July 2, 1935. F. VAN DER WOUDE 2,006,660

TURNTABLE DRIVING MECHANISM

Filed Feb. 25, 1932

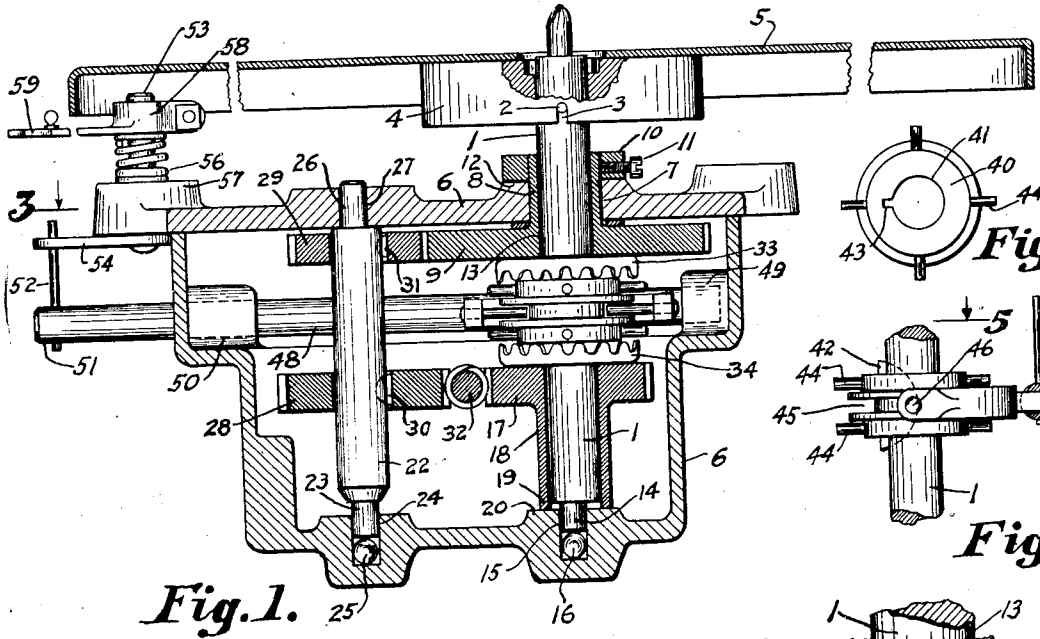


Fig. 1.

Fig. 5.

Fig. 4.

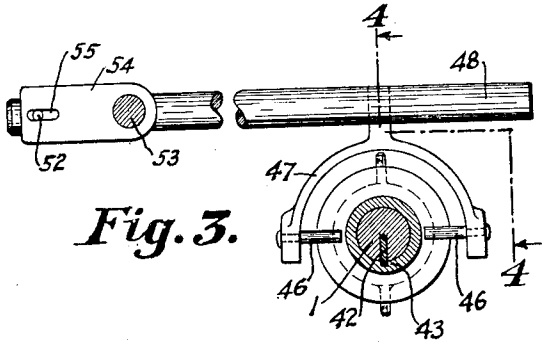


Fig. 3.

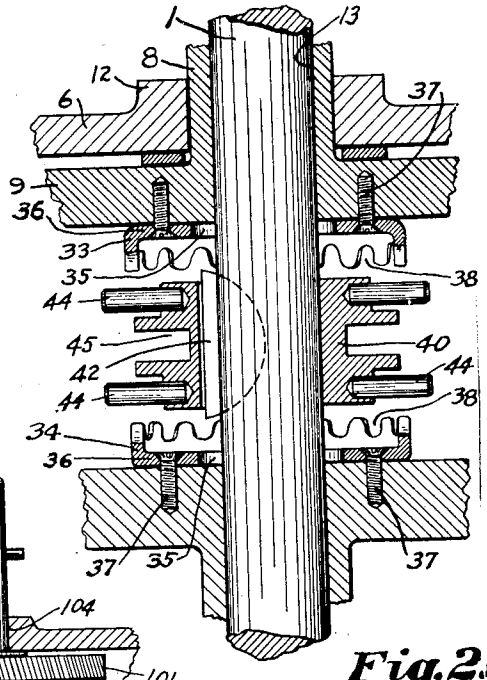


Fig. 2.

