Jan. 31, 1933. G. P. COWLES 1,895,787

ELECTRICALLY WOUND CLOCK

Filed March 10, 1930 2 Sheets-Sheet 1

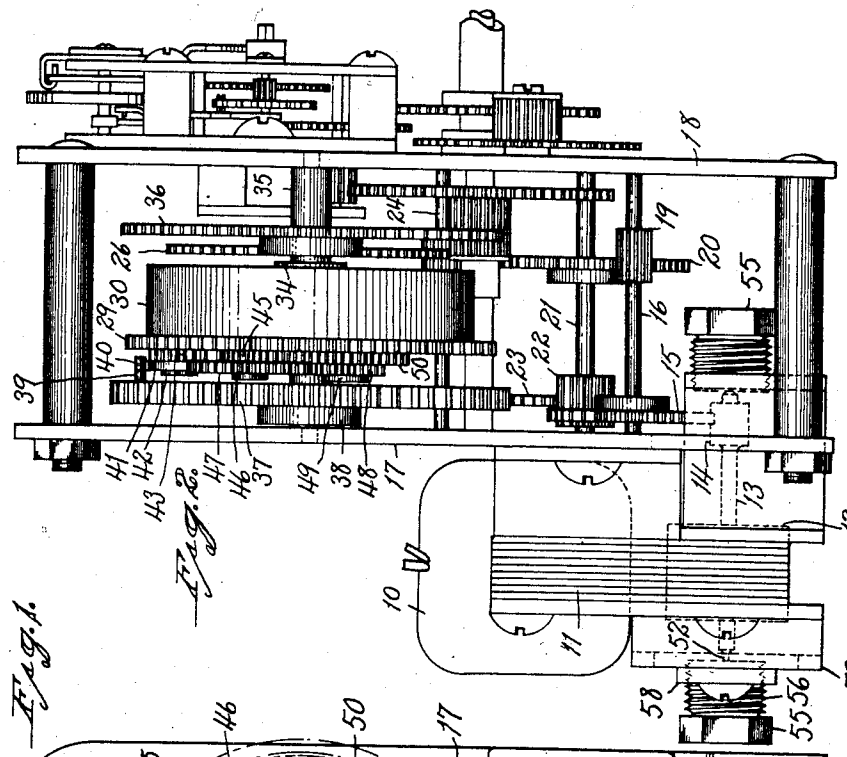


Fig. 2.

