Dec. 23, 1924. 1,520,418

H. A. HURLBUT

WINDING DEVICE FOR SPRING MOTORS

Filed July 6, 1921 2 Sheets-Sheet 1

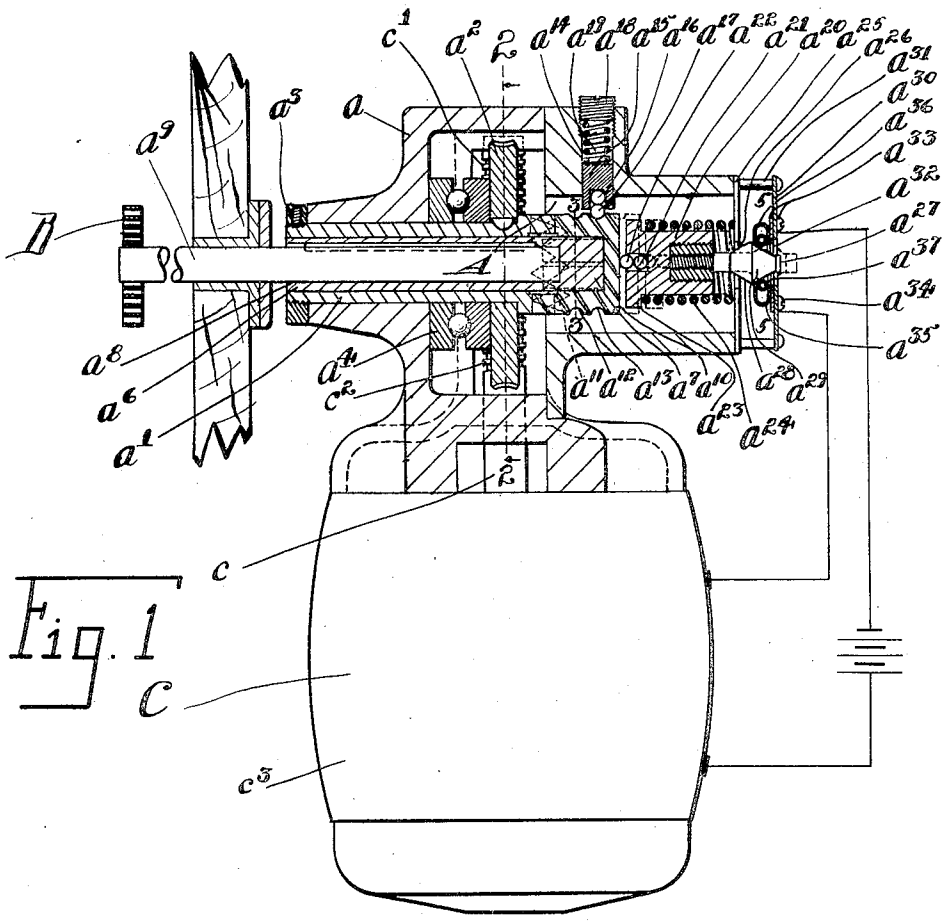


Fig. 1

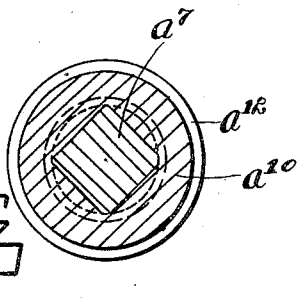


Fig. 3

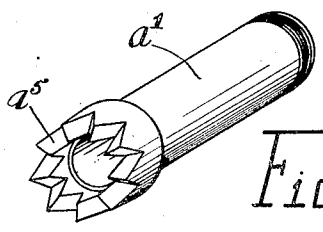


Fig. 4

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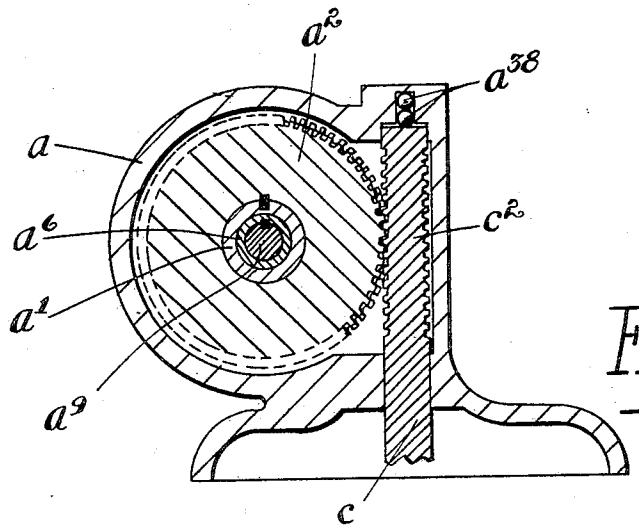


Fig. 2

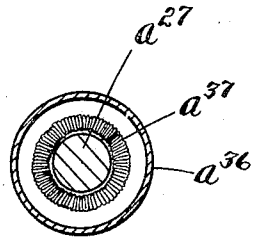


Fig. 5

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Patented Dec. 23, 1924. 1,520,418

UNITED STATES PATENT OFFICE.

