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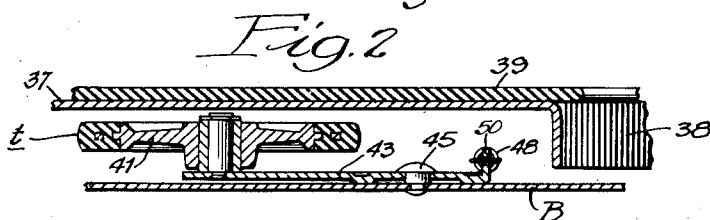
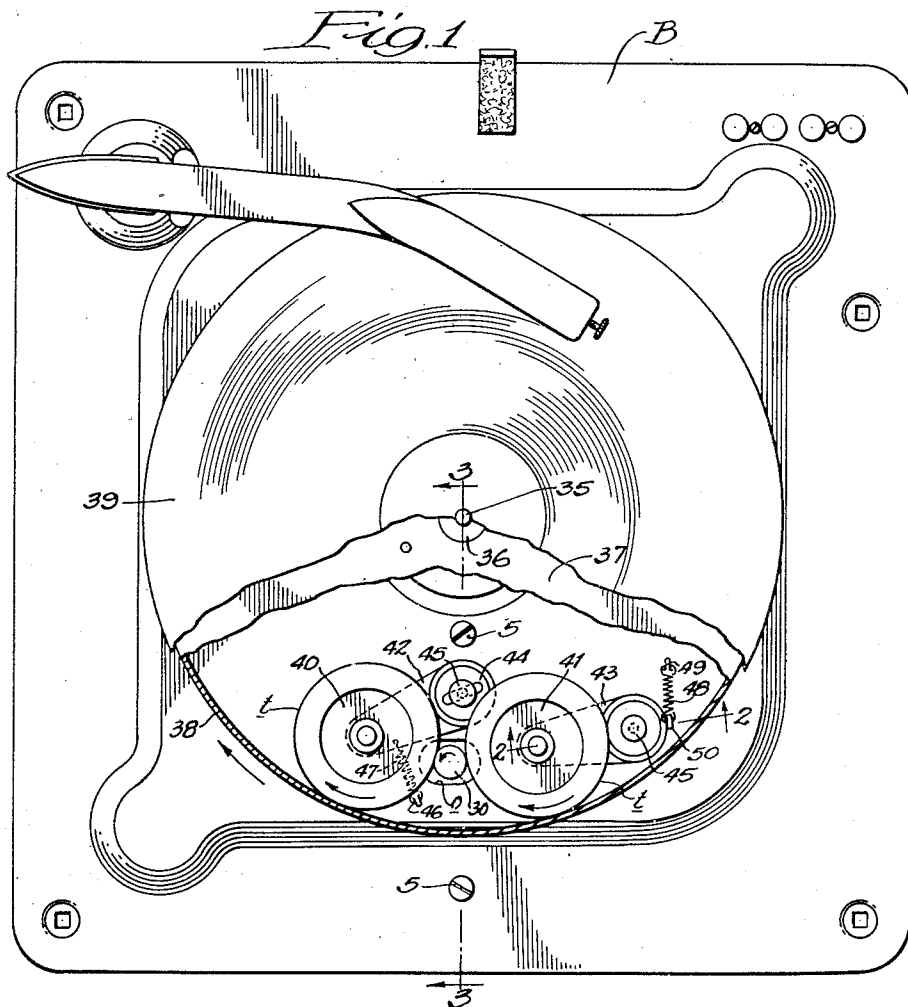
N. L. CONRAD