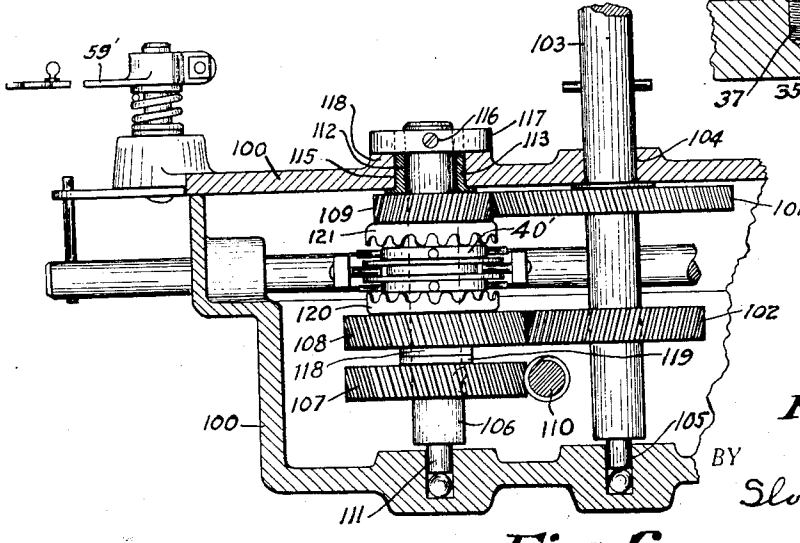


Fig. 6.

INVENTOR.
Fritz Van der Woude
BY
Slough and Canfield
ATTORNEYS.

Patented July 2, 1935 2,006,660

UNITED STATES PATENT OFFICE

2,006,660

TURNTABLE DRIVING MECHANISM

Fritz van der Woude, Elyria, Ohio, assignor to The General Industries Company, Elyria, Ohio, a corporation of Ohio

Application February 25, 1932, Serial No. 595,012

6 Claims. (Cl. 192—82)

This invention relates to driving mechanisms for phonographs or the like and particularly to mechanisms for varying the speed of power transmission from the power supply motor to the phonograph or the like turntable.

It has been customary for some time to drive the turntables of phonographs such as are used in the home at a standardized speed of 78.2 revolutions per minute and when the power is supplied by electric motor suitable gearing or other transmission mechanism has been interposed between the motor and the turntable to effect a reduction of speed to that value.

The introduction of talking moving pictures employing a phonograph to reproduce the voice or other sounds has led to the development of phonographic reproducing apparatus having relatively large record discs driven at a lower speed, and a speed of 33⅓ revolutions per minute has been continuously employed in this art.

It is therefore one of the objects of this invention to provide a transmission or driving mechanism whereby a phonograph turntable may be driven either at a predetermined high speed or at a predetermined low speed and optionally changed from one to the other in an improved manner.

Another object of my invention is to provide improved mechanism whereby a phonograph turntable may be driven either at a speed of 78.2 revolutions per minute or at 33⅓ revolutions per minute and whereby the shift from one to the other may be conveniently effected.

Another object is to provide improved mechanism of the class referred to in which the change from one speed to the other may be effected without the disengagement and re-engagement of gears.

Another object is to provide improved mechanism of the class referred to in which the speed reduction from a power source such as an electric motor may be made through continuously meshed gears.

Another object is to provide for the driving of phonograph or the like turntables, an improved simple two-speed transmission mechanism between the power-supplying motor and the turntable, adapted to transmit power at two predetermined speeds, and provided with improved means for effecting the change from one speed to the other.

Other objects of my invention will be apparent to those skilled in the art to which my invention appertains. My invention is fully disclosed in the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a cross-sectional view of a mechanism embodying my invention, with parts thereof in elevation;

Fig. 2 is a view to an enlarged scale of a part of Fig. 1 showing in cross-section parts which in Fig. 1 are shown in elevation;

Fig. 3 is a view taken approximately from the plane 3 of Fig. 1, with some of the parts below the plane of the view omitted, and illustrating a shifting mechanism which I may employ;

Fig. 4 is a view taken from the plane 4—4 of Fig. 3;

Fig. 5 is a view of a clutch element forming part of the mechanism of Figs. 3 and 4, the view of the element being taken as from the plane 5 of Fig. 4;

Fig. 6 is a view similar to Fig. 1, illustrating a modification.

