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MOTOR MOUNT AND MOTOR DRIVE MEANS FOR PHONOGRAPHS

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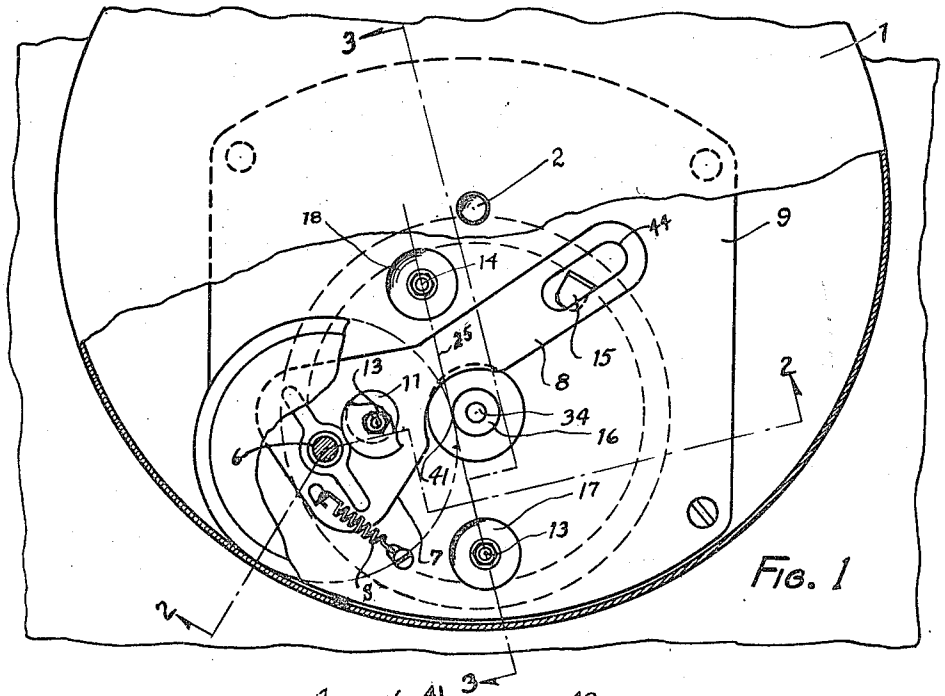


FIG. 1

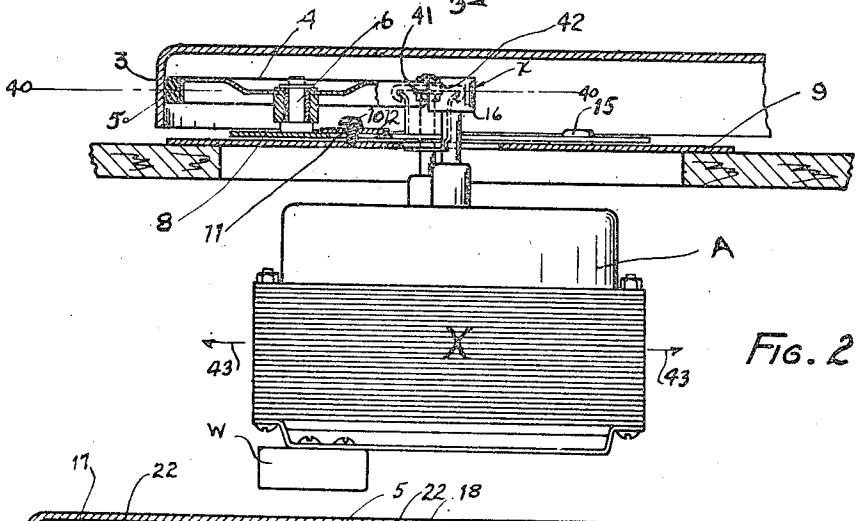


FIG. 2

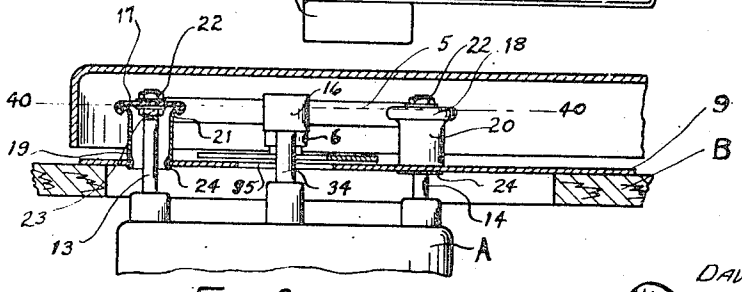


FIG. 3

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MOTOR MOUNT AND MOTOR DRIVE MEANS FOR PHONOGRAPHS

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5 Claims. (Cl. 74—206)

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My invention relates to improved motor mount and motor drive means for phonographs.