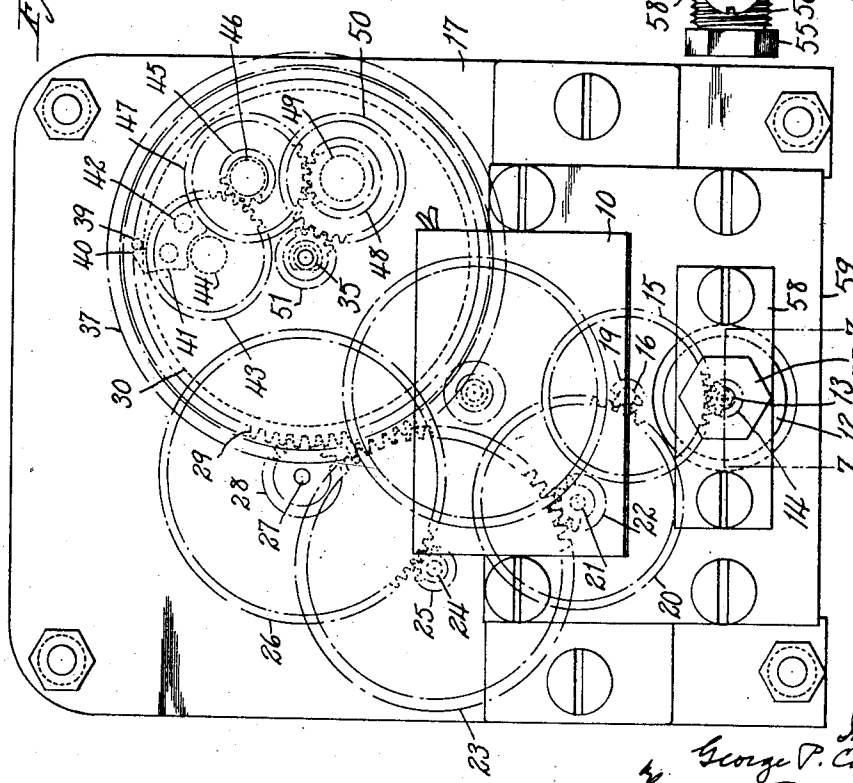


Fig. 1.

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Fig. 3.

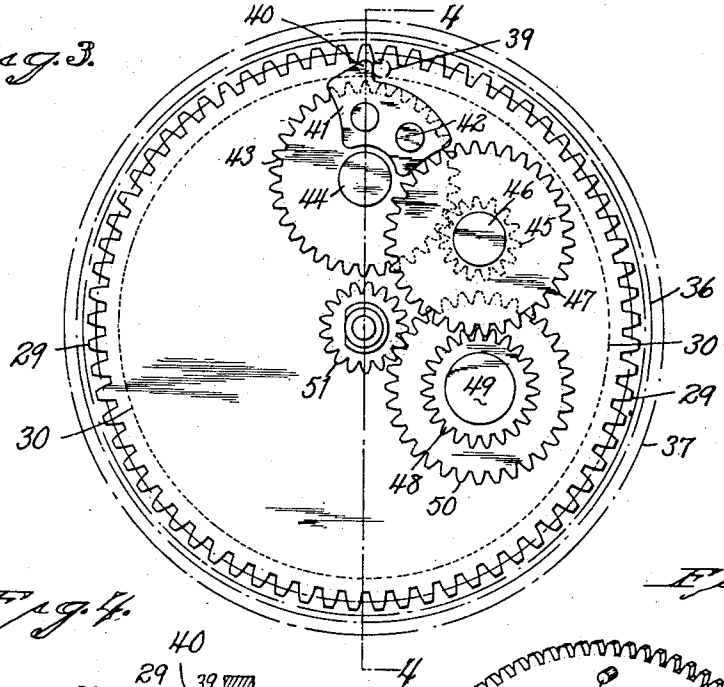


Fig. 4.

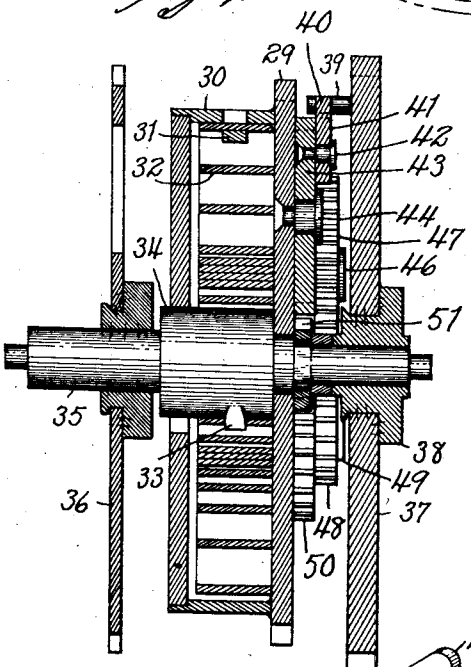


Fig. 5.

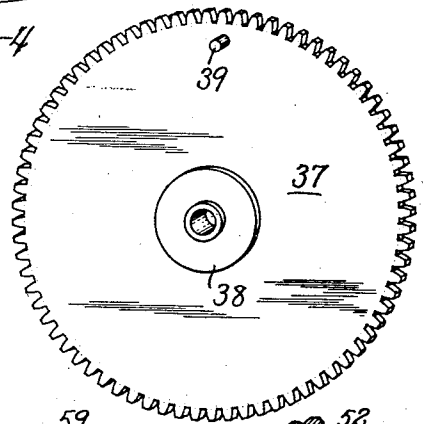


Fig. 7.

