E. E. TALIAFERRO.

WINDING DEVICE FOR SPRING MOTORS.

APPLICATION FILED NOV. 6, 1914.

1,174,454.

Patented Mar. 7, 1916.

2 SHEETS—SHEET 1.

Fig. 1

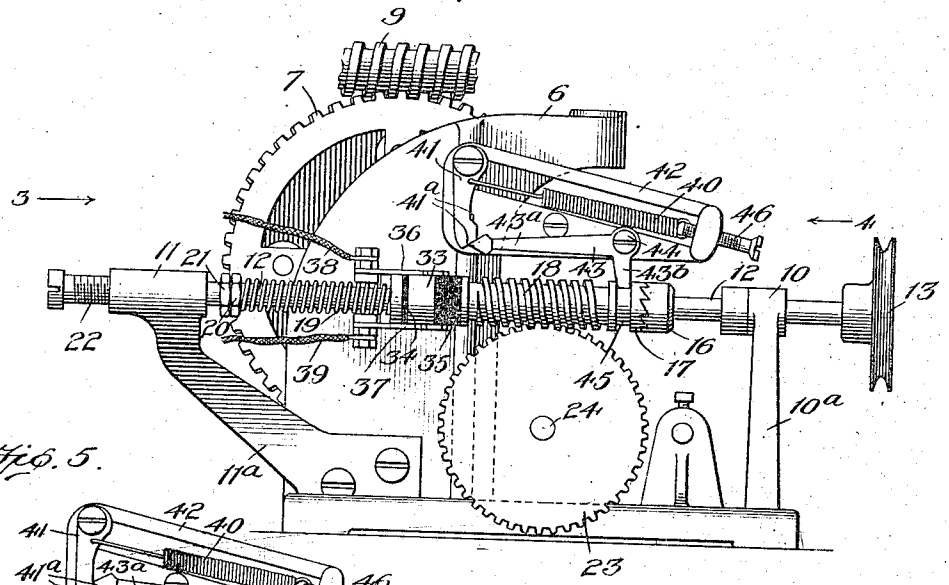


Fig. 5.

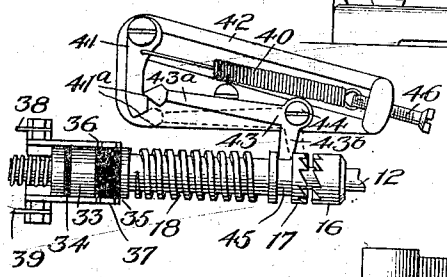
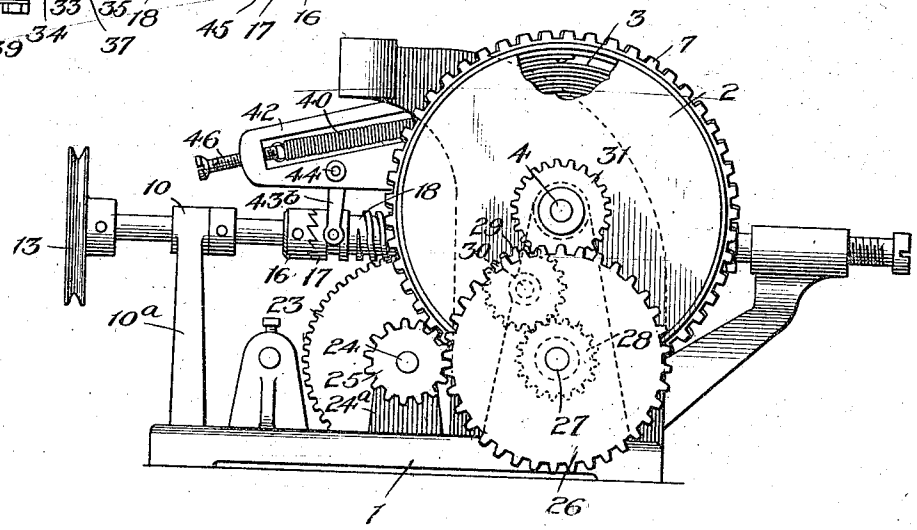


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3.