For the driving of phonograph turntables, it was long ago proposed to effect such driving by frictional contact of a driving roller with the interior surface of a peripherally disposed pendant turntable flange, and more recently, an intermediate idler wheel has been interposed between such flange surface and a driving roller directly positioned on an upwardly disposed end of the driving motor shaft, said idler wheel being supported by a mounting plate underlying said turntable and adapted to effect resiliently applied frictional engagement between the usual rubber tread of such idler wheel and the relatively hard engaging portions of said turntable flange and driving roller, the motor being usually pendantly carried by said supporting plate.

In some cases, the support for said motor has been in the form of a plurality of rubber grommets or the like with mechanically rigid connections, each with the periphery and central portions of said grommets whereby said grommets are rigidly interposed in motor supporting connections between said plate and said motor whereby motor noise may not be transmitted through the motor shaft driving roller and idler wheel to the turntable and thence to a turntable supported record, and ultimately to the sound pickup device of the phonograph.

The interposition of such rubber motor mounting elements of which three or four are commonly provided has resulted in the practical elimination of motor noise to the phonograph pickup, but I find that tonal defects of a different but still objectionable character have been introduced as a result of the motor cushion mounts, to wit:

Since the motor is not rigidly secured to the base plate, it tends to vibrate, such motor vibrations being sometimes caused by bodily movement imparted to the entire phonograph casing by vibrational movements of its underlying floor, or other support, and again from the rotational movement of the motor rotor commonly augmented by variable friction effects between the motor shaft roller and the said idler wheel engaged thereby.

In any event, I find that such motor movements communicated to the driving roller create variable friction effects as between said roller and said idler and thereby sets up a pulsation of speed variations in the rotation of the turntable and supported record whereby the sound reproduced from the record by the action of the pickup

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are not reproduced with such fidelity as to satisfy the more critical music lovers.

In analysing the problem thus presented, I have found that the vibrational effects tend to create a swinging of the pendant motor in variable patterns but the more noticeable deleterious effects are caused by vibrational movements of the motor tending to effect corresponding movements of the driving roller about an axis which is relatively spaced from the point of engagement between the roller and idler wheel and such more objectionable movements being such as to tend to separate the roller and idler wheel, and alternatively to increase the pressure of contact therebetween.

These vibrations sometimes achieve a periodicity which approximates the periodicity of the entire interlinked parts comprising the motor, the rubber mounts and the rubber tread for the idler at which times the distortion of the reproduced sound is readily noticeable.

My invention therefore relates to an improved position of the rubber grommet motor mounts with respect to the engaged surfaces of the driving roller and the idler wheel tread whereby the axis of any such vibratory effects passes either exactly medially between the engaged surfaces of driving roller and idler tread that swinging movements of the motor about such axis will produce the minimum variation of driving effect as between said motor roller and said idler wheel and consequently, to minimize any such sound distorting effects proceeding therefrom through said turntable flange to the rotating turntable supported record.

An object of any invention therefore is to minimize the sound distorting effects of a vibrating cushion mounted motor in a friction drive mechanism for phonograph turntables.

Another object of my invention is to improve the tonal qualities of phonograph record reproductions from a phonograph mechanism with a motor driven friction drive transmission for rotating the turntable.

Another object of my invention is to provide improved means and method for pendantly supporting the electric motor, as commonly employed in friction drives for phonograph turntables, whereby oscillatory movements, of the motor on the shaft of which a driving roller is affixed, are so constrained as to have the center of such oscillation located in the horizontal plane of the contacting engaged motion-communicating surfaces of said driving roller and the rotatable

element through which said roller is adapted to frictionally drive the turntable.

A more specific object of my invention is to achieve the foregoing object in a manner whereby such center of oscillation is also disposed at or, at least, close to the zone of said engagement.