HENRY A. HURLBUT, OF CINCINNATI, OHIO.

WINDING DEVICE FOR SPRING MOTORS.

Application filed July 6, 1921. Serial No. 482,793.

To all whom it may concern:

Be it known that I, HENRY A. HURLBUT, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in a Winding Device for Spring Motors, of which the following is a specification.

This invention relates to devices of the type wherein an electric motor is employed to wind or tension a spring motor, the spring motor being employed for various purposes, such as the operation of phonographs, etc. In this class of winding devices the opening and closing of the switch for the supply of power for the winding device is effected by the tension of the spring of the spring motor. It has been found that in devices produced up to this time the opening and closing of the switch is too recurrent, because a tension slightly below or slightly above the normal, causes either a closing or an opening of the switch, causing what may be termed a chattering of the device, resulting from the constant movement of the parts because of the opening and closing of the electric circuit embracing the motor. It is the object of my invention to provide means for overcoming this chattering effect.

Another object is to provide a device for the purpose stated that will be simple in construction and operation.

These and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which—

Fig. 1 is a transverse sectional view of a device embodying my invention, the full lines showing the parts in their normal or driving relation, and the dotted lines showing the parts in their abnormal relation.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional view on line 3—3 of Fig. 1.

Fig. 4 is an enlarged perspective view of a sleeve having a series of saw teeth formed upon one of its ends, all of which form details of my invention.

Fig. 5 is an enlarged sectional view on line 5—5 of Fig. 1.

My invention comprises an electric motor C having a drive shaft c adapted to transmit motion to a spring shaft or crank shaft a^9 of a spring motor B by means of a control mechanism A operatively disposed between the said two shafts. The control mechanism is adapted to both transmit motion between the shafts and to control the operation of the electric motor.

The motor C has extending from it a driven shaft c upon the outer or free end c' of which is formed a worm c^2 which, together with the worm wheel a^2 engaged thereby, comprises an irreversible drive mechanism.

The housing a of the mechanism A is in part integral with the housing c^3 of the motor and has a longitudinal bore therethrough in which bore is revolubly mounted a sleeve a' having keyed upon it a worm wheel a^2 engaging the worm c^2. A collar a^3 may be mounted upon the one end of the sleeve, which end of the sleeve may extend from the casing a. A suitable ball bearing a^4, mounted within the housing, serves as a thrust bearing. The collar and bearing a^4 preclude longitudinal movement of the sleeve in the housing. The teeth on the worm wheel and on the worm bear such relation that the worm can turn the worm wheel but cannot be turned by the worm wheel. The end of the sleeve contained within the housing has formed upon it a series of gear teeth, or saw teeth a^5. A driven shaft a^6 extends revolubly through the sleeve and has formed upon its inner end a square head a^7. The driven shaft has a central bore a^8 into which extends the crank shaft a^9 adapted to wind or tension the spring B of the spring motor. The crank shaft a^9 is splined to the driven shaft a^8. A clutch head a^{10} is slidably mounted upon the square head a^7 formed on the shaft a^6. The clutch head has formed upon it a series of saw teeth a^{11} complementary to, and which engage, the saw teeth formed on the sleeve a'. Upon the periphery of the clutch head are formed two circumferential grooves, a^{12} and a^{13}, having their centers spaced from one another at a distance slightly less than the depth of the saw teeth. The housing has a bore a^{14}, the axis of which extends radially to the axis of the longitudinal bore in the housing, the transverse bore terminating directly above the clutch head a^{10}, and within this bore is reciprocally mounted a block a^{15} supporting the balls a^{16} and a^{17}. The ball a^{17} is adapted to revolubly engage in the grooves a^{12} and a^{13}. The upper end of the bore a^{14} is threaded and has adjustably mounted in it the adjustment screw or cap a^{18}. A spring a^{19} abuts the adjust-