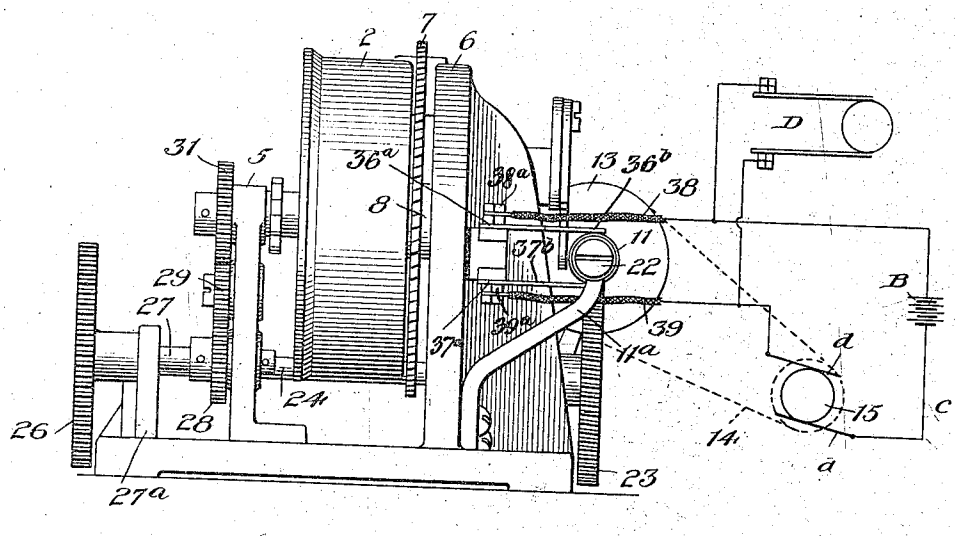
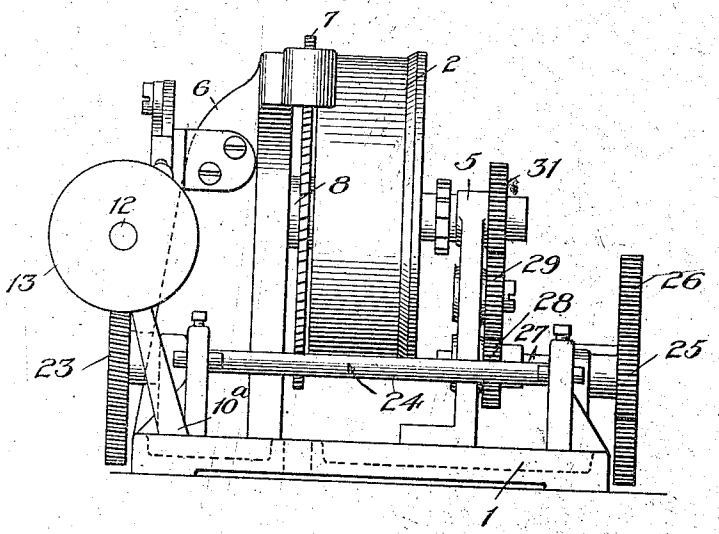


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD E. TALIAFERRO, OF COLORADO SPRINGS, COLORADO.

WINDING DEVICE FOR SPRING-MOTORS.

1,174,454. Specification of Letters Patent. Patented Mar. 7, 1916.

Application filed November 6, 1914. Serial No. 870,618.

To all whom it may concern:

Be it known that I, EDWARD E. TALIAFERRO, a citizen of the United States, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented certain new and useful Improvements in Winding Devices for Spring-Motors; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the figures and letters of reference marked thereon.

This invention relates to devices for winding motors, and particularly to a novel arrangement for automatically winding the spring of a spring motor, as the spring becomes unwound and the tension decreased.