Another object of my invention is to achieve approximate positioning of the said center of oscillation sufficiently close to said zone of engagement to ensure that such movements will not appreciably be reflected in resultant periodic variations in driving torque as between said roller and the driven element of said motor and turntable drive.

Another object of my invention is to achieve any or all of the foregoing objects in a more complete manner by providing the said engaged surfaces with such a form that, notwithstanding a substantially minor spacing between the said center of motor oscillation and the said zone of friction driving contact, oscillatory bodily movement of said motor will not result in appreciable variations in driving torque between the said motor roller and the driven element of said drive mechanism.

Other objects of my invention and the invention itself will become more readily apparent from a purview of the accompanying drawings and description thereof which follows.

In the drawings:

Fig. 1 is a partial plan view showing a turntable drive embodying my invention with a portion of the underlying turntable and certain of the underlying parts broken away to expose certain underlying parts;

Fig. 2 is a sectional elevation taken through the device approximately as indicated by line 2—2 of Fig. 1; and

Fig. 3 is a sectional elevation taken through the device of Fig. 1 approximately as indicated by line 3—3 of Fig. 1.

The drawings illustrate a single preferred embodiment of my invention, as shown in Figs. 1 to 3 inclusive, my improved turntable driving device comprising, in general, a rotary turntable 1, rotatably mounted on a turntable spindle 2, said turntable comprising a downwardly extending peripheral flange or rim portion 3 with which an idler wheel 4 is adapted to have frictional engagement by means of a rubber tire or friction tread 5 which is fitted peripherally about the idler wheel 4.

The idler wheel is mounted to revolve about a spindle 6 which is carried by an enlarged end 7 of a sliding arm 8, said sliding arm being, in turn, mounted upon a mounting plate 9. The means for securing the arm 8 to the mounting plate 9 comprises a screw 10 and a washer 12, also a tongue 15 of the mounting plate 9 projected upwardly through an elongated slot 44 at the end of the arm, which is remote from the spindle 6, said screw being threaded into the plate 9 and said washer being but loosely confined between the head of the screw 10 and the upper side of the arm 8.

The screw 10 is projected through an enlarged opening 11 of the arm 8 and its lower end is threaded into the plate 9 sufficiently to loosely retain the washer 12 in place and similarly, the tongue 15 but loosely projects within the elongated slot 44 of said arm.

The idler wheel is therefore adapted to freely float under the resilient influence of the tensile spring S to a driving position between the motor driving roller 16 and the inner surface of the

turntable flange 3 whereby the rubber tread of said idler wheel contacts the peripheral surface of the roller 16 and the intra-peripheral surface of the turntable flange 3 at portions of its tread surface angularly separated an amount approximately midway between 90° and 180°. The idler spindle and the contact between the idler tread and the turntable flange thereby defines an obtuse angle.

The above relationship between the roller, the idler and the turntable is a preferred arrangement previously known.

The motor A is pendantly supported by the mounting plate 9 by posts 13 and 14 vertically secured to the motor casing and extending parallel to the motor shaft 34 which projects through an enlarged aperture 35 of the mounting plate 9, and carries the driving roller 16 at its upper end. The motor supporting posts 13 and 14 are secured to upstanding tubular posts 19 and 20 through the instrumentality of the rubber grommets 17 and 18, which grommets are fitted over the expanded upper flange portion 21 of the posts, the grommets being normally molded to such smaller size as to require stretching in order to snap the peripheral flanges of the grommets over the posts 19 and 20.

The upper end of the motor supporting posts 13 and 14 are preferably threaded, as shown, and a pair of nuts 22 and 23 threaded onto said posts above and below the medially apertured portion of the grommets to clamp the upper ends of the motor posts to the central portions of the cushioning grommets. The tubular grommet supports 19 and 20 are preferably headed over at their slightly reduced lower ends, as shown at 24, after projection of such reduced lower ends through circular apertures of said mounting plate 9.

I consider it important to position the points and connection, indicated at 42, Fig. 2, in the horizontal plane which contains the zone of engagement between the motor roller 16 and the peripheral surface of the idler wheel tread 5, and where, as preferred, the outer tread surface is rounded, as illustrated, said plane shall preferably include the peripheral portion of said tread which is of greatest diameter. In Figs. 2 and 3, the above recited plane is indicated by the broken line 40—40.

