

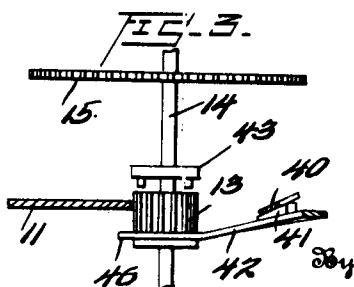
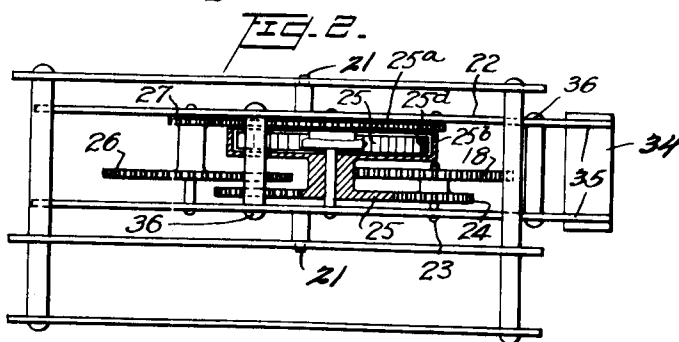
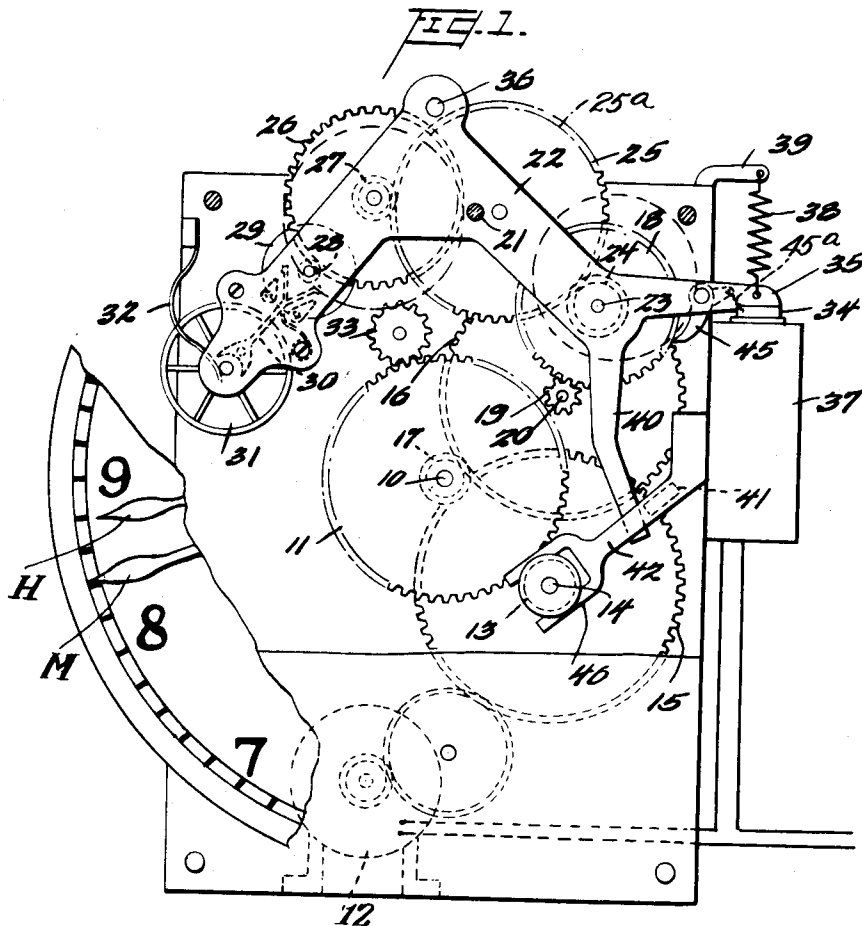
March 2, 1937.

E. E. TALIAFERRO

2,072,609

CLOCK

Filed April 14, 1931



Inventor

E. E. Taliaferro,

H. H. Snelling

Attorney

UNITED STATES PATENT OFFICE

2,072,609

CLOCK

Edward E. Tallaferra, Jackson, Tenn.

Application April 14, 1931, Serial No. 530,053

24 Claims. (Cl. 58—26)

This invention relates to clocks and has for its principal object the provision of a simple and efficient spring motor operated auxiliary equipment designed to continue the registering of the time automatically when and if the current to the electric motor of the clock is broken.