Among the objects of the present invention, is the provision of means for automatically throwing the winding device into and out of connection with the motor, such means being responsive to variations in tension of the motor spring. The relation between the winding device and the motor spring is such that when the tension of the spring becomes feeble, due to continued revolution of the motor, the winding device is automatically thrown into engagement to rewind the spring. The operation of throwing the winding device into engagement with the motor to rewind it, is effected by spring actuated mechanism, the normal tension of which is greater than the unwound motor spring but less than the wound spring, the motor spring and the mechanism for throwing the winding device being so related that until the motor spring has reached a low tension, the said mechanism remains inoperative. When, however, the tension of the motor spring has decreased to that point where its tension is overbalanced by the spring actuated mechanism, the winding device is quickly thrown into engagement with the motor to rewind it and remains in engagement until the tension of the spring in the motor is sufficiently high to overbalance the pressure of the spring actuated mechanism and throw the winding device out of engagement. In other words, according to this invention the operation of connecting and disconnecting the winding device is controlled primarily by the tension in the motor spring itself.

The invention also provides means for adjusting the degree of tension variation between the motor spring and the spring actuated mechanism for throwing the winding device in order to properly determine the exact periods during the operation of the spring motor when the connection and disconnection of the winding device shall take place. In this way a very fine adjustment of the tension of the opposing springs may be attained, and, in addition, it is possible to determine the exact degree of difference in the tension of said springs necessary to effect throwing of the winding device.

The arrangement of the parts controlling the operation of the winding device is such that it will be quickly thrown into and out of engagement with the motor with a spring-like motion and held in positive locking engagement when the motor spring is being wound, and at the same time the winding device will be maintained in positive disengagement after winding of the spring and before such a low tension of the motor spring has been reached as to again bring the parts into locking engagement.

A full understanding of the invention will be obtained from the following detailed description, taken in connection with the accompanying drawings illustrating a construction embodying the same in a preferred form and specifically pointed out in the appended claims.

In the drawings: Figure 1 is a side elevation of a portion of a spring motor of the type usually employed in talking machines or phonographs, equipped with the improved winding device; Fig. 2 is a side elevation looking in the opposite direction from Fig. 1; Fig. 3 is an end elevation looking in the direction of the arrow 3 in Fig. 1; Fig. 4 is an end elevation looking in the direction of the arrow 4 in Fig. 1; and Fig. 5 is a fragmentary detail view of the tension regulating mechanism showing the position of the parts when the winding device is disconnected from the motor, the intermediate position of the parts being indicated by dotted lines.

For convenience in describing the invention I have shown the improved winding device used in connection with a spring motor of the type usually employed in talking machines or phonographs, the invention be-

ing particularly applicable for use with such a motor. It will be understood, however, that the showing of a spring motor of the type referred to is merely for purposes of illustration and the invention is not to be in any way limited thereto, for the reason that it will be found equally useful with motors of other types, and for different purposes as well.

As shown in the drawings, the spring motor and the winding device are mounted on a base plate 1, the spring motor having the usual drum 2, containing a spring 3. The drum 2 is mounted on a shaft 4 (see Fig. 2) journaled in bearings in fixed uprights 5 and 6 which are supported by the base plate 1, and the spring 3 is adapted to revolve a worm gear 7, mounted on a collar 8 on the shaft 4, the worm gear 7 meshing with a worm 9 for the purpose of driving the record disk or cylinder and other parts, in a manner well known in the art.