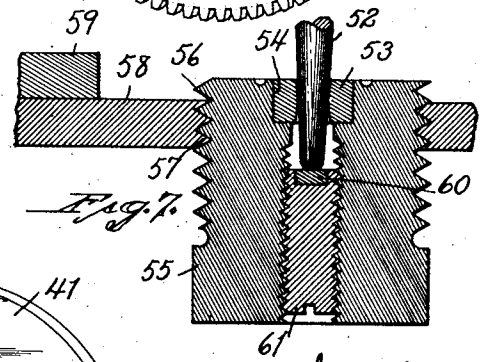
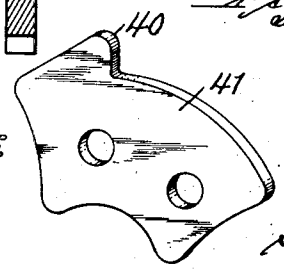


Fig. 6.



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Patented Jan. 31, 1933

1,895,787

UNITED STATES PATENT OFFICE

GEORGE P. COWLES, OF WATERBURY, CONNECTICUT, ASSIGNOR TO WATERBURY CLOCK COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION

ELECTRICALLY-WOUND CLOCK

Application filed March 10, 1930. Serial No. 434,564.

My invention relates to an improvement in electrically-wound clocks, the object being to prevent what is known in horology as "over-banking," with its attendant effect on timekeeping, by virtually isolating from the time-train the torque of a motor of sufficient power to insure its starting when released. A further object of my invention is to provide a simple and reliable mechanism for accomplishing the above purpose.

With these ends in view, my invention consists in an electrically-wound clock having certain details of construction and arrangements of parts as will be hereinafter described and pointed out in the claims.

In the accompanying drawings:

Fig. 1 is a view in rear elevation of an improved electrically-wound clock embodying my invention;

Fig. 2 is an edge view thereof;

Fig. 3 is a detached view in elevation of the main winding-wheel with the planetary-gear control-train installed thereupon, showing in dotted line the control-pin with which the said train cooperates and also showing the main-wheel of the time-train, which is concentric with the main winding-wheel aforesaid;

Fig. 4 is a view in vertical transverse section on the line 4—4 of Fig. 3, with the addition of the control-wheel;

Fig. 5 is a detached perspective view of the control-wheel;

Fig. 6 is a corresponding view of the control-hook; and

Fig. 7 is a fragmentary sectional view on the line 7—7 of Fig. 1.

In the electrically-wound clock chosen for the illustration of my invention, I employ a motor comprising a field-coil 10, a laminated field-magnet 11, and a rotor 12, which latter is mounted upon a shaft 13 carrying a pinion 14 meshing into a gear 15 mounted upon the arbor 16 of a winding-train located between the rear and front movement-plates 17 and 18 of the clock-movement. The said arbor 16 carries a pinion 19 meshing into a gear 20 on an arbor 21 carrying a pinion 22 meshing into a gear 23 on an arbor 24 carrying a pinion 25 meshing into a wheel 26 on an arbor 27 carrying a pinion 28 meshing into the main winding-wheel 29 mounting a spring-barrel 30 provided, as usual, with a hook 31 for the attachment of the end of the outer coil of a main-spring 32 located within the barrel and having its inner end attached by means of a hook 33 to the hub 34 of the main-arbor 35. The main-arbor 35 has staked upon its forward end the main wheel 36 of the time-train composed of the usual gears, pinions, and escapement, and not necessary to particularly describe. The motor through its rotor 12 effects the winding of the main-spring 32, the power of which is transmitted through the main-arbor 35 to the main-wheel 36 of the time-train and hence to the escapement of the clock.