ment cap a^{18} and the block a^{15}, and serves to yieldingly retain the detent ball a^{17} in engagement upon the clutch head a^{10}. A second block or thrust member a^{20}, somewhat like the block a^{15}, has mounted within it the balls a^{21} and a^{22} having their centers in alignment with the axis of the shaft a^9. The ball a^{22} engages the clutch head a^{10}. A shoulder a^{23} is formed on the block a^{20} and a spring a^{24} coiled about the block a^{20} abuts the shoulder a^{23} and the plate a^{25} mounted upon the casing a and forming a closure for one end of the casing. The spring a^{24} yieldingly retains the ball a^{22} in engagement with the clutch head a^{10}. The plate a^{25} has a slot a^{26} therein, in axial alignment with the shaft a^9 and through this slot extends a plunger a^{27} adjustably mounted upon the block a^{20}. The plunger a^{27} has formed upon it the oppositely inclined faces a^{28} and a^{29}, whereby the plunger is given in part the form similar to two truncated cones having their bases in engagement. The portion of the plunger containing the inclined faces is normally contained between the plate a^{25} and a similar plate a^{30} spaced from the plate a^{25} by means of suitable spacing bars a^{31}. The plate a^{30} has a slot a^{32} in alignment with the line of movement of the plunger. Electrical contacts a^{33} and a^{34} are mounted upon the plate a^{30} and disposed on opposite sides of the slot a^{32} in said plate. A yielding contact ring a^{35} is mounted upon the plunger intermediate the plates a^{25} and a^{30}, and is adapted to be snapped into and out of engagement with the contact pieces a^{33} and a^{34} to close and open the circuit for operating and stopping the motor C, as the plunger is reciprocated. The contact ring a^{35} is made of some electricity conducting material and the plunger is made of a non-conductor of electricity. The outer shell a^{36} of the contact ring contains a coiled spring a^{37}. The upper end of the shaft c^2 may revolubly engage the ball bearings a^{38}.

The operation of my device is as follows:

We will assume that the parts are in the relation shown in full lines in Fig. 1, and that the spring B is to be wound. The spring a^{24} operating upon the block a^{20}, yieldingly retains the clutch head a^{10} and sleeve a' in the relation shown in Fig. 1. The yielding contact ring closes the circuit embracing the motor C and rotatory motion from the drive shaft c of the motor is transmitted to the crank shaft a^9 by way of the worm c^2, the worm wheel a^2, sleeve a', clutch head a^{10}, and shaft a^6. As the spring B becomes tensioned from being wound, the cam-like saw teeth on the sleeve and the cam-like saw teeth on the clutch head are cammed partially apart, wherefore the clutch head is moved upon and towards the block a^{20}, thereby causing the detent ball a^{17} to be unseated from the groove a^{13} and to snap into its seat in the groove a^{12}. The movement of the clutch head serves to move the block a^{20} against the spring a^{24}, wherefore the yielding contact ring a^{35} is caused to assume a position on the conical face a^{28} of the plunger, thereby breaking the circuit embracing the motor. Therefore the electric motor stops. The parts then are in the positions shown in dotted lines in Fig. 1. It should be observed that although the clutch head a^{10} has moved away from the worm wheel a^2 nevertheless parts of the saw teeth on the clutch head are still in engagement with parts of the saw teeth formed on the sleeve a'. This contact of the saw teeth prevents the spring a^{24} from returning the parts to the positions shown in Fig. 1. As the tension of the spring B becomes less, as a result of the operation of the train of gears operated by the spring motor, the spring a^{24} gradually moves the clutch head towards the worm wheel a^2, and when the clutch head again assumes the position as shown in full lines in Fig. 1, the contact spring a^{34} will again be moved onto the face a^{29} of the plunger, thereby completing the circuit embracing the motor. It should be observed that as the spring B is tensioned, and as the tensioning thereof tends to move the clutch head a^{10} away from the worm wheel a^2, the tension placed upon B must be sufficient to overcome the combined action of the springs a^{24} and a^{19}. During this period, the spring a^{19} cooperates with spring a^{24} in resisting the movement of the clutch head. After the ball a^{17} has seated in the groove a^{12}, however, the spring a^{19} becomes a force which cooperates with the spring B in resisting the force of spring a^{24} tending to move the clutch head toward the worm wheel a^2. Therefore, the spring B can be untensioned to a considerable extent before the combined forces of springs B, a^{19} and the frictional engagement of the saw teeth is overcome by the spring a^{24}. This is sufficient to permit the spring motor to operate for a considerable period of time before the electric motor C is again energized, and therefore the chattering effect is avoided. The action of spring a^{24} upon the block a^{20} is slightly stronger than is the action of the detent spring a^{19}.