Mounted to revolve in bearings 10 and 11, carried by suitable supports 10^a and 11^a, is a shaft 12. This shaft has fixed thereto at one end a sheave 13 adapted to carry a belt 14 which passes over the driving pulley of a motor 15, as indicated diagrammatically in Fig. 3. The shaft 12 has also fixed thereto a clutch member 16 and is also provided with a slidable clutch member 17 carried at one end of a sliding cylindrical worm 18 mounted on the shaft. The worm 18 and its clutch member 17 is pressed into engagement with the fixed clutch member 16 at the proper moment by the tension of a spring 19 encircling shaft 12. Means for adjusting the tension of the spring 19 is provided, consisting of an adjusting nut 20 and a locking nut 21 for maintaining the spring in its position of adjustment. The shaft 12 may be adjusted longitudinally by means of a set screw 22 in the bearing 11. The worm 18 meshes with and is adapted to drive a worm gear 23 mounted on a shaft 24 when the clutch members 16 and 17 are in engagement and the shaft 12 is rotated. The shaft 24, which is journaled in suitable bearings, mounted on supports 24^a, is also provided with a small gear 25 meshing with a gear 26 mounted on a shaft 27 journaled in a bearing 27^a and also in the upright 5. The shaft 27 also rotates a gear 28 meshing with a gear 29 on a shaft 30 mounted to rotate in the fixed upright 5. The gear 29 in turn drives a gear 31 on the main driving shaft 4, to rewind the motor spring 3 when the two clutch members 16 and 17 are in engagement and the worm 18 is rotated by the shaft 12. When the two clutch members are in engagement the shaft 12 is adapted to be driven to rewind the motor spring 3 by means of the electric motor 15. Hence it is desirable that the circuit of said motor be closed at the same time as the locking engagement of the two clutch members. This is accomplished as follows: The worm 18 is provided with a contact ring 33 insulated from the worm by means of insulating rings 34 and 35. The contact ring 33 is adapted to close the electric motor circuit when in engagement with contact members 36 and 37 from which lead the line wires 38 and 39. Contact members 36 and 37 are substantially L-shaped, having arms 36^a and 37^a fixed to terminals 38^a, 39^a, and angular arms 36^b, 37^b, which engage the contact and insulating rings respectively as the worm 18 is moved on shaft 12. As indicated diagrammatically in Fig. 3, the line wire 38 leads to one pole of generator B, the wire *c* leading from the other pole to one of the motor brushes *d*; the other line wire 39 is connected to the other motor brush. It will thus be apparent that, when the contact ring 33 is pressed into engagement with the contact members 36 and 37, the circuit will be completed through line wire 38, battery B, wire *c*, motor brushes *d* and motor 15, line wire 39, contact member 37, ring 33, contact member 36, line wire 38 and back to generator. Closing the circuit in this manner, sets in motion the electric motor 15 which at the same time is operatively connected to the spring motor by the engagement of the clutch members 16 and 17. Rotation of the electric motor revolves the shaft 12, and with it the worm 18, and the train of gears connecting the worm to the drum 2 to wind the spring 3. Continued winding of the spring 3 increases its tension, and when a degree of tension in the spring 3 in excess of the spring 19 controlling the clutch member 17 has been reached, the greater tension of the motor spring 3 overbalances the tension of the spring 19 in such manner as to slide the worm 18 and clutch member 17 on the shaft 12 away from the clutch member 16, thus disconnecting the electric motor. At the same time, the insulating ring 35 is shifted into a position of contact with the contact members 36, 37, opening the circuit of the motor 15. The tension of the motor spring 3 is transmitted through the train of intermediary gears to the worm 18 and opposes the pressure of the spring 19, causing the worm to move axially and disconnect the clutch and electrical contacts.

The basic principle upon which the clutch members are thrown into and out of engagement with each other is the variation in tension between the spring motor and the clutch shifting means. The spring 19 is preferably of such strength that its normal tension is greater than the unwound motor spring but less than the wound motor spring. It will thus be seen that until the tension of the motor spring is weakened to a certain extent by the operation of the spring motor its pressure will overbalance the pressure of the

spring 19 and keep the clutch members 16 and 17 separated during which the winding motor will be disconnected. The moment, however, the tension of the main motor spring has weakened to an extent that it is overbalanced by the tension of the spring 19, connection of the winding motor takes place and the winding operation begins. In this manner, the spring motor is kept continuously wound, the connection and disconnection of the winding device being controlled primarily by variations in tension in the spring motor itself.