Referring to the drawing, I have shown at 1 a turntable driving shaft generally vertically disposed having a pin 2 extending transversely therethrough engaging a notch or notches 3 of a turntable head 4 supporting a turntable proper 5 whereby the turntable 5 may be supported upon and rotated by the shaft 1.

A main frame 6 has rotatably mounted in a generally vertical bore 7 coaxial with the shaft 1, the hub 8 of a gear 9, to be more fully described, the hub extending upwardly through and outwardly of the bore 7 and having a collar 10 secured thereto by a set screw 11, the collar engaging on its lower face a boss 12 of the main frame, whereby the gear 9 is rotatably supported in the frame 6. The hub 8 has a bore 13 therethrough constituting a rotary bearing for the shaft 1 on a portion thereof adjacent the turntable 5. The lower end of the shaft 1 is reduced in diameter to provide a trunnion 14 which is rotatably mounted in a bore 15 in the frame, the bore 15 being of the nature of a cup-like recess; and a steel ball 16 is disposed in the bottom of the recess and upon the ball the extreme end of the trunnion 14 rests, the construction thus providing an end thrust bearing 14—16 and a rotary bearing 14—15 for the shaft 1.

A worm gear 17 having a hub 18 is rotatably mounted on the shaft 1 and the end 19 of the hub abuts upon a boss 20 on the frame 6 to axially support the gear.

At 22 I have shown a counter-shaft, disposed generally parallel to the shaft 1 and spaced laterally therefrom and provided with a trunnion

23 on its lower end, rotatably supported in a bore or recess 24 and supported on a ball 25 in the recess, the construction providing a rotary bearing 23—24 and an end thrust bearing 24—25 which may be similar to the corresponding bearings above described for the shaft 1.

The opposite end of the shaft 22 is provided with a trunnion 26 of reduced diameter rotatably mounted in a bearing bore 27 in the frame 6.

A gear 28 and a gear 29 are rigidly secured to the shaft 22 as by keys 30 and 31 respectively.

The gears 17 and 28 are disposed to mesh with a worm 32, preferably on opposite sides of the worm, and to be rotatably driven thereby. The worm 32 is adapted in a well known manner to be rotated by an electric motor not shown and which may be of any suitable or well known construction; and which is preferably designed or has regulating apparatus associated therewith so that it will drive the worm 32 at a substantially constant speed.

The gears 17 and 28 have preferably the same number of teeth, which is proportioned to the rate of revolution of the worm 32 to cause the gears 17 and 28 to rotate at a speed of substantially 78.2 revolutions per minute.

The gear 29 is meshed with the gear 9, above described, and the relative numbers of teeth in these two gears is determined so that the gear 9 will be rotated at 33.33 revolutions per minute by the above described movement transmitted by the worm 32 to the gear 28 and by shaft 22.

Secured to each of the gears 9 and 17 and by confronting each other coaxially, are two crown clutch elements 33 and 34, respectively, being formed preferably from sheet metal and generally of flat cup-form, having relatively large perforations 35—35 centrally of the cup bottom 36 through which perforations the shaft 1 extends, and the cup bottom 36 being rigidly connected to the gears 9 and 17 by screws 37—37. The outer edge of the skirts of the cups 33 and 34 are provided with an annular row of notches 38—38 and thus form each one element of a clutch.

The other element of the clutch comprises an annular body 40 having a bore 41 therethrough, through which the shaft 1 extends, and being controlled to rotate with the shaft 1 or, optionally, to move axially thereupon by means of a key-construction comprising a key 42 secured to the shaft 1 and a key-way 43 in the clutch member 40. At opposite axial ends of the body member 40, there is provided a plurality such as four radially extending pins 44—44. When the clutch body 40 is moved in either direction axially on the shaft 1, the said pins 44 may be thereby projected into the notches 38 of one or the other of the clutch elements 33—34 to thus lock or clutch the gears 9 and 17 alternatively to the shaft 1, in a manner that will be understood.