In the present embodiment, only two motor supporting posts 13 and 14 are provided whereby vibratile or other oscillations of the motor A will be on an axis corresponding with the line 25, indicated in Fig. 1, and whereby the pressure contact between the motor roller 16 and the idler wheel tread 5 will be neither increased nor decreased during any such oscillatory movements, and during such movements, the motor oscillations will be about a center, shown at 41, Figs. 1 and 2, there being only an exceedingly slight rolling movement of the engaging surface of the roller 16 on the preferably curved peripheral surface of the idler tread 5. There will not be an appreciable variation in the power transmitted from said motor roller to the idler wheel.

Although more than two grommet supported motor posts may be provided in other embodiments of my invention, such as two additional such posts, if these are placed symmetrically with respect to the placement of the two posts 13 and 14, and the point of medial contact as between the roller 16 and the contacted idler wheel periphery, the same avoidance of appreciable

variation in pressure between said roller and idler wheel will be achieved.

There may at times be substantially lesser oscillatory movements of the motor in other directions which are transverse to the above described movement which involve oscillatory movements of the motor A, as indicated by the arrows 43, Fig. 2, such oscillatory movements comprising a possible oscillation of the motor at right angles to the vertical plane which includes the grommet centers and, indeed, there may be other oscillatory movements in directions which are the result of movements in the above related right angularly intersecting planes; however, in every case, the center of any such simple or compound oscillatory movements will be located according to the placement of the grommets at or, close to, the intersection of the horizontal plane 40—40 and a line such as the line 25.

In effect, the motor, representing most of the weight of the oscillatory system pendulously supported by the plurality of flexible grommets 42, oscillates about a center which, in the embodiment illustrated, is located at the point 41 and the oscillatory system partakes of the nature of a pendulum, the length thereof extending from such center of oscillation to the center of mass which is located at some such point as is indicated by "X," Fig. 2.

The oscillatory movement of any part of said system, such as at the point "X," is such a fractional portion of the movement at "x," according to the relative distance of the point "x" and the point "X" from the center of oscillation indicated at 41, Figs. 1 and 2.

While I prefer to so position any desired practical plurality of flexible supporting grommets, such as 17 and 18, with respect to the center of mass of the oscillatory system, roughly indicated at "X," the center of oscillation will be precisely located at the precise center of the area of interengagement of the peripheral surfaces of the roller 16 and the idler wheel tread 5 and advantageous results may be obtained so long as said center of oscillation is not spaced from said central point of said area of interengagement 41 more than one-fifth of the effective length of the oscillatory system, considered as a pendulum.

I prefer however to make such relative distance not more than one-half of the above value, or one-tenth of said distance, and as above stated, this may be accomplished by using 2, 3, 4 or more flexible elements, such as the grommets 17, for supporting the motor whose center of mass is roughly indicated at "X."

As an added feature of improvement, I may add weighting means, such as the weight "W," to the oscillatory system at any suitable point to offset the otherwise greater weight of the motor or any other part of the oscillatory system comprising such motor, and which may be effective at the opposite side of the motor whereby the motor will hang pendantly, without including the posts 13 and 14 nor the motor shaft 34, from the vertical. Usually, however, the posts such as 13 and 14, and others if more than two grommets are employed, may be so distributed laterally with respect to the upper surface of the motor so that the stated purpose of said weight may be effected without utilization of any such weight.

Within the above range of permissible variations of placement of the center of oscillation, I find accomplishes substantially better results than have heretofore been accomplished in prior constructions and the precise positioning

of such oscillatory center, as provided in the illustrated embodiment, is ideal.

I am aware that my invention is susceptible to variations in the positioning of such center and that it is not always possible to fully achieve the most desirable positioning herein illustrated in commercial structures manufactured in quantity production but, fortunately, within the above range of permissible variations, I find that the results are considerably superior to that formerly obtained and I therefore claim as my invention the combination of elements positioned as set forth in the following claims both broadly as including such permissible range of variations, and more specifically, in certain of said claims wherein said ideal positioning of the center of mode of oscillation is more closely and/or precisely defined.

