Aug. 18, 1936. J. B. SUOMALA 2,051,799

TWO-SPEED MOTOR

Filed June 30, 1932

Fig. 1.

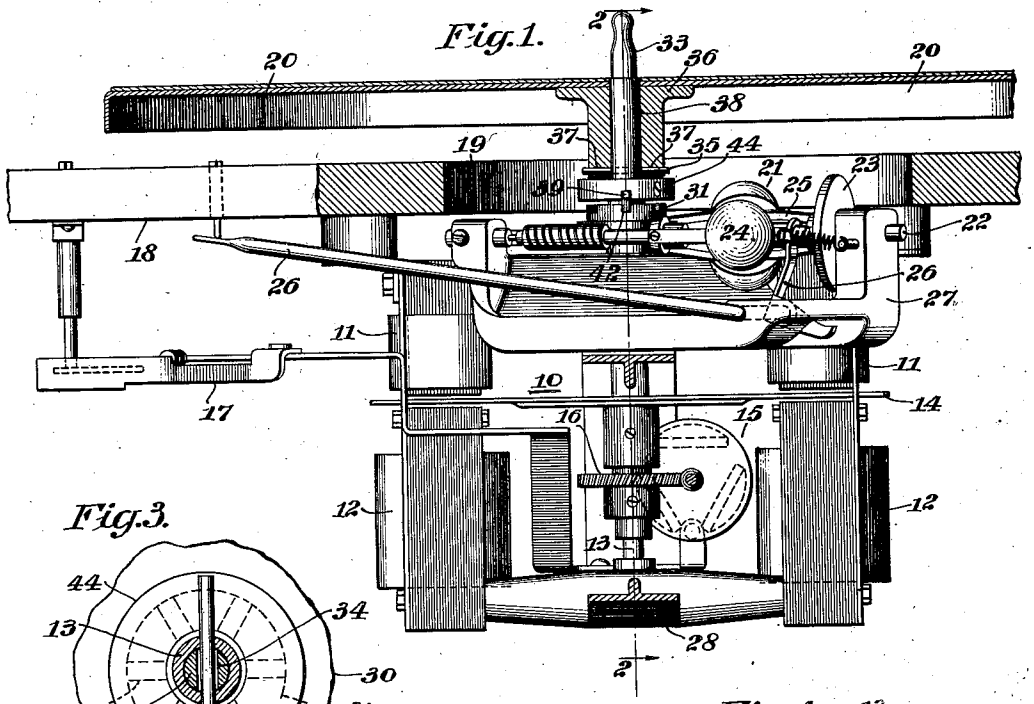


Fig. 3.

Fig. 4.

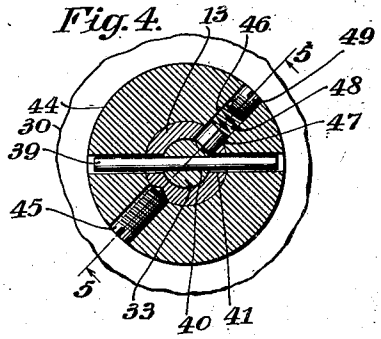


Fig. 2.

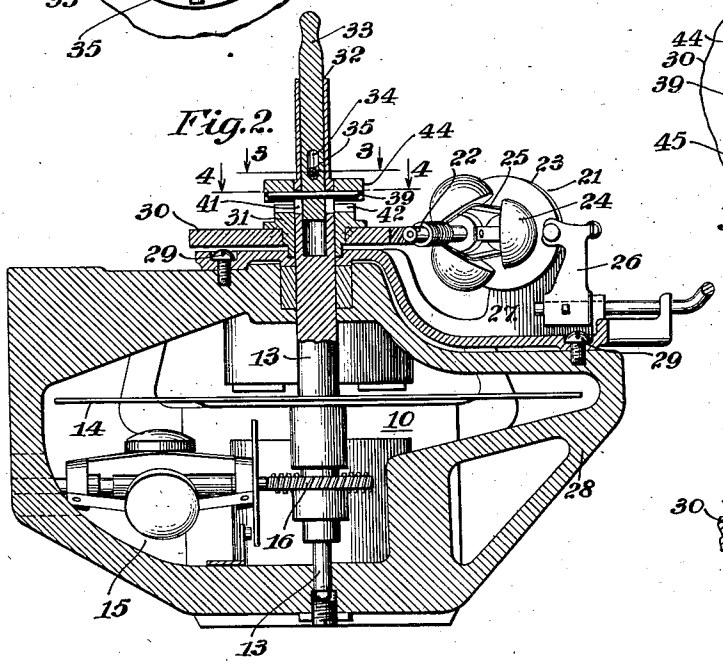
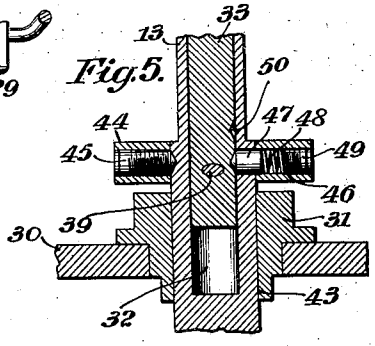


Fig. 5.