What I claim is:

1. In a winding device of the character described for use with a spring motor, the combination of a switch, a longitudinally movable member under the domination of the spring motor adapted to actuate the switch, a main spring tending to hold the said member in its normal position with the switch closed, and an auxiliary device adapted yieldingly to at all times resist movement of said member from either its normal or its abnormal position.

2. In a device of the class described, the

combination of a spring motor, a winding means adapted to tension the spring motor comprising a revoluble shaft having substantially no lateral movement, an irreversible drive connection between the shaft and the spring motor, means revolvable at all times with the shaft and controlled by the tension of the spring motor adapted to control the operation of the winding means, and an auxiliary device adapted yieldingly to at all times resist the movement of the last mentioned means.

3. In a device of the class described, the combination of a spring motor, an electric motor, a drive shaft on the electric motor, a worm formed on the drive shaft, a revolubly mounted sleeve, a worm wheel mounted on the sleeve engaging the worm, a clutch in driving engagement with the sleeve adapted to transmit power from the sleeve to the spring of the spring motor, and to be reciprocated in relation to the sleeve in proportion to the tension of the spring of the spring motor, and means controlled by the reciprocation of the clutch controlling the operation of the electric motor.

4. In a device of the class described, the combination of a spring motor, an electric motor, a drive shaft on the electric motor, a worm formed on the drive shaft, a revolubly mounted sleeve, a worm wheel mounted on the sleeve engaging the worm, a clutch in driving engagement with the sleeve adapted to transmit power from the sleeve to the spring of the spring motor and to be reciprocated in relation to the sleeve in proportion to the tension of the spring of the spring motor, means controlled by the reciprocation of the clutch controlling the operation of the electric motor, and means yieldingly resisting the reciprocation of the clutch.

5. In a device of the class described, the combination of a spring motor, an electric motor, a drive shaft extending from the electric motor, a driven shaft extending from the spring motor, a sleeve mounted revolubly upon the driven shaft, a worm wheel mounted upon the sleeve, a worm formed in the drive shaft engaging the worm wheel, a clutch slidably mounted upon the driven shaft adapted to transmit motion from the sleeve to the driven shaft, an electric switch electrically connected with the electric motor, and means yieldingly resisting movement of the clutch from the sleeve and controlling the switch.

6. In a device of the class described, the combination of a spring motor, an electric motor, a drive shaft extending from the electric motor, a driven shaft extending from the spring motor, a sleeve mounted revolubly upon the driven shaft, a worm wheel mounted upon the sleeve, a worm formed in the drive shaft engaging the worm wheel, a clutch slidably mounted upon the driven shaft adapted to transmit motion from the sleeve to the driven shaft, an electric switch electrically connected with the electric motor, means yieldingly resisting movement of the clutch from the sleeve and controlling the switch, and means yieldingly resisting movement of the clutch toward and from the sleeve.

7. In a device of the class described, the combination of an electric motor, a drive shaft extending from the electric motor, a spring motor, a driven shaft extending from the spring motor, a sleeve mounted revolubly upon the driven shaft, means adapted to transmit motion from the drive shaft to the sleeve, a clutch head mounted upon the driven shaft and slidable longitudinally thereupon, cooperating means upon the sleeve and upon the clutch head whereby motion may be transmitted from the sleeve to the clutch head at all times, means yieldingly resisting movement of the clutch head in a direction away from the sleeve, a switch electrically connected with the motor and adapted to be actuated by the yielding means, and means yieldingly resisting movement of the clutch head toward and away from the sleeve.

8. In a device of the class described, the combination of an electric motor, a drive shaft extending from the electric motor, a spring motor, a driven shaft extending from the spring motor, a sleeve mounted upon the driven shaft, an irreversible drive mechanism adapted to transmit motion from the electric motor to the sleeve, a clutch head splined upon the driven shaft and having circumferential grooves formed in its outer surface, complementary cooperative tooth members formed on the sleeve and upon the clutch head, a block mounted reciprocally adjacent the clutch head adapted to seat in the grooves therein, means yieldingly retaining the block in engagement with the clutch head, a second block having an axial bearing upon the clutch head, means retaining the second block in said engagement upon the clutch head and yieldingly resisting longitudinal movement of the second mentioned block and of the clutch head, and a switch controlled by the second mentioned block and controlling the operation of the electric motor.

In testimony whereof, I have hereunto subscribed my name this 29th day of June, 1921.

HENRY A. HURLBUT.