The invention also provides means for adjusting the variation in tension between the two springs in such manner that the periods during the operation of the motor at which the connection and disconnection of the winding device takes place may be positively determined. This adjustment is attained by means of a supplementary spring 40 having one end secured to a locking dog 41 pivoted to a plate 42 which is secured to the upright 6. The lower end of the dog 41 is provided with inclined shoulders 41^a either of which may be engaged by the horizontal member 43^a of a trip arm 43 is pivoted at 44 to the plate 42, the vertical member 43^b of the trip arm entering a groove 45 in the worm 18. The tension of the spring 40 is such that its pull upon the dog 41 is adapted to retain the horizontal member 43^a in engagement with either side of the shoulder 41^a, depending upon the direction of pressure upon the worm 18. When the tension of the spring 19 is greater than the motor spring 3 it will exert its pressure on the worm 18 to lock the clutch members. This pressure will move the vertical member 43^b and the horizontal member 43^a of the trip arm 43 into reverse position indicated by dotted lines in Fig. 5. It will be apparent that the pull of the spring 40 will unite with the pressure of the spring 19 to snap the member 43^a into the position shown in Fig. 1. This snapping or spring-like action will be transmitted to the worm 18 through the vertical member 43^b, thus causing the clutch member 17 to slip quickly into positive engagement with the clutch member 16. Obviously, the spring 40 will exert the same snapping action in the opposite direction, or in other words, when the spring 19 is overbalanced by the wound motor spring 3. Thus, the spring 40 with its accompanying parts is equally effective in assisting both the motor spring 3 and the spring 19 to shift the worm in either direction, effecting the same quick connection and disconnection of the winding device. Adjustment of the tension or pull of the spring 40 is effected by means of a set screw 46 to which one end of the spring is secured, said set screw being threaded in the plate 42. By adjusting the spring 40 and the spring 19 through the adjustment nuts 20 and 21, and also the set screw 22, the exact degree of differences between the tension of the clutch shifting device and the motor spring 3 may be fixed. In other words, by the use of the adjustable feature of this invention, it is possible to determine exactly the amount of tension variation necessary for throwing the clutches, so that, the device may be adjusted to connect or disconnect the winding motor at predetermined amounts of tension variation between the motor spring and the mechanism for operating the clutches. When the worm is unclutched from the shaft and ceases to rotate the shaft is entirely free for winding any other springs which may be connected with it, as hereinafter explained. As the spring motor runs by the tension of the wound spring 3, it will be obvious that the tension will gradually grow weaker until it is below that of the spring 19. When the degree of variation has been reached the worm 18 will be shifted forward on the shaft 12, connecting the clutches and closing the motor circuit to again wind the spring 3.

The invention will be found very valuable in winding all sorts of spring motors and its operation has not only been found entirely satisfactory in winding a single train of wheels driven by a single spring, but it is equally satisfactory in driving any number of trains with independent springs from a single motor and a single shaft. For instance, in winding a clock having two trains of wheels, one for time keeping purposes and the other for operating the striker or chime, the separate trains may be connected to a single motor by the use of an auxiliary circuit D connected in shunt across the main circuit (as shown in Fig. 3). Obviously, such an arrangement may be multiplied at will and with equal success, the single motor winding the several trains of wheels independently. The shaft 12 being independent of the spring motor when the motor is not winding, it is obvious that other springs may be wound by the same shaft without interference by simply connecting other worms and gear trains in the manner previously described.

While I have shown and described a certain specific embodiment of my invention and a particular application thereof it will be understood that the same is not to be limited in any way to details of construction nor to any particular use, but on the contrary is capable of considerable variation and modification within the scope of the claims.

What I claim is,—

1. In a winding device for spring motors,

the combination of an electric motor, a clutch for connecting the electric motor with the spring motor, and means responsive to variations in tension of the spring in the spring motor for operating said clutch, and opening and closing the circuit of said electric motor.