Now, to prevent the motor from winding the main-spring 32 to such a degree as to transmit its torque directly to the escapement and result in the over-banking of the same, I employ a control-wheel 37 staked upon a bushing 38 turning loosely upon the reduced rear end of the main-arbor 35. This control-wheel 37 is driven at a relatively-high speed, as herein shown, by the gear-wheel 23 which in common parlance is the "third wheel" of the winding-train, by which it is periodically driven, though it is continuously urged to rotate. The said control-wheel carries, near its periphery, a forwardly-projecting control-pin 39 which periodically coacts with the nose 40 of a control-hook 41 rigidly secured by rivets 42 to the outermost wheel 43 of a planetary-gear control-train mounted upon the rear face of the main winding-wheel 29 and comprising the said wheel 43, which is mounted upon a stud 44, a pinion 45 meshed into by the said wheel 43 and mounted upon a stud 46, a gear 47 carried by the said pinion 45 and meshing into a pinion 48 mounted upon a stud 49 and carrying a gear 50 meshing into a pinion 51 on the rear end of the main-arbor 35.

The three planetary-gears and their pinions above described have bodily rotation with the main winding-wheel 29, in addition to their individual rotation upon their respective studs in the usual manner of planetary-gearing.

The several trains and parts above set forth are constructed, ordered and timed so that after the main-spring 32 has been wound by the motor to a predetermined degree sufficient to drive the escapement with proper pressure, say for a period of twenty-four hours, or for any other period that may be determined upon, the control-nose 40 of the control-hook 41 is moved outward into the path of the control-pin 39 carried by the control-wheel 37, which latter during this winding is being revolved at a relatively-rapid rate by the motor. The ensuing engagement of the control-pin 39 with the nose 40 of the control-hook 41 results in the stalling of the motor and winding-train, due to the differential rate of speed at which the said control-pin 39 is being moved, as compared to the speed at which the control-hook 41 is being bodily moved with the relatively-slow-moving winding-wheel 29.

Now, it is to be noted that the stalling of the motor, as above described to prevent the overwinding of the main-spring 32, is effected by means of a part driven at a relatively-high rate of speed by the motor and hence with correspondingly small torque, so that when the control-pin 39 engages with the control-hook 41 but a small amount of restraint is required to check its rotation and hence check the rotation of the motor. Therefore, the driving-urge of the control-pin 39 upon the main winding-wheel 29 is so slight as to be negligible in its effect upon the application of power to the time-train in sufficient amount to cause the over-banking of the escapement.

Now, as the main-spring 32 slowly unwinds in driving the escapement, the pinion 51 upon the main-arbor 35 will cause the reverse rotation of the planetary-gear-train, with the effect of swinging the nose 40 of the control-hook 41 inward out of the path of the control-pin 39, so that the control-wheel 37 is released for rotation, whereby the motor is released from restraint and permitted to act through the winding-train to rewind the main-spring 32, after which the cycle above described is repeated.

It will be noted that the inward swinging movement of the control-hook 41 is in the same direction as the control-pin 39 is being urged to move by the motor, so that the effort required for this disengagement is at the minimum, and does not impose an appreciable load upon the time-train.

Since the motor has a relatively-high torque, it is necessary to provide bearings for the rotor of the same, which will permit the free rotation of the said rotor but guard the same against vibration under the pulsations of alternating current. For this purpose, the respective opposite ends of the rotor-shaft 13 are reduced in diameter to form tapered pivots 52 which run in corresponding bearings, so that a description of one will serve for both. Each of these bearings consists of an annular "olived" jewel 53 adapted in its interior periphery to engage and centralize the tapered pivot 13. The said jewel 53 is mounted in an axial recess 54 in the inner face of a relatively-large bearing-screw 55 provided upon its exterior periphery with screw-threads 56 engaging with corresponding threads 57 in a bore formed in a bridge-plate 58 secured in any approved manner to the motor-frame 59. The end of each of the pivots 52 impinges against a cap-jewel 60 set into the inner end of an adjusting-screw 61 threaded into the adjusting-screw 55 before referred to. By moving the adjusting-screw 55 inward until the inner periphery of the annular jewel 53 lightly engages the tapered periphery of the pivot 13, the latter will be accurately centered and held against lateral vibration under the influence of the alternating current energizing the motor. To limit the end-play of the rotor-shaft 13 and to prevent the tapered pivot from wedging itself into the annular jewel 53, the adjusting-screw 61 is turned inward to bring the cap-jewel 60 into engagement with the rounded outer end of the pivot 13. By this construction I am enabled to employ a motor of relatively-high torque and stabilize the rotor thereof against the annoying vibration and consequent hum, due to the pulsations in the alternating current employed to energize the motor.