INVENTOR:
John B. Suomala,
by R. Goldsborough
HIS ATTORNEY.

Patented Aug. 18, 1936 2,051,799

UNITED STATES PATENT OFFICE

2,051,799

TWO-SPEED MOTOR

John B. Suomala, Camden, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application June 30, 1932, Serial No. 620,108

13 Claims. (Cl. 185—1)

My invention relates to turntable drives and more particularly, although not exclusively, to a plural speed drive for phonograph turntables.

In reproducing sound from records of the disc type, it is customary to rotate the disc at a constant predetermined speed. Until recently, substantially all phonographs of the disc record type have been so designed that the turntable or record supports thereof rotate at 78 R. P. M. By reason of improved recording and reproducing methods, however, phonograph records requiring a much lower angular speed, as, for example, 33⅓ R. P. M., are now available. Obviously, such records cannot satisfactorily be reproduced on the majority of existing phonographs since the speed regulating mechanisms thereof cannot be adjusted to maintain the extreme constancy of angular velocity required by the new slowly-rotating records, better known commercially as long-playing records. It will be obvious, therefore, that a record tablet intended for reproduction by phonograph apparatus of one type cannot be properly reproduced by phonograph apparatus of the other type.

It is, therefore, the primary object of my invention to provide an improved turntable drive for phonographs whereby different angular speeds may be transmitted to the turntable at will.

A further object of my invention is to provide a phonograph motor having a plural speed turntable drive mechanism formed integrally therewith.

Another object of my invention is to provide a plural speed turntable drive mechanism and a control device therefor as an integral part of the phonograph motor.

A further object of my invention is to provide a phonograph which is adapted for the proper reproduction of record tablets which operate at different angular speeds.

Another object of my invention is to provide a phonograph having a two-speed turntable drive mechanism whereby record discs, each operable at a different reproducing speed, may be reproduced at their own proper reproducing speeds.

A further object of my invention is to provide a phonograph mechanism which may be operated independently of, or which may be combined with a portable type of moving picture projector adapted for the synchronization of sound with motion pictures, as, for example, in the home, and wherein the angular velocity of the phonograph turntable may be quickly changed at will for the reproduction of the usual type of record tablet or special record tablets adapted for reproduction of sound in conjunction with motion pictures.

More specifically stated, it is an object of my invention to provide a unitary turntable drive mechanism for phonographs whereby under one operating condition, as, for example, in the reproduction of standard record tablets, the turntable may be driven through one coupling to a motive means at a given speed, while under another operating condition, as, for example, in the reproduction of long-playing records or the synchronization of special sound records with moving picture apparatus, the turntable will be driven by the same motive means but through another coupling at another given speed, the change from one coupling to the other being possible instantly and at will.

A preferred embodiment of my invention by which the above objects, and other objects ancillary thereto, may be accomplished comprises a motor having two independent control devices, either one of which may be rendered operative to determine the speed at which the motor spindle shall operate, through means forming a part of the said spindle.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawing, in which

Figure 1 is an assembly view of one form of my invention in elevation with certain parts in section to better illustrate the same.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, with certain parts shown in Fig. 1 omitted.

Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a detail sectional view taken on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 4.

Referring more particularly to the drawing, wherein similar reference characters indicate corresponding parts throughout, a conventional induction disc motor, generally indicated at 10, comprises operating field and core windings 11 and 12, a spindle 13, a disc armature 14 carried by the spindle 13, a centrifugal governor 15 disposed in cooperative engagement with a worm gear 16 carried by the spindle 13 to hold the

said spindle to a speed of substantially 78 R. P. M. when the operating windings are energized, and an adjustable speed regulating lever 17 for controlling the governor 15.

As shown, the motor 10 may, for example, be attached to the underside of a motor-board 18 by means of suitable screw bolts or the like, an enlarged opening 19 being provided in the motor-board for passage therethrough of the upper end portion of the spindle 13 which is adapted to support and rotate a turntable 20 in a position above said motor-board.