A further object of the present invention is the provision of a pivoted spring clock train together with means for moving this train to drive the time works whenever the current is broken to the electric motor and also including means for disconnecting the spring clock train from the hands upon restoration of the current.

A still further object of the present invention lies in the provision of a pivoted spring clock train which is automatically oscillated about its pivot by the making and breaking of the current to the synchronous motor which normally operates the clock.

Other objects of the invention are set forth more fully in the claims and relate primarily to the specific details of the works.

At the present time the synchronous motor clock is very popular but most of the clocks are subject to the serious disadvantage that the mechanism ceases to operate whenever the electric current is interrupted. My invention contemplates the use of the synchronous motor in the well known manner and the utilization of this motor to keep the spring motor constantly wound and subject to immediate going into use upon the breaking of the current to the synchronous motor, the current to the motor passing thru a solenoid or magnet which withholds the spring clock train as long as the current is flowing but immediately upon breaking of the current means are released for moving the spring clock train into position to continue the operation of the hands with a loss of time entirely too small to be of importance, the delay being somewhat less than a single second.

According to my device the entire spring clock train and escapement is carried upon a frame pivoted somewhat centrally so that it can be rocked into position to drive the mechanism when at one limit of travel and to cause the spring motor to be wound at the other limit of travel, in the latter position engaging a light spring which prevents the balance wheel from revolving, the arrangement being such that the balance wheel not only is automatically freed but is furthermore given a starting impulse upon rocking of the frame out of engagement with the spring.

In the drawing:—

Figure 1 is a somewhat diagrammatic elevation of a device embodying my invention.

Figure 2 is a top plan view showing the mounting of the pivoted frame and part of the gearing in the spring clock train, the latter being partly broken away.

Figure 3 is a detail showing the method of de-clutching the shaft of the dial train from the synchronous motor train.

In the figures of the drawing I have purposely omitted many parts in order that the parts here claimed may more clearly be seen and understood. Somewhat centrally of the stationary main frame is the shaft 10 of the wheel 11 which is the third wheel from the synchronous motor diagrammatically shown at 12 which may be of any synchronous or sub-synchronous type and may be either self-starting or non-self-starting but the motor is not claimed per se here in any manner. This third wheel 11 diagrammatically represents the time-indicating train which train receives its motion from a pinion 13 on shaft 14 of wheel 15 which is the second wheel from the synchronous motor; pinion 13 is part of the time-indicating train while shaft 14, wheel 15 and motor 12 with the intermediate gearing constitute what is hereinafter called the electric motor train. The wheel 11 in turn transmits motion to the wheel 16 thru a pinion 17 which are part of the time-indicating train. The hands H and M of the clock may be geared to the shaft 10 of wheel 11, and wheel 16 drives a gear 18 thru a pinion 19 on the shaft 20.

In the upper part of the frame are two pivotal shafts 21 which form the axis of the supporting rocking frame 22 which carries the spring clock train or as hereinafter termed the spring motor train which includes as one element the previously mentioned wheel 18 which is the winding wheel for the spring clock mechanism, wheel 18 carrying on its shaft 23 a pinion 24 which drives the motor main spring barrel 25b thru its drive wheel 25 to wind up spring 25c; the spring is operatively connected to wheel 25a which is usually fixed to the shaft on which floats, the barrel 25b and the wheel 25, the axis of which is near, if not concentric, with the axis of the pivotal shafts 21 for supporting the rocking spring clock frame 22. The spring 25c by means of wheel 25a drives wheel 26 thru pinion 27 and second clock wheel 26 in turn drives the pinion 28 of the escape wheel 29. The lever 30 of well known form rocks about its shaft in accordance with oscillations of the balance wheel 31 which, as shown in Figure 1, is held against movement by

the spring clip 32 which prevents oscillation of the hair spring driven balance wheel when the rocking clock frame 22 is in the position shown. Upon rocking of this frame 22 the balance wheel is freed and started under which circumstances the second wheel 26 of the spring motor train drives the wheel 11 of the time-indicating train by means of a connecting wheel 33 positioned between the spring-motor train wheel 26 in lowered position and the wheel 11 of the time-indicating train which latter wheel may revolve once per minute. The pinion or connecting wheel 33 is preferably adjustable in order more easily to accommodate the constant speed of the time train to different speeds of the electric motor train. It is well known that the frequency of the supply lines is different in different localities so that it becomes necessary to change the gear ratio of the time and motor trains if the time train is to keep correct time.