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TURNTABLE DRIVE

Filed Sept. 3, 1940

2 Sheets-Sheet 1



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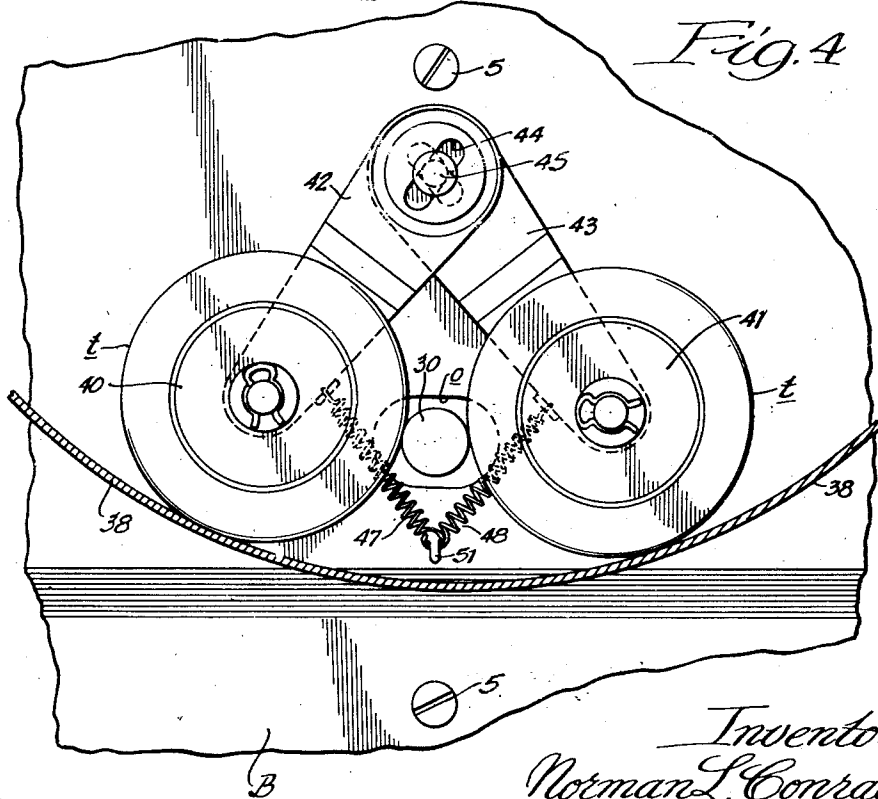
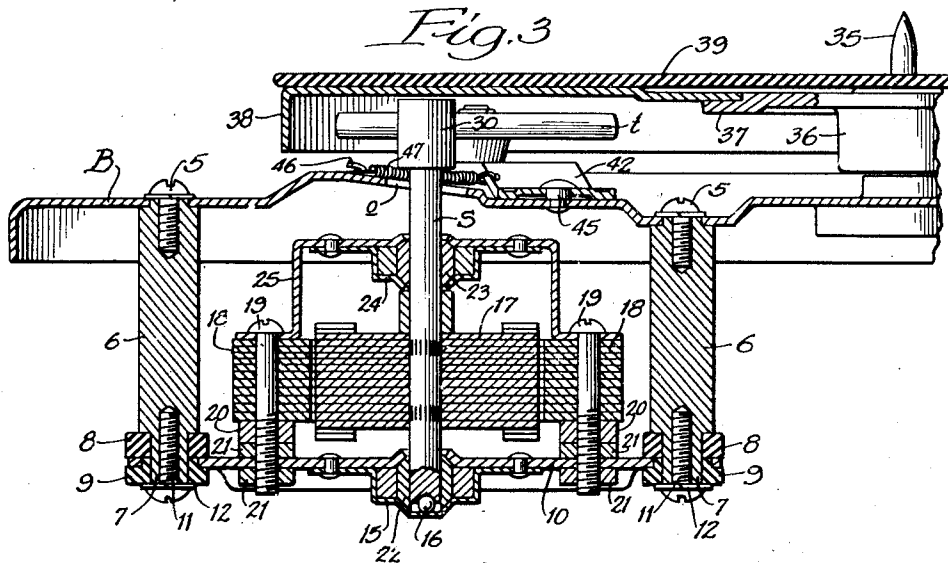
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UNITED STATES PATENT OFFICE

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TURNTABLE DRIVE

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7 Claims. (Cl. 74-206)

The invention herein described is concerned with a turntable drive for phonographs and the like. The present improvements have to do with a frictional type of drive between a motor which depends from a supporting base and a turntable which is mounted to rotate above the base. The entire mechanism is unitary so that it may be applied to or removed from a platform forming part of a phonograph cabinet, or otherwise.