In accordance with my invention, I provide the motor 10 with an auxiliary governor 21 in addition to the usual governor 15 whereby the motor 10 may be optionally controlled to operate at a speed of substantially 33⅓ R. P. M. as well as a standard speed of substantially 78 R. P. M. To this end, an additional centrifugal governor assembly comprising a governor worm shaft 22, a friction disc 23, a plurality of flyweights 24 carried by a like number of spring blades 25, and a known type of speed regulating device 26 are operatively assembled on a bearing bracket 27. The bracket is secured to the frame 28 of the motor 10 in the example shown by means of a plurality of machine screws 29 or the like, with the governor shaft 22 in spaced relation to the spindle 13, the axes of the spindle 13 and the governor worm shaft 22 lying in planes normal to each other. In practice, however, the bracket 27 may be formed as an integral part of the motor frame 28, if desired.

The auxiliary worm gear 30, preferably of non-metallic material, having a bearing hub 31 suitably staked or otherwise secured thereto, is rotatably mounted on the spindle 13 and in cooperative engagement with the worm formed on the governor shaft 22.

In order that the auxiliary worm gear 30 may be coupled to the spindle 13 to effect the second predetermined speed, I provide a clutch mechanism which includes the upper end portion of the spindle 13.

As clearly shown in Fig. 2, the uppermost end portion of the spindle 13 is provided with a suitable bore 32 which extends inwardly from its free end to a predetermined depth. Disposed in the bore 32 for sliding movement therein is a plunger 33 which serves as a clutch control member and as a record centering pin, inasmuch as the upper end of the plunger 33 projects beyond the uppermost end of the spindle 13.

Movement of the plunger 33 in the bore 32 is limited by means of an elongated slot 34 formed in the plunger 33 adjacent the lower end thereof, and a pin 35 which passes through the slot 34 and the motor spindle 13 in which it is securely held as by a force fit therein. The slot 34 and the pin 35 cooperate to permit limited upward and downward movement of the plunger 33 within the bore 32 as clearly shown in Fig. 2.

The pin 35 acts, further, to support and drive the turntable 20 which is provided with a depending boss 36 having elongated slots 37 formed in the bottom face thereof, the slots 37 communicating with the turntable bore 38 at diametrically opposed points. The said slots 37 are adapted to receive the projecting end portions of the pin 35 therein when the turntable is mounted on the spindle 13 in a manner well known in the art.

A pin 39 is force fitted into an opening 40 in the plunger 33 at a point below the slot 34 and an elongated slot 41 is formed in the walls of the spindle 13 to provide clearance for the lateral projecting end portions of the pin 39, so that the plunger 33 is free for limited sliding movement in the bore 32. The upper face of the bearing hub 31 which supports the worm gear 30 is provided with a plurality of aligned slots 42 which communicate with the central opening 43 therein at diametrically opposed points and are adapted to receive the pin 39 therein whereby the worm gear 30 may be coupled to the spindle 13 in a manner hereinafter described.

In order that the plunger 33 may be yieldably maintained in either its raised (unclutched) or lowered (clutched) position, I provide a collar 44 which is secured to the spindle 13 in close proximity to the bearing hub 30 by means of a set screw 45. The collar 44 is further provided at a point diametrically opposite the said screw 45 with a threaded opening 46 for the reception of a short pin 47 having one end thereof substantially pointed, a spring 48, and, finally, a set screw 49 to maintain the pin 47 and spring 48 within the opening 46 and the pointed end of the pin 47 in yieldable contact with the plunger 33.

The plunger 33 is provided adjacent its lower end with two longitudinally spaced notches or recesses 50 for the reception of the pointed end of the pin 47 whereby, upon engagement of the pin 47 with either one or the other of the recesses 50, the plunger 33 will be yieldably retained in either its raised or lowered position as the case may be.

The operation of my improved two-speed motor should now be apparent from the foregoing description. Assuming, first, that it is desired to play a standard record operable at 78 R. P. M., the plunger 33 is raised to the position shown in Figs. 1 and 2. The motor 10 now drives through the lower portion of the spindle 13 including the bore 32, the transverse pin 35 to the plunger 33, which causes rotation of the pin 35, the boss 36, and the turntable 20. When the plunger 33 is in the raised position, the speed of the motor is controlled by the governor 15, which is so set that the turntable will rotate at 78 R. P. M.

Should it be desired, now, to play one of the new so-called "long-playing" records, it is merely necessary to depress the plunger 33 until the pin 39 has entered the slots 42. The turntable 20 is now driven from the lower part of the spindle 13, through the slotted bearing hub 31, the pin 39, the plunger 33, the pin 35 and the boss 36. However, inasmuch as the worm gear 30 is staked to the bearing hub 31 and is coupled to the governor 21, the latter immediately comes into operation to control the speed of the turntable 20 at the speed for which the governor 21 is set, namely, 33⅓ R. P. M.