To reciprocate, alternatively, the clutch body member 40, it is provided with an annular groove 45 in which inwardly radially extending shift pins 46—46 extend, the pins being carried by a shift fork 47 having a portion intermediate the pins 46 connected to a clutch shaft 48.

The clutch shaft 48 is disposed generally at right angles to the shafts 1 and 22 and is supported at one end in a suitable rotational bearing 49 (see Fig. 1), and disposed on one side of the shift fork 47, and in a rotational bearing 50 on the other side of the fork. The shaft extends outwardly through the bearing 50 and at its termination as at 51 is provided with a radially extending arm 52 through the agency of which rotary movement or oscillatory movement may be given to the shaft 48 to turn it and to thereby shift the clutch in the manner above described.

To move the arm 52, a generally vertical control shaft 53 is rotatably mounted in a suitable bearing on the main frame 6, (See Fig. 1), and carries a radially extending arm 54 having a slot 55 through which the arm 52 above described projects. Thus, see Figs. 1 and 3, rotation or oscillation of the shaft 53 will communicate a corresponding movement to the shaft 48. In the preferred construction, a compression spring 56 surrounds the shaft 53, abuts at one end upon a boss 57 of the frame 6 and at its other end abuts upon a head 58 of an adjusting arm 59 secured to the shaft 53. The spring 56 thus may exert friction to hold the shaft 53 in either of its two operative positions or in a neutral therebetween; and the construction also disposes the regulating arm 59 in a plane parallel to the turntable 5 and permits the disposal of the arm 59 above the other parts of the frame 6 whereby the frame 6 and its power transmission part may be disposed under a cabinet panel and concealed from view. Thus, as will be understood to be desirable, the turntable 5 and the arm 59 alone may be visible above a generally horizontal cabinet panel.

The operation of the embodiment of my invention of Figs. 1 to 5 inclusive will now be clear. Upon moving the arm 59 in either direction to turn the shaft 53, this movement will be communicated to the shaft 48 to raise or lower, with respect to the shaft 1, the clutch member 40. If it be raised, the pins 44 thereof engaging notches 38 of the clutch member 33, will lock the gear 9 by the shaft 1. Rotary movement from the worm 32 will then be transmitted through the gear 28, shaft 22, gear 29, gear 9, to the shaft 1, to rotate the turntable 5 at approximately 33.3 revolutions per minute. If the clutch member 40, however, be moved downwardly, the pins 44 thereof will engage notches 38 of the clutch member 36 and will lock the gear 17 to the shaft 1, and motion transmitted from the worm 32 to the gear 17 to the shaft 1 will rotate the shaft at the rate of 78.2 revolutions per minute.

In the modified form of my invention shown in Fig. 6, a housing 100 is provided; and two gears 101 and 102 are rigidly mounted on a turntable driving shaft 103, the shaft being rotatably mounted in a bearing bore 104 in the housing and on its lower end being supported as at 105 by a rotational and end thrust bearing which may be like or similar to that described in connection with Fig. 1.

A counter-shaft 106 laterally spaced from the shaft 103 and generally parallel thereto is supported by a rotational and end thrust bearing 111 similar to the bearing 105, and at its opposite or upper end is rotationally supported in a bore 112 formed in the hub 113 of a gear 109, the gear itself being rotatably mounted in the frame 100 by its hub 113 in a bore 115 in the frame 100, and being supported axially by a collar 117 secured to the hub 113 by a set screw 116, and the lower face of the collar 117 bearing upon a boss 118 of the frame.

By this construction the gear 109 and the shaft 106 may rotate independently of each other but are maintained coaxial.

A gear 108 is rotatably mounted on the shaft 106 and is supported axially on the shaft by the engagement of a hub portion 118 thereof with a hub portion 119 of a gear 107 rigidly connected to the shaft 106 and meshed with a driving worm 110. The gear 108 meshes with the gear 102, and the gear 109 meshes with the gear 101 above described.

Intermediate of the gears 109 and 108 and coaxial with the shaft 106 is a movable clutch member which may be identical with that described in connection with Figs. 1 to 5 inclusive; and correspondingly, the gears 108 and 109 are provided with opposite confronting clutch members 120 and 121 secured respectively to the gears 108 and 109.