The motor, preferably electrically operated, is balanced in its mounting with a vertically disposed shaft extending upwardly through an opening in the base, a roller being carried at the upper end of the shaft in position to engage a pair of idler wheels having floating mountings on the base, each wheel being in frictional engagement with the inner face of a marginal flange which depends from the turntable. By such a mechanism, a frictional drive is established between the roller on the motor shaft and the rim of the turntable so as to maintain a constant driving engagement therewith.

The mechanism herein described is simple and dependable, it is easily assembled and operated, and it permits of ready exchange of driving rollers of varying sizes so that a desired speed of operation for the turntable may be obtained if alternating currents of different cycles be employed for operation of its electric motor, usually of the synchronous type. The friction drive is enhanced by the utilization of friction treads on the idler wheels, and the use of two such wheels bearing at different places upon the turntable rim makes for greater dependability and enhanced driving power in the operation of the turntable.

These and other objects, as will hereinafter appear, may be realized from the construction of which a suggestive embodiment is set forth in the accompanying drawings in the manner following:

Figure 1 is a top plan view of a base plate whereon is mounted a turntable a portion of which is broken away to exhibit the driving mechanism thereunder;

Fig. 2 is a detail in section, on an enlarged scale, taken on line 2-2 of Fig. 1;

Fig. 3 is a similar view, taken on line 3-3 of Fig. 1; and

Fig. 4, which is a detail in section taken in a plane just below the turntable, shows a modified construction of the driving mechanism.

The present turntable operating mechanism is of unitary character in that it may be mounted upon a base, here shown in the form of a

plate B, adapted to be rested upon or secured to a platform (not shown) of a phonograph cabinet or other support, as is customary. The base plate is provided toward one side with an opening *o*, and upon opposite sides thereof with two other openings through which are extended screws *5* which engage with and furnish support for a pair of posts *6* which depend from the base (see Fig. 3). Each post is reduced at its lower end to provide a neck *7* around which is fitted a pair of resilient bushings *8* and *9*, the latter having an annulus which extends through an opening in a saddle plate *10* extending between the two posts so as to be supported thereby. Each bushing assembly may be retained in position upon its supporting post as by a screw *11* whose head *12* underlies the under face of the lower bushing in the manner shown.

The saddle plate carries in its middle region a depending strap *15* affording a thrust bearing for a ball *16* which underlies the socketed lower end of a vertical motor shaft *8* with which is connected a rotor *17*. The motor comprises also a stator *18* which is fixedly supported as by a pair of bolts *19* extending therethrough and through an assembly of washers and nuts *20* and *21* lying in part above and below the saddle plate. Bearings for the motor shaft may be provided by a pair of sleeves *22* and *23*, the former centered in position within the strap *15* and the latter within a strap *24* depending from a bridge strap *25* that extends over the stator and rotor with connection to the two bolts *19* by which it is maintained fixedly in place.

A motor having support on diametrically opposite sides, as just described, tends to maintain its shaft in vertical position, but may, in response to lateral pressure, shift transversely either way, owing to the resiliency of the supporting bushing assembly. Whenever this lateral pressure is relaxed, the motor shaft will resume its normal vertical position. As shown best in Fig. 1, the opening *o*, through which the shaft is extended, is elongated in a direction which coincides with the plane of the swinging movements of the shaft so as to avoid interference therewith. This capacity of the shaft to shift either way is a feature of importance in connection with the drive which is extended from a roller *30* carried at the upper end of the shaft in a plane above the base plate B, all as will now be described.

