for driving the turntable through drive means including a two-step wheel and including a frictional engagement with the periphery of the turntable, said motor control mechanism including speed control means for causing either the small step or the large step or neither step to drive the turntable, a motor switch for controlling the energization of the motor, and a single control device for operating both the speed control means and the motor switch, said control device being so arranged that the motor switch is closed before establishing a frictional drive engagement with the turntable when starting the apparatus, and the frictional drive engagement with the turntable is released before the motor switch is opened when stopping the apparatus.

9. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor driving the turntable through either a low speed wheel or a high speed wheel for frictionally engaging the periphery of the turntable, said motor control mechanism including speed control means for engaging either wheel with the turntable, or for disengaging both wheels from the turntable, a motor switch for controlling the energization of the motor, and a single control device for operating both the speed control means and the motor switch.

10. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable and a motor driving the turntable through either a low speed wheel or a high speed wheel for frictionally engaging the periphery of the turntable, said motor control mechanism including a speed control means for engaging either wheel with the turntable, or for disengaging both wheels from the turntable, a motor switch for controlling the energization of the motor, and a single control device for operating both the speed control means and the motor switch, said control device being so arranged that the motor switch is closed before either wheel engages the turntable when starting the apparatus, and the wheels are disengaged from the turntable before the motor switch is opened when stopping the apparatus.

11. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable, a motor disposed vertically beneath the turntable, a two-step motor wheel at the upper end of the motor, friction drive intermediate wheels disposed between said motor wheel and the turntable, a control lever connected to said intermediate wheels for moving one wheel or the other into frictional driving position between the motor wheel and the turntable, one of said intermediate wheels being arranged to be driven by the small step and the other being arranged to be driven by the large step of the motor wheel, said control lever when in neutral position functioning to disengage both of said intermediate wheels from the turntable, a motor switch for controlling the energization of the motor, and means on said control lever cooperating with said switch, whereby the switch is opened when the control lever is in neutral, and is closed when the control lever is moved to either high or low speed position.

12. Motor control mechanism for sound recording or reproducing apparatus, including a turntable, a motor disposed vertically beneath the turntable, a two-step motor wheel at the upper end of the motor, friction drive intermediate wheels disposed between the motor wheel and the turntable, a control lever connected to said intermediate wheels for moving one wheel or the other into frictional driving position between the motor wheel and the turntable, one of said intermediate wheels being arranged to be driven by the small step, and the other being arranged to be driven by the large step of the motor wheel, said control lever when in neutral position functioning to disengage both of said intermediate wheels from the turntable, a motor switch for controlling the energization of the motor, and a cam on said control lever cooperating with said switch, whereby the switch is opened when the control lever is in neutral, and is closed when the control lever is moved to either high or low speed position, the cam being so shaped that the switch is closed before an intermediate wheel engages

the turntable when starting the apparatus, and the wheel is disengaged from the turntable before the switch is opened when stopping the apparatus.

13. Motor drive mechanism for sound recording or reproducing apparatus, including a record turntable and a motor having a stepped or two-speed motor wheel for driving the turntable with a friction drive, said motor being suspended in approximately upright position with the motor wheel at the top, the motor being oscillatably supported on rubber bushings, spaced intermediate wheels disposed between the motor wheel and the turntable, a speed control lever connected to said intermediate wheels and so arranged that movement in one direction moves one intermediate wheel into frictional engagement with the turntable and the small step of the motor wheel, and moves the second intermediate wheel out of engagement with the turntable, while movement in the other direction moves the second intermediate wheel into frictional engagement with the turntable and the large step of the motor wheel, and moves the first intermediate wheel out of engagement with the turntable, while in mid-position both intermediate wheels are disengaged from the turntable, the disposition of the parts being such that the weight of the suspended motor helps maintain the frictional drive force between the motor wheel, the intermediate wheel, and the turntable.

14. Motor control mechanism for sound recording or reproducing apparatus, including a record turntable, a motor disposed vertically beneath the turntable, a two-step motor wheel at the upper end of the motor, speed-control means arranged to cause either the small step or the large step or neither step to drive the turntable, a motor switch for controlling the energization of the motor, and a single control handle for operating both the speed-control means and the motor switch, the arrangement being such that the switch is open when the driving relation between the two-step wheel and the turntable is made inoperative, and the switch is closed when the driving relation between the turntable and either step of the wheel is made operative.

15. Motor control mechanism for sound recording or reproducing apparatus including a rigid large diameter record turntable for disc records rotatable on a vertical shaft and a constant speed synchronous electrical motor having a small diameter motor wheel for frictionally engaging the turntable, said turntable and wheel having contacting surfaces one of which is hard and the other of which is made of a soft and yieldable frictional material such as rubber, said motor being movably mounted with its shaft in upright position to permit said wheel to be moved radially into or out of engagement with the periphery of the turntable, said motor control mechanism including a motor control means for so moving the motor as to radially engage or disengage the motor wheel from the turntable, a motor switch for controlling the electrical energization of the motor, and a single control device for operating both the motor wheel release and the motor switch, the switch being closed when the motor wheel engages the turntable, and being opened when the motor wheel is disengaged from the turntable, whereby said wheel is not left in engagement with said turntable during non-use of the apparatus, in order to avoid deformation of the soft yieldable surface, with consequent modulation of the pitch of the sound.

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