Since the auxiliary worm gear 30 is over twice as large as the worm gear 16, it will be obvious that when the spindle 13 is controlled by the governor 21, it will not be rotated fast enough to cause the governor 15 to function as a controlling device. Hence, the governor 15 becomes inoperative to control the speed of the turntable 20.

When it is desired to reproduce records which have been recorded in part at a speed of 78 R. P. M. and in part at a speed of 33⅓ R. P. M., it is only necessary, with my improved motor, to manipulate the plunger 33, even while the turntable is still in motion, so as to change the speed of the turntable 20 in accordance with the differently recorded sound grooves on such a record. The change can be made during the

silent portion between the several grooves, and may even be made automatically, if desired, by any suitable mechanism.

Although I have shown and described one specific embodiment of my invention, I am fully aware that many modifications thereof are possible. Furthermore, while I have described my invention as applied to the reproduction of records, it should be understood that the invention is equally applicable to machines for recording sound. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim:—

1. In combination, a motor including a spindle, a plurality of control devices associated with and adapted to individually control said motor, and means associated with the uppermost free end portion of said spindle whereby either one of said control devices may be selectively rendered effective or ineffective to control said motor.

2. In combination, a motor including a spindle, a plurality of control devices associated with and adapted to individually control said motor, and means slidably carried substantially within said spindle and adjustable relatively thereto whereby either one of said control devices may be selectively rendered effective or ineffective to control said motor.

3. In combination, a motor including a spindle, a plurality of governor devices associated with and adapted to individually control said motor, and means slidably carried substantially within said spindle and adjustable relatively thereto whereby either one of said governor devices may be rendered effective or ineffective to control said motor.

4. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, and means slidably carried substantially within said spindle and adjustable relatively thereto, for selectively coupling either one of said governor devices to said spindle whereby the other of said devices is rendered ineffective to control said motor.

5. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, adjustable means carried by and slidable relatively to said spindle for selectively coupling one of said governor devices to and uncoupling the same from said spindle, and means for yieldably maintaining said slidable means in adjusted position.

6. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, and means carried by and slidable substantially within one end portion of said spindle for selectively coupling one of said governor devices to and uncoupling the same from said spindle, during the operation of said motor whereby the other one of said devices is rendered respectively ineffective or effective to control said motor.

7. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, and means slidably carried substantially within said spindle and movable relatively thereto for selectively coupling and uncoupling one of said governors to and from said spindle.

8. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, and means slidably carried substantially within said spindle and movable relative thereto for selectively coupling and uncoupling one of said governors to and from said spindle to render the other one of said devices respectively ineffective and effective to control said motor.

9. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, and means carried by and slidable within said spindle to one of two positions for coupling one of said devices to said spindle while rendering the other of said governor devices ineffective to control said motor, and slidable to the other of said positions for uncoupling the first of said devices from said spindle and rendering the other of said devices effective to control said motor.

10. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to individually control said motor, means carried by and slidable within said spindle to one of two positions for coupling one of said devices to said spindle while rendering the other of said governor devices ineffective to control said motor, and slidable to the other of said positions for uncoupling the first of said devices from said spindle and rendering the other of said devices effective to control said motor, and means for yieldably maintaining said slidable means in either one of said positions.

11. In combination, a motor including a spindle, a pair of governor devices associated with and adapted to independently control said motor, means adjustable for regulating one of said control devices, means independent of said last named means and also adjustable for regulating the other of said control devices, and means slidably carried substantially within one end portion of said spindle and movable relative thereto for selectively rendering either one of said control devices effective or ineffective to control said motor.

12. In combination, a motor including a spindle, a governor device associated with and adapted to control said motor at one predetermined speed, an auxiliary governor device associated with and adapted to control said motor at another predetermined speed, and means slidably carried substantially within one end portion of said spindle and movable relative thereto whereby said auxiliary governor device may be selectively coupled to and uncoupled from said spindle, said first named governor device being automatically rendered ineffective when said auxiliary governor is rendered effective to control the motor.

13. In combination, a motor including a spindle, a governor device associated with and adapted to control said motor at one predetermined speed, an auxiliary governor device associated with and adapted to control said motor at another predetermined speed, means separately adjustable for regulating each of said governor devices, and means slidably carried substantially within one end portion of said spindle and movable relative thereto whereby said auxiliary governor device may be selectively coupled to and uncoupled from said spindle.

JOHN B. SUOMALA.