Extending upwardly from the base, at approximately its center, is a spindle *35* over which

may be fitted the hub 36 of a turntable 37 having a concentric annulus here shown as a marginal rim in the form of a down-turned flange 38. The turntable is freely rotatable about the spindle for the support of a record 39, which, when rotated, cooperates with a tone arm 40 (and other mechanisms not shown) to reproduce sound therefrom. To rotate the turntable a friction drive is extended from the motor shaft roller 30, all the parts comprising the drive being located below the turntable and close to the upper surface of the base plate where their presence is largely concealed by the flange 38.

A pair of idler wheels 40 and 41 each of which may be fitted, if desired, with a friction tread *t*, are arranged upon opposite sides of the shaft roller 30 in position to engage therewith. Each idler wheel is also positioned to engage the inner face of the turntable flange 38 (see Fig. 1), the wheel 40 being supported upon an arm 42 and the other idler wheel 41 upon an arm 43. Each arm at its end which is remote from the supported idler wheel is provided with an opening to receive therethrough a pin 45 which is anchored to the base plate, and in the arm 42 the opening is in the form of a slot 44 elongated in the direction of the arm length. By this arrangement both arms are free to swing, and the arm 43 to slide lengthwise of itself, whereby to permit both idler wheels to swing toward and from the turntable rim, and one of them, whose pivot point is furthest removed from the turntable rim, to advance in that direction by a sliding movement as well.

For convenience in differentiation, I will refer to the wheel 40, which is carried on the arm 42 having a combined pivoted and sliding connection with the base plate, as "full floating," and to the other wheel 41, which is carried on the arm 43 having capacity only for swinging movement about its pivot, as "semi-floating." The relationship of the normal position of the shaft roller and of the turntable flange to each other and to the two floating wheels and the pivoted supports therefor, is best indicated in Fig. 1 where it will be observed that each wheel assembly, while independent of the other, co-acts therewith primarily through the common shaft roller and secondarily through the turntable flange which is common to both idlers. It is of advantage that the idler wheel 41 furnish an abutment against which the shaft roller may bear in response to pressure exerted against the shaft roller by the other idler wheel 40. For this reason it is unnecessary, and perhaps even undesirable, that the arm 43 have capacity for sliding movement which would then permit this arm, in consequence, to recede from and advance toward the shaft roller. No such combined pivoted and sliding mounting is therefore provided for this arm. The other sustaining arm 42, however, is differently disposed, being located entirely to the inside of the shaft roller. In order that its wheel 40 may, with greatest effect, bear against the shaft roller 30 in a direction which will press the latter against the idler wheel 41 it is desirable that a combined sliding and pivotal connection be provided for at the arm 42, hence the reason for two floating mountings one of which is full and the other semi-floating as already described.

A transverse force is exerted near the free end of the arm 42 by a spring 47 which is incapable, of itself, of producing any longitudinal sliding movement of the arm, but because the wheel 40

bears against the shaft roller 30 at a point which is nearly opposite its point of contact with the other roller 41, there is a tendency for the arm 42 to shift lengthwise, in response to the tension of the spring, in order that frictional engagement between the wheel 40 and the turntable flange on the one hand, and the shaft roller on the other, may continue under all operating conditions. This spring is anchored at one end to a lug 46 which upstands from the base plate. A second spring 48 which is connected to a lug 49 is joined to the mounting arm 43 at the end of a tail piece 50 which is located at a point beyond its pivotal end. In respect of the tension force exerted by the two springs, each arm is, in effect, a lever, one arm (the arm 42) being of the third class and the other (the arm 43) of the first class. These two springs each exert a yielding force against the associated arms tending to swing the two wheels toward the turntable rim, and, in the case of the idler wheel 40, against the shaft roller which is thereby maintained against the other idler wheel 41.