I claim:

1. In a phonograph turntable drive of the type described wherein the said turntable is frictionally driven by the engagement of the peripheral tread of the idler wheel with a pendant flange of the turntable, and wherein said idler wheel at another point in its circumference is peripherally frictionally engaged by the periphery of a motor driven driving roller of such substantially lesser diameter than said idler wheel that said roller may be driven at a relatively high speed to effect frictional driving by said idler wheel of the turntable at a reduced rotational speed, the combination with a motor having an upwardly projecting shaft, said pendant flange, and said idler wheel, a roller carried by the upper end portion of said motor shaft, and means affording a common support adapted to maintain said roller flange and idler wheel, in substantially the same horizontal plane; means for resiliently and yieldably urging said idler wheel into predetermined pressure contact with both said roller and said turntable flange, and a plurality of supporting elements for pendantly supporting said motor from said support, said elements comprising substantially rigid means extending upwardly from said motor into said plane, substantially resilient cushioning means interconnecting said support and said rigid means, said cushioning means being so disposed as to afford a horizontal extending pivotal swinging axis for said shaft supported roller, with said swinging axis passing substantially tangentially through the inter-engaged portions of the idler wheel periphery and the roller periphery.

2. In a phonograph drive mechanism of the type described, the combination with a phonograph turntable having a pendant flange, a motor, a shaft therefor, an idler wheel, and a common support for said turntable, motor and wheel, said shaft extending upwardly and its upper end adapted to afford a driving roller peripherally engaged with said idler wheel, said idler wheel being peripherally engaged with the inner surface of said flange, mounting means interconnecting said motor and said support comprising at least a pair of flexible elements, both carried by said support in interspaced relationship, and said elements having flexible portions disposed substantially both in the horizontal plane of interengagement of said roller and wheel, and in the vertical plane thereof which is tangential to the roller engaged portion of the wheel periphery to afford a horizontal swinging axis for said roller, said axis passing tangentially through the engaged wheel and roller surfaces.

3. Mounting means for yieldably pendantly supporting the driving motor of a phonograph

drive mechanism of the type described, the combination with the idler wheel, and driving roller thereof and a fixed support, said roller axially secured to the upwardly extending end of the motor shaft, said wheel and roller being operatively peripherally interengaged for driving of said wheel by said roller, and mounting means comprising at least a pair of flexible elements both carried on a fixed support and both disposed in a vertical plane which is parallel to and so closely adjacent to the vertical plane of the interengaged peripheral surface portions of said roller and said wheel, and also so closely adjacent to the horizontal plane of said interengaged surface portions, and said elements being so nearly similarly laterally spaced from said interengaged surface portions, as to cause said flexible elements to afford a horizontal swinging axis about which said roller can only be moved, whereby swinging of said motor and roller as a unit such as normally encountered in the operation of the device may be had without impairment of normal operating pressure engagement between said roller and said idler wheel periphery.

4. In a phonograph drive mechanism of the type described comprising a disc-type turntable, the combination of a motor having an upwardly projecting shaft, a pendant flange for said turntable, an idler wheel, and a roller carried by an upper end portion of said shaft, and means affording a common support adapted to maintain said roller, flange and idler wheel in substantially the same horizontal plane, said wheel and roller being operatively peripherally interengaged for driving said wheel by said roller, and mounting means comprising a plurality of flexible diaphragm elements, means securing a portion of each of said diaphragm elements to said fixed support, and rigid means joining said motor to another portion of each of said flexible elements

whereby the motor is yieldably pendantly supported by said elements, all said elements being relatively so disposed in the line which is tangential to the interengaged peripheries of said wheel and roller, and at the level of such interengagement as to constrain pendulum-like oscillations of said motor to oscillatory movements about an axis in the region of said interengagement of said roller and said wheel.

5. In combination with a phonograph drive mechanism of the type described comprising an idler wheel and frictional driving motor shaft roller therefor, means for flexibly and pendulously supporting the driving motor to form an oscillatory system adapted to normally position said roller and idler wheel in frictional peripheral driving engagement, and with the axis of oscillation of said system extending horizontally and tangentially to the engaged peripheral portions of said wheel and roller whereby oscillatory movement of the roller about said axis will be limited to vertical movements and said system having a roller adapted during such movements to maintain substantially uniform engagement between the driving roller and idler wheel periphery.

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