I am, by my improved construction as herein described, enabled to employ a motor of sufficient torque to insure its self-starting when released, without in any way endangering over-banking, with its attendant effect upon the timekeeping quality of the clock.

I claim:

1. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a pair of co-acting locking abutments, one of which is retirable out of the path of the other, and respectively driven at differential rates of speed but in the same direction by the said motor, the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and connections between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

2. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a pair of co-acting locking abutments mounted for bodily movement about a common center and respectively driven at differential rates of speed but in the same direction by the said motor and one being retirable

out of the path of the other, the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and connections between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

3. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a pair of co-acting locking abutments respectively driven at differential rates of speed but in the same direction by the said motor and one being retirable out of the path of the other, the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and a planetary-gear-train interposed between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

4. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a pair of co-acting locking abutments mounted for bodily movement about a common center and respectively driven at differential rates of speed but in the same direction by the said motor and one being retirable out of the path of the other, the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and a planetary-gear-train between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

5. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a winding-wheel for the said main-spring, a control-wheel coaxial therewith, a pair of co-acting locking abutments respectively carried by the said wheels, one of which abutments is retirable with respect to the other, the said abutments being driven in the same direction and the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and connections between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

6. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a winding-wheel for the said main-spring, a control-wheel coaxial therewith, a pair of co-acting locking abutments respectively carried by the said wheels, one of which abutments is retirable with respect to the other, the said abutments being driven in the same direction and the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and a planetary-gear-train interposed between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

7. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a winding-wheel for the said main-spring, a control-wheel coaxial therewith, a locking abutment rigidly secured to the said control-wheel, a retirable locking abutment movably mounted upon the said winding-wheel, the said abutments being driven in the same direction and the said retirable abutment moving at a much lower rate of speed than its coacting abutment, and connections between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

8. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a winding-wheel for the said main-spring, a control-wheel coaxial therewith, a locking abutment rigidly secured to the said control-wheel, a retirable locking abutment movably mounted upon the said winding-wheel, the said abutments being driven in the same direction and the said retirable abutment moving at a much lower rate of speed than its coacting abutment, and a planetary-gear-train interposed between the said main-spring and the said retirable abutment for moving the same out of the path of its co-acting abutment upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

9. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a pair of co-acting locking abutments respectively driven at differential rates of speed by the said motor and one of which is retirable out of the path of the other, the said abutments being driven in the same direction and the said retirable abutment moving at a much lower rate of speed than its complementary abutment, and connections between the said main-spring and the said retirable abutment for moving the same out

of the path of its co-acting abutment in a direction corresponding to the urge of the latter upon the unwinding of the said main-spring for unlocking the said winding-train to permit it to rewind the said main-spring.

10. An electrically-wound clock having a motor, a main-spring, a winding-train for imparting the motion of the former to the latter, a planetary-gear-train driven in one direction by the said main-spring and in the other direction by the said motor, a retirable locking abutment mounted upon one of the wheels of the said planetary-gear-train, and a second locking abutment adapted to co-act with the said retirable abutment and driven at a faster rate of speed by the said motor, the said abutments being driven in the same direction but at differential rates of speed, whereby upon the unwinding of the said main-spring, the planetary-gearing will be rotated to withdraw the said retirable abutment out of the path of its co-acting abutment for unlocking the said winding-train to permit it to rewind the said main-spring.

In testimony whereof, I have signed this specification.

GEORGE P. COWLES.