It is desired that each wheel should freely contact, without binding or constriction, both the turntable flange and the shaft roller, and to accomplish this I have provided mountings, which in the one case is sliding and pivotal and in the other is pivotal alone, whereby each arm is free to recede from or advance toward the turntable flange and in the case of the wheel 40 toward the shaft roller 30 which in turn is advanced against the idler wheel 41 whereby a firm frictional engagement with the shaft roller is maintained under all conditions of use. These mountings are accordingly floating, one being full and complete and the other only partially so, in the respects that each idler wheel, while independent of the other, is free to move in any direction in a plane parallel with the turntable as may be required by irregularities or eccentricities in the turntable flange or shaft roller, the two springs being effective at all times to maintain the idler wheels in engagement with the associated parts of the drive with a pressure that is constant and unvarying. Due to the mounting of the motor which is free to tilt in response to lateral pressures exerted by the idler wheels against the drive roller at the end of its shaft *S* there can be no binding of the latter during operation of the turntable.

A generally similar drive construction is illustrated in Fig. 4, the differences being confined to the mountings of the two idler wheel supporting arms 42 and 43, which, as shown, are each slotted at 44 for pivotal and sliding connection to a common pivot pin 45 that is anchored to the base plate. The axis of the pivot pin, as shown, is about in the plane between the two screws 5, i. e. in line with the tilting axis of the motor or transversely of the plane through which the shaft roller 30 is free to swing. This pivot pin is also relatively remote from the turntable flange, and lies to the inside of the shaft roller 30. The two springs 47 and 48 extend from a common lug 51 to the two arms with which they are respectively connected at points further removed from the turntable rim than is the lug 51 so that each spring exerts a force tending to pull the two arms toward the turntable rim while maintaining the respective idler wheels in engagement with the shaft roller 30. In this construction both idler wheels are full floating, and the pressure which either exerts against the shaft roller 30 is transmitted to the other, and vice versa, so as to

maintain a balanced relationship at all times. If either idler wheel be displaced from a given position of contact with both the turntable flange and the driving roller 30, the other idler wheel is correspondingly and concurrently displaced, but in any such movement a reduction in the tension of one spring is accompanied by an increase in the tension of the other spring, so that the balancing of the forces is not disturbed.

An important advantage gained by each of the present drives is the increased friction, with binding or constriction, that is constantly maintained between its several elements. This results not merely from the use of two idler wheels, instead of one, but from the balanced relationship which exists between the idler wheels and the turntable annulus on the one hand, and the driving roller on the other. Due to the tiltable mounting of the motor the driving roller is free to shift laterally permitting pressure from either or both idler wheels thereagainst to produce a traction that is both enhanced and equalized. The manner in which the idler wheels are mounted for movement when engaging the driving roller is such that there is also increased traction with the turntable annulus. My improved drive is accordingly maintained automatically during all conditions of use, even though there be irregularities and eccentricities in the engaging surfaces, this being due to the special relationship between the floating mountings of the driving roller and of the co-acting idler wheels which constitute the principal elements of the drive.

I claim:

1. In combination with a phonograph having a rotatable turntable provided with an annulus, means for operating the turntable comprising a drive shaft mounted for rotation and for lateral movement as well, a driving roller carried by the shaft, a pair of idler wheels each engageable with both the roller and the turntable annulus, a pair of co-axially pivoted sustaining arms affording support to the two idler wheels, and a pair of springs connected with the two arms adapted to exert balanced forces thereon such that the two idler wheels are maintained in frictional engagement at widely separated points against the driving roller.

2. In combination with a phonograph having a base whereon is mounted a rotatable turntable provided with a concentric annulus, a frictional drive mechanism for the turntable comprising a laterally movable driving roller, two floating idler wheels engageable with the roller and with the turntable annulus, means for supporting the driving roller yieldingly in an intermediate position, and tension means urging the idler wheels toward widely spaced points of contact with the driving roller and with the turntable annulus.