The rocking spring-motor carrying frame 22 is held in the position shown by means of an armature 34 held at the end of the two members 35 of the frame 22, these members being properly spaced by pillar posts 36. Whenever current is passing to the motor 12 the armature is drawn down to the solenoid or electromagnet 37 which is connected in parallel or series with the motor windings, but on the flow of current being broken the frame is rocked to the other limit of its oscillation by means of the spring 38 connected at one end to the armature and at the other end to a small bracket 39 rising from the main frame.

A dependent extension arm 40 of the frame 22 in movement of the frame 22 about its pivot engages a camming surface 41 mounted on clutch spring 42, the fork 46 of the latter riding in a groove on the pinion 13 which is loose on shaft 14 but is brought by the spring 42 into locking engagement with a clutch 43 fast on shaft 14. The pinion 13 need not be splined because the clutch 43 is fast to the shaft and the pinion 13 is of sufficient axial length to maintain constant engagement with the wheel 11. Whenever the current is resumed after interruption, the balance wheel end of the rocking shaft is elevated by the downward movement of the armature and this movement frees the cam 41 whereupon spring 42 moves the pinion 13 into clutching engagement with clutch 43 which may be equipped with either pins or ratchet teeth or any other form of gripping members, for example, the two members could have parallel friction faces.

In ordinary operation, the clock mechanism, that is, the time indicating train including the hands is driven entirely from the synchronous motor and the winding wheel 18 of the clock train is in lower position, that is, in mesh with the synchronous motor driven pinion 19 on the wheel 16. Since the pinion 24 is always in mesh with the main spring driven gear 25a, the main spring, which is kept from unwinding by the ratchet 45 spring pressed as at 45a, will be wound to the proper degree and after reaching this situation the main spring slips 25d so that there is no danger of overwinding and on the other hand the spring motor is always ready for use upon failure of the current. In normal operation the starting and stopping spring clip 32 lightly engages the shaft of the balance wheel 31 and the latter is therefore without movement. Instantly upon the breaking of the electric current the spring 38 rocks the frame 22, freeing winding wheel 18 from the pinion 19 and simultaneously bringing

the second clock wheel 26 into driving relation with the adjustable connecting wheel 33 which drives the wheel 11 and thru it the regular clock hands, i. e., the time indicating train. As the shaft of the balance wheel 31 is drawn away from the spring clip 32 the latter drags over the shaft and gives the wheel a starting impulse. Also as the frame 22 rocks to this position it throws out the clutch 43 and thus disconnects the motor from the time indicating train.

It will be noted that winding wheel 18 and pinion 19 are so related with respect to the pivotal axis 21 that when the wheels turn in the proper direction the meshing of wheel 18 and pinion 19 is certain and silent and also as pinion 19 drives wheel 18 there is a resultant turning force on the rocking frame which adds to the turning force exerted by magnet 37 whereby all possibility of clatter due to the opposing forces set up by spring 38 and magnet 37 is eliminated. The same relation exists between wheels 33 and 26 and pivotal axis 21 whereby the wheels mesh silently as the frame is turned by the spring 38 upon failure of the current, also the resultant torque on the rocking frame adds to that set up by the spring.

As noted above the type of synchronous motor is immaterial but where a so-called non-self-starting slow speed motor of the phonic wheel type is used and an impulse starter is necessary it is obvious that the electro-magnet 37 may also serve to give the starting impulse in addition to its function of rocking the frame. Furthermore the magnetic field of the motor itself may be used for rocking the frame (as well as starting) by simply arranging the armature 34 in proximity to the field core in which case the electro-magnet 37 may be dispensed with; the latter idea is feasible on all types of synchronous motors.

No claim is made to the particular elements of the spring motor train such as the main spring, main spring barrel and the over-wind preventing mechanism since all of these elements are very old and well known in horology and have been used in watches and clocks for many years; the drawings illustrating these elements are intended to be conventional since individually they form no part of the invention. The illustration of the escapement is intended to indicate in a conventional manner an escapement of the marine type, that is, one controlled by a timing device other than a pendulum.

What I claim is:

1. The combination with a clock having a time indicating train driven by an electric motor, of a spring motor train including an escapement, a movable mounting for said spring motor train for permitting movement thereof as a