Dec. 13, 1949 F. G. BUHRENDORF 2,491,247

TURNTABLE DRIVE

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FIG. 1

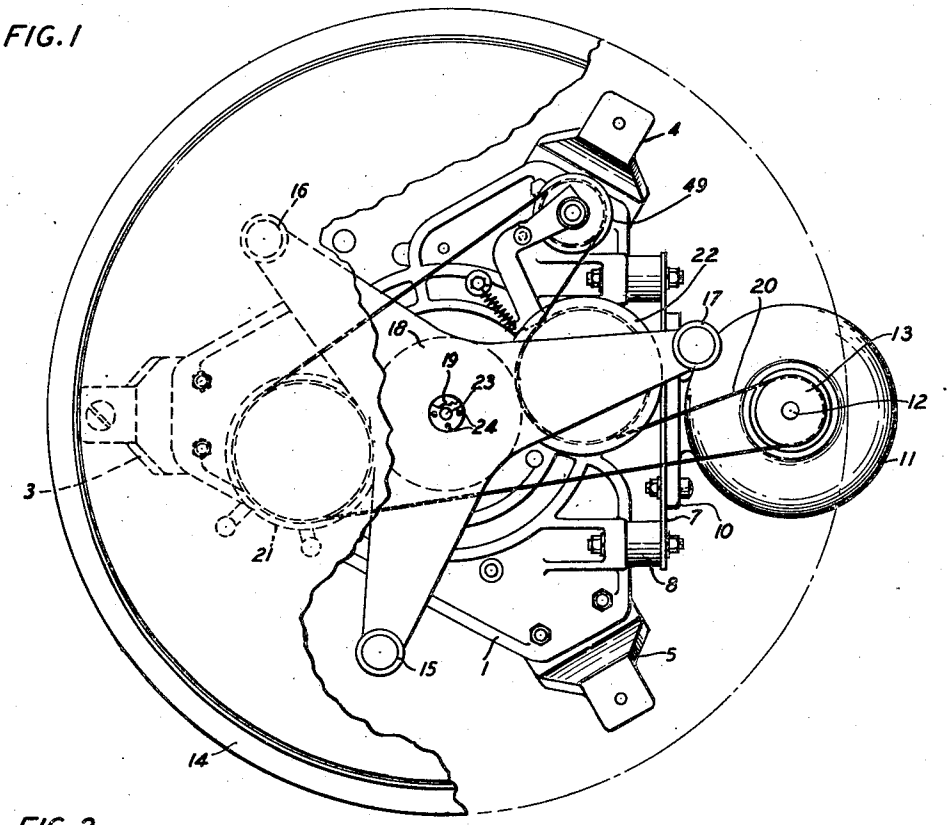
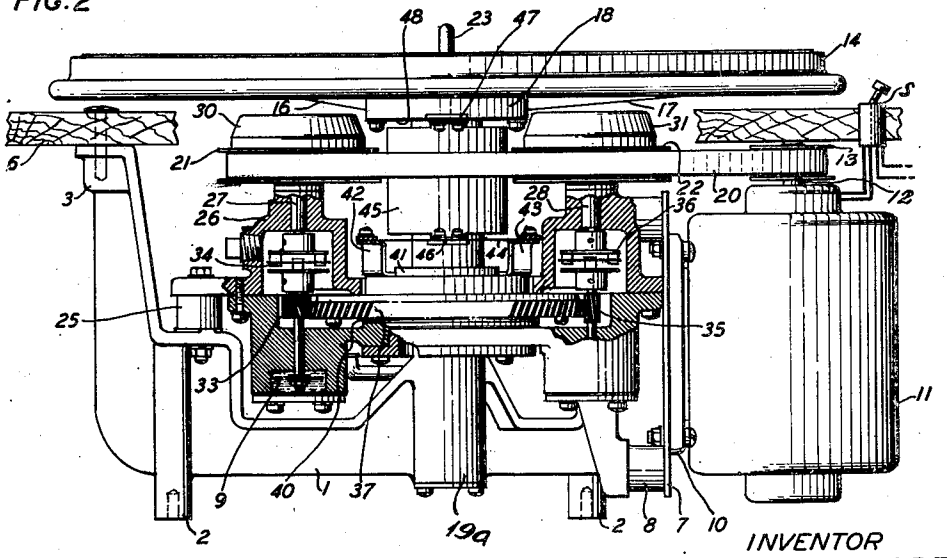


FIG. 2



INVENTOR
F. G. BUHRENDORF
BY
J. F. McEneany
ATTORNEY

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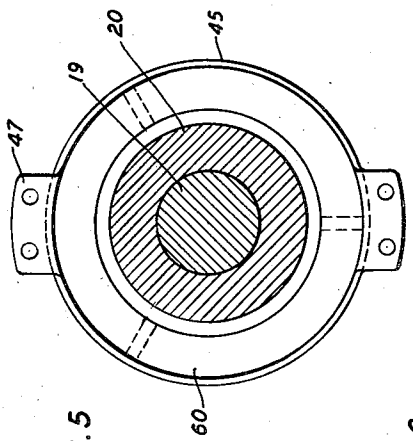

FIG. 5

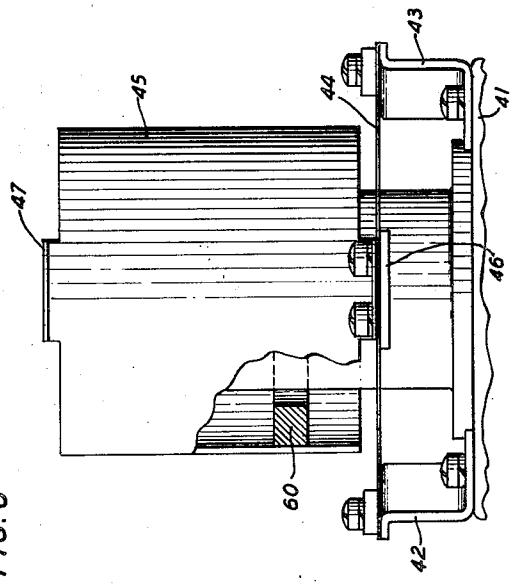

FIG. 6

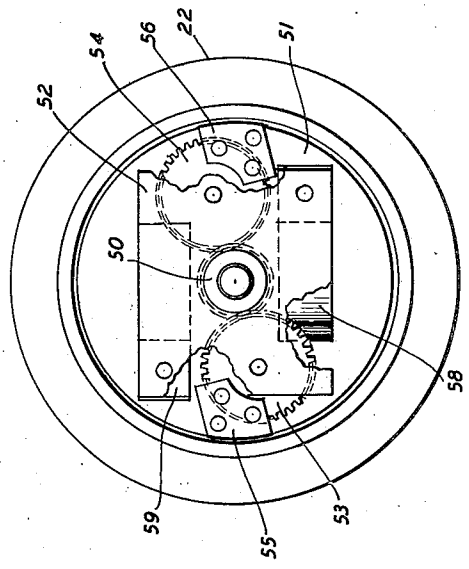

FIG. 3

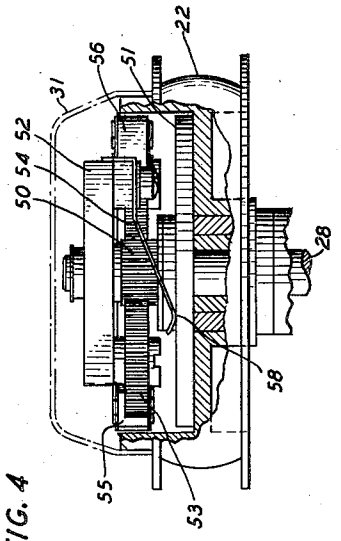

FIG. 4

INVENTOR
F. G. BUHRENDORF
BY
J. F. McEneany
ATTORNEY

Patented Dec. 13, 1949 2,491,247

UNITED STATES PATENT OFFICE

2,491,247

TURNTABLE DRIVE

Frederick G. Buhrendorf, Westfield, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application November 13, 1946, Serial No. 709,593

2 Claims. (Cl. 74—367)

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This invention relates to turntable drives and more particularly to a plural speed drive for a phonograph turntable.

It is the object of this invention to provide a plural speed turntable drive incorporating improved means for effecting a change from one speed to another.

It is another object of this invention to provide a plural speed turntable drive in which the change from one speed to another is made instantly and simply by a reversal of the direction of rotation of the turntable driving motor.

It is a further object of this invention to provide a plural speed turntable drive in which the turntable at any selected speed is driven with minimum variation from constant angular velocity.

In present day reproduction of phonograph records, particularly in the transcription of records for broadcast purposes, it is desirable that the turntable drive be provided with means for selectively rotating the turntable at either 33⅓ revolutions per minute or 78 revolutions per minute in order that different type records may be satisfactorily reproduced at their proper reproducing speeds.

Numerous mechanical drives have been proposed heretofore for this purpose but in these drives, the change from one speed to another usually involves the manual shifting of gears in the drive mechanism to select the appropriate gear ratio to produce the speed desired.

In accordance with this invention the change from one speed to another is made instantly and simply by a reversal of the direction of the rotation of the driving motor, which change can be readily effected by operation of a single switch in the motor circuit. In the turntable drive in accordance with this invention, the turntable shaft is driven by either one of two driving shafts, each permanently coupled to the turntable shaft through gears of predetermined ratio. The two driving shafts are located on opposite sides of the turntable shaft and are both rotated by means of a single belt which is pulley coupled to the shaft of a reversible electric motor. An over-running clutch is provided in the driving connection between the belt and each of the driving shafts. These over-running clutches are driven simultaneously in opposite directions of rotation for one direction of motion of the belt so that when one clutch is operative, the other is non-operative. Thus, either one of two turntable speeds may be obtained by selection of the direction of rotation of the driving motor.

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The invention will be more readily understood by reference to the specification when read in connection with the accompanying drawings in which:

Fig. 1 is a plan view of the turntable drive in accordance with this invention;

Fig. 2 is a side elevation, partly in section, of the turntable drive shown in Fig. 1;

Fig. 3 is a detail plan view of an over-running clutch in accordance with this invention;

Fig. 4 is a side elevation of the over-running clutch shown in Fig. 3; and

Figs. 5 and 6 are plan and side elevations, respectively, of a yieldable coupling element between the driving mechanism and the turntable.

Referring to Figs. 1 and 2, a base 1 is provided with downwardly extending supporting legs 2 and upwardly extending arms 3, 4 and 5. A mounting panel 6 is attached to these arms.

A plate 7 is secured to the base 1 by four resilient mounting elements 8. A bracket 10, supporting an electric motor 11, its secured to plate 7 by suitable means. The shaft 12 of motor 11 has a pulley 13 mounted thereon. A switch S, Fig. 2, shown mounted in panel 6, is connected in the circuit from an electric power source to motor 11. This switch provides means for reversing the direction of rotation of the motor by reversing the current through one of the motor windings. As will be explained clearly hereinafter, the switch S constitutes the sole means whose operation is necessary to change the speed of rotation of turntable 14 from one predetermined speed to another predetermined speed.

A turntable 14 rests on and is frictionally engaged by the outer ends of spider arms 15, 16 and 17. These arms are integral with and extend outward radially from a flanged end 18 of turntable shaft 19 (Fig. 1). The shaft 19 extends downwardly within a housing 19*a*, which forms part of and is centrally disposed on the base 1. The inner surface of housing 19*a* constitutes a bearing surface for the shaft 19.

As shown in Fig. 1, a turntable spindle 23, having a circular flanged base, is secured to the upper end of shaft 19 by means of screws 24. This spindle may be readily replaced by another spindle of different size to accommodate any particular record disc provided with other than a standard center hole.

A unit mechanism for driving the turntable shaft 19 is resiliently mounted at several points on base 1, as at 25 (Fig. 2). This unit comprises a casing 26 which houses two drive shafts located on opposite sides of the housing 19*a* and a driven

gear which is resiliently coupled to the driving shaft 19 through flanged end 18, as will be explained hereinafter.

Two driving shafts 27 and 28 (Fig. 2) are driven from motor 11 by means of a belt 20 and pulleys 21 and 22, respectively. As will be explained in greater detail in connection with Figs. 3 and 4, the pulleys 21 and 22 each drive their respective shafts 27 and 28 through an over-running clutch disposed in housings 30 and 31, respectively.

Shaft 27 drives pinion gear 33 through a flexible coupling 34 while shaft 28 drives pinion gear 35 through a similar flexible coupling 36. The pinion gears 33 and 35, which are of different diameter, are permanently meshed with a gear 37. The gear ratio between the gear 37 and each of the gears 33 and 35 are selected to produce the desired speed of rotation of gear 37 when this gear is driven by either one or the other of the two driving shafts.

The teeth of gears 33, 35 and 37 are helically cut. The shafts 27 and 28 are each restrained from axial movement by the spring element in couplings 34 and 36, respectively, and any axial movement of these shafts is damped by a plunger 9 (one shown) movable in an oil-filled cylinder in the bottom of casing 26. The combined action of the helical gear, plunger and coupling spring provides a low-pass filter which minimizes momentary variation in uniform rotation of gear 37 and shaft 19 as might be caused by slight mechanical imperfections in the driving elements from the power source.

Gear 37 is rotatable about housing 20, a bearing surface for this gear being provided on housing 26 at 40 (Fig. 2). A member 41 is secured to gear 37 to be rotatable therewith. This member 41 has uwardly extending arms 42 and 43 secured thereto. A metal ring 44 is clamped to the arms 42 and 43, as shown. The ring 44 is flexible in the vertical direction but rigid in the direction of rotation of the gear 37. A cylindrical metal member 45, which surrounds the housing 19*a*, is provided with a lower flange 46 and means for clamping this flange to ring 44. As shown in Fig. 5, two of these flanges are provided on diametrically opposite sides of the cylinder 45. The upper end of cylinder 45 is also provided with two flanges 47 which are clamped to a second metal ring 48. On another diameter, the ring 48 is clamped to the flanged end 18 of shaft 19. It is seen, therefore, that the power from gear 37 is transmitted to shaft 19 through a coupling having high torsional rigidity but sufficiently low longitudinal stiffess to prevent the transmission of vibrations in the drive. This coupling is shown in greater detail in the enlarged view in Figs. 5 and 6.

As shown in Fig. 1, the belt 20 engages motor pulley 13 and pulleys 21 and 22. A spring-tensioned idle roller 49 is provided to maintain constant tension in belt 20. It will be observed that the belt 20 engages the pulleys 21 and 22 in a manner to produce rotation of one pulley in a direction opposite to the direction of rotation of the other pulley, that is, for a clockwise rotation of motor pulley 13, pulley 21 will receive clockwise rotation while pulley 22 will be rotated in a counter-clockwise direction.

Referring now to Figs. 3 and 4, the details of a suitable one-way engaging clutch to be employed in the drive between the pulleys 21 and 22 and shafts 27 and 28, respectively, will be described. As the same type clutch is used in each case, the details of the clutch associated with pulley 22 and shaft 28 will be described.

It will be observed that the shafts 27 and 28 and their respective pinions 33 and 35 rotate always in the same direction of rotation (counter-clockwise) whether one pinion, for example gear 35, is driving the gear 37 or is being driven by gear 37 in response to its rotation by the other pinion 33. Thus, the gear 37 and, therefore, the turntable is always driven in one direction of rotation (clockwise) for any selected speed.

A gear 50 is secured to the end of shaft 28. Pulley 22 and an annular member 51 secured thereto are rotatable about shaft 28. A rectangular plate 52 is mounted for free rotation on the end of shaft 28. A pair of gears 53 and 54 are rotatably mounted on studs depending from plate 52. Each of these gears is in mesh with gear 50. Gears 53 and 54 have shoes 55 and 56 respectively, secured thereto. These shoes are free from contact with the inner surface of pulley 22 but are so shaped and positioned on their respective gears that they may be brought into frictional engagement with the pulley by rotation of the plate 52 in one direction of rotation.

Two springs 58 and 59, each have one end secured to the underside of plate 52 and their free end in frictional engagement with member 51. The engagement of these springs with the rotating pulley 22 produces rotation of plate 52 in the direction of rotation of the pulley. Referring to Fig. 3, a counter-clockwise rotation of pulley 22 produces similar counter-clockwise rotation of plate 52. In this direction of rotation of plate 52, the gears 53 and 54 are rotated about gear 50 in a counter-clockwise direction. Thus shoes 55 and 56 are urged into engagement with pulley 22 and are gripped therein to produce rotation of plate 52, gears 53, 54 and gear 50, which is in mesh therewith. Therefore, for counter-clockwise rotation of pulley 22, the shaft 28 is driven in the same counter-clockwise direction to produce clockwise rotation of gear 37.

For clockwise rotation of pulley 22, produced by reversal of the direction of motion of belt 20, the springs 58 and 59 frictionally engage annular member 51, producing clockwise rotational movement of plate 52 and gears 53 and 54 mounted thereon. Because they are in mesh with gear 50, the gears 53 and 54 are rotated clockwise on their mounting studs. For this direction of rotation of gears 53 and 54 on their mounting studs, the shoes 55 and 56 are disengaged from frictional contact with the pulley. The pulley then rotates without power transmitting linkage.

It will be seen from Fig. 1 that the belt 20 drives pulleys 21 and 22 simultaneously in opposite directions of rotation, thus rotating either one or the other of shafts 27 and 28 for one direction of motion of the belt. Upon reversal of direction of travel of the belt, the previously non-operative shaft is made operative.

In Figs. 5 and 6 an enlarged view of the coupling between gear 37 and shaft 19 is presented. A metal ring 60, secured to the cylinder 45, is of such mass and is so located that the center of percussion of the coupling is at the lower ring 44 when the axis of suspension is at the ring 48. A coupling of this type is disclosed and claimed in United States Patent 1,832,285, November 17, 1931, to L. A. Elmer.

While in this disclosure the two driving shafts are gear coupled to the turntable shaft, it will be understood that this invention is applicable to phonograph turntable drives in which the turntable is rotated by a plurality of turntable-engag-

ing friction wheels of different diameters mounted on the individual driving shafts.

What is claimed is:

1. In a two-speed power transmission system, a driven shaft, a pair of driving shafts each having one end coupled to said driven shaft through gears of selected ratio and each provided at its free end with a gear, a separate coupling associated with the free end of each of said driving shafts, each of said couplings comprising a hollow pulley, a freely rotatable gear mounted within said pulley in mesh with the gear on the free end of said driving shaft, said freely rotatable gear being provided with a shoe surface over a portion of its periphery adapted to frictionally engage said pulley for one direction of rotation thereof and to disengage from said pulley for a reverse direction of rotation thereof, and a single reversible power transmitting means for rotating the pulley elements of said couplings simultaneously in opposite directions of rotation for one direction of travel of said power transmitting means.

2. In a turntable drive, a turntable shaft, a pair of driving shafts each coupled to said turntable shaft through gears of predetermined ratio, a reversible driving motor having a shaft, a pulley secured to said motor shaft a separate coupling associated with each of said driving shafts, each

of said couplings comprising a hollow pulley rotatably mounted on said driving shaft and a one-way engaging clutch disposed in said hollow pulley and forming the sole driving connection between said pulley and said shaft, and a single belt connecting said motor shaft pulley with said coupling pulleys in a manner to produce simultaneous rotation thereof in opposite directions for one direction of motion of said belt.

FREDERICK G. BUHRENDORF.

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