3. In combination with a phonograph having a rotatable turntable provided with a concentric annulus and a motor whose shaft is equipped with a driving roller substantially in the plane of the annulus, a friction drive between the roller and annulus comprising a mounting whereon the motor is movably mounted to permit its shaft to freely shift laterally, a pair of idler wheels engageable at widely spaced points with both the roller and the annulus, floating mountings for the rollers such that they may move relatively toward and from the roller and the annulus, and spring means in connection with the floating mountings exerting counter-balancing tension forces which urge the idler wheels yieldingly relatively toward each other and the

roller and toward the annulus as well whereby to maintain an enhanced frictional interconnection therebetween.

4. In combination with a phonograph having a rotatable turntable provided on its underside with an annulus, means for operating the turntable comprising a rotatable drive shaft located interiorly of said annulus and adjacent one side of the same, a mounting for the drive shaft providing for lateral movement of said shaft, a driving roller carried by the shaft, a pair of idler wheels located at opposite sides of the driving roller in the path of the lateral movement of said driving roller and contacting with the driving roller and the annulus and each idler being affected by movement of the other idler in the direction of the driving roller, a separate floating mounting for each idler wheel, one at least of said mountings being full floating so that either wheel when moved toward and from the turntable annulus will produce a change in position of the driving roller and in the other idler wheel, and spring means associated with each idler wheel and exerting tension forces tending to maintain frictional contact between the two idler wheels and the driving roller on one hand and the turntable annulus on the other hand.

5. In combination with a phonograph having a rotatable turntable provided on its underside with an annulus, means for operating the turntable comprising a rotatable drive shaft located interiorly of said annulus and adjacent one side of the same, a mounting for the drive shaft providing for lateral movement of said shaft, a driving roller carried by the shaft, a pair of idler wheels located at opposite sides of the driving roller in the path of the lateral movement of said driving roller and contacting with the driving roller and the annulus and each idler being affected by movement of the other idler in the direction of the driving roller, a movable mounting for each idler wheel one of which permits its associated wheel to advance toward and from the driving roller, a separate floating mounting for each idler wheel, one at least of said mountings being full floating so that either wheel when moved toward and from the turntable annulus will produce a change in position of the driving roller and in the other idler wheel, and spring means associated with each mounting, one adapted to maintain the associated idler wheel against the turntable annulus and the other adapted to maintain the associated idler wheel against both the annulus and the driving roller to transmit through the latter a force which reacts against the idler wheel first mentioned.

6. In combination with a phonograph having a rotatable turntable provided on its underside with an annulus, means for operating the turntable comprising a rotatable drive shaft located interiorly of said annulus and adjacent one side of the same, a mounting for the drive shaft providing for lateral movement of said shaft, a driving roller carried by the shaft, a pair of idler wheels located at opposite sides of the driving roller in the path of the lateral movement of said driving roller and contacting with the driving roller and the annulus and each idler being affected by movement of the other idler in the direction of the driving roller, an arm whereon each idler wheel is mounted near one end, means pivotally connecting each arm near its opposite end, one of the arms, in its normal position, being extended in a direction towards the driving roller and the other arm, in its normal

position, being extended in a position past the driving roller, and spring means associated with the two arms adapted to urge both idler wheels toward the turntable annulus and one idler wheel toward the driving roller in a manner to advance the latter against the remaining idler wheel for frictional driving connection therewith.

7. In combination with a phonograph having a rotatable turntable provided on its underside with an annulus, means for operating the turntable comprising a rotatable drive shaft located interiorly of said annulus and adjacent one side of the same, a mounting for the drive shaft providing for lateral movement of said shaft, a driving roller carried by the shaft, a pair of idler wheels located at opposite sides of the driving roller in the path of the lateral movement

of said driving roller and contacting with the driving roller and the annulus and each idler being affected by movement of the other idler in the direction of the driving roller, a separate floating mounting for each idler wheel, one at least of said mountings being full floating so that at least one of said idler wheels when moved toward and from the turntable annulus will produce a change in the position of the driving roller and the other idler wheel, and spring means associated with each idler wheel and exerting tension forces tending to maintain frictional contact between the two idler wheels and the driving roller on one hand and the turntable annulus on the other hand.

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