2. In a winding device for continuously running spring motors, the combination of a device operative to wind the motor when the force of the motor spring is almost spent, and spring actuated mechanism adapted to be controlled by variations in tension for connecting and disconnecting said winding device.

3. In a winding device for continuously running spring motors, the combination of a device operative to wind the motor when the force of the motor spring is almost spent, a spring actuated clutch for connecting and disconnecting said winding device, and means controlled by variations in tension of the spring in the motor for actuating said clutch to connect and disconnect said winding device.

4. In a winding device for spring motors, the combination of an electric motor for winding the spring motor, a spring actuated clutch for connecting and disconnecting the electric motor, circuit connections adapted to be controlled simultaneously by said clutch, and means controlled by variations in tension of the spring in the spring motor for actuating said clutch to connect and disconnect the electric motor and open and close its circuits.

5. In a self-winding continuously running spring motor, the combination of a winding device adapted to be connected thereto when the force of the motor spring is almost spent, a clutch for connecting and disconnecting said winding device, a spring controlling said clutch having a tension greater than the unwound motor spring but less than the wound motor spring whereby the connection and disconnection of the winding device is determined by variations in tension between the two springs, and means for adjusting said variations in tension to vary the periods during the operation of the motor when the connection and disconnection of the winding device takes place.

6. In a self-winding continuously running spring motor, the combination of an electric motor for winding the spring motor when the force of the motor spring is almost spent, a clutch for connecting and disconnecting the electric motor, circuit connections adapted to be controlled simultaneously by said clutch, a spring controlling said clutch having a tension greater than the unwound motor spring, but less than the wound motor spring whereby the connection and disconnection of the electric motor is determined by variations in tension between the two springs, and means for adjusting said variations in tension to vary the periods during the operation of the spring motor when the connection and disconnection of the electric winding motor takes place.

7. The combination of a spring motor, an electric motor for winding the spring motor and adapted to be connected and disconnected therewith, circuit connections for the electric motor, and a spring actuated clutch responsive to a difference in tension between the clutch spring and the motor spring for automatically connecting the electric motor and simultaneously closing its circuit through said circuit connections when the spring motor has become unwound.

8. The combination of a spring motor, an electric motor for winding the spring motor and adapted to be connected and disconnected therewith, circuit connections for the electric motor and a spring actuated clutch for automatically connecting and disconnecting the electric motor and simultaneously closing and opening its circuit, the tension of the clutch spring being greater than the motor spring when the force of the motor spring is almost spent whereby the electric motor is connected, and less than the motor spring when wound, whereby the clutch spring is overbalanced upon winding of the motor and said electric motor is disconnected.

9. The combination of a spring motor, an electric motor for winding the spring motor and adapted to be connected and disconnected therewith, circuit connections for the electric motor, a spring actuated clutch for automatically connecting and disconnecting the electric motor and simultaneously closing and opening its circuit, the tension of the clutch spring being greater than the motor spring when the force of the motor spring is almost spent, whereby the electric motor is connected, and less than the motor spring when wound, whereby said clutch spring is overbalanced upon winding of the motor, and said electric motor is disconnected, and means for adjusting the tension of the clutch spring to vary the periods during the operation of the spring motor when the connection and disconnection of the electric winding motor takes place.

10. The combination of a spring motor, an electric motor for winding the spring motor and adapted to be connected and disconnected therewith, circuit connections for the electric motor, a spring actuated clutch for automatically connecting and disconnecting the electric motor and simultaneously closing and opening its circuit, the tension of the clutch spring being greater

than the motor spring when the force of the motor spring is almost spent, whereby the electric motor is connected, and less than the motor spring when wound, whereby said clutch spring is overbalanced upon winding of the motor, and said electric motor is disconnected, and means for imparting a spring action in either direction to said clutch to quickly engage and disengage said winding means and maintain the same in positive engaged and disengaged relation at the proper intervals during the operation of the spring motor.

EDWARD E. TALIAFERRO.