Rotation of the worm 110 will rotate the shaft 106 through the gear 107. The clutch member indicated generally at 40' may be raised or lowered by corresponding movement of the arm 59' as has been more fully described in connection with the clutch member 40 and arm 59 of Fig. 1. When the clutch member 40' is lowered, the clutch member 120 will be thereby locked to the shaft 106 and rotary movement from the worm 110 will be transmitted through the gear 107, shaft 106, clutch member 120, gear 108, gear 102, and shaft 103. The number of teeth of the gears 107, 108 and 102 may be determined, in view of the rate of revolution of the worm 110, to rotate the shaft 103 at 78.2 revolutions per minute.

When the clutch member 40' is elevated, it will lock the clutch member 121 to the shaft 106 and then movement from the worm 110 will be transmitted through the gear 107, shaft 106, clutch member 121, gear 109, gear 101 and shaft 103, and the ratio of gears 109 and 101 may be determined so as to drive the shaft 103 at 33.33 revolutions per minute.

With respect to the two forms of my invention above described, it will be observed that in the form shown in Figs. 1 to 5 inclusive, the four gears, 17, 28, 29 and 9 continuously rotate by power from the worm 32 and the gears 9 and 17 are optionally or alternatively drivingly connected to the shaft 1.

In the form shown in Fig. 6, only the gear 107 rotates continuously and the gears 109 and 108 are alternatively or optionally connected to the shaft 106 and since these gears are at all times meshed with the gears 101 and 102, they are thus optionally and alternatively connected to the shaft 103 in a manner to drive it.

My invention is not limited to the exact details of construction shown and described inasmuch as many changes and modifications may be made within the scope and spirit of my invention without sacrificing its advantages.

I claim:

1. In a two speed power transmission for the turntables of phonographs and the like of the type comprising a reciprocable clutch element, means for shifting the clutch element comprising an oscillatably mounted shaft having an arm extending laterally therefrom, an operating arm, and a pin and slot connection between the operating arm and the laterally extending arm to communicate oscillatory movement of the operating arm to said first named arm to oscillate it and thereby oscillate the shaft.

2. In a clutch operating mechanism, a reciprocable clutch element, an oscillatable shaft, means for oscillating the shaft, means for communicating oscillatory movement of the shaft to the clutch element to reciprocably selectively position it comprising an arm member extending laterally from the shaft, a pivotally supported arm having a portion oscillatable in directions at an angle to the laterally extending arm member and connected to the arm member and pivotally movable to defined positions.

3. In a clutch operating mechanism, a reciprocable clutch element, an oscillatable shaft, means for oscillating the shaft, means for communicating oscillatory movement of the shaft to the clutch element to reciprocably selectively position it comprising an arm member extending laterally from the shaft, a pivotally supported arm having a portion movable in a plane at an angle to the laterally extending arm member and having a pin and slot connection therewith and movable to defined positions.

4. In a clutch operating mechanism, a reciprocable clutch element, an oscillatable shaft, means for oscillating the shaft, means for communicating oscillatory movement of the shaft to the clutch element to reciprocably selectively position it comprising a pivoted arm having a pivot axis at an angle to the axis of the shaft, the shaft having a laterally extending arm, the pivoted arm having a bearing connection with the laterally extending arm and movable to defined positions.

5. In a clutch operating mechanism, a reciprocable clutch element, an oscillatable shaft, means for oscillating the shaft, means for communicating oscillatory movement of the shaft to the clutch element to reciprocably selectively position it comprising a pivoted arm having a pivot axis at an angle to the axis of the shaft, the shaft having a laterally extending arm, the pivoted arm having a pin-and-slot connection with the laterally extending arm and movable to defined positions.

6. In a clutch operating mechanism, a main frame, a reciprocable clutch element, supported on an oscillatory shaft on the frame, an arm extending laterally from the shaft, a pivoted arm pivotally movable on the frame on an axis at an angle to the shaft axis and having a bearing connection with the laterally extending arm, for oscillating the shaft, an indicating arm pivoted on the frame for moving the said pivoted arm, and friction brake means for holding the pivoted arm and shaft in predetermined positions.

FRITZ VAN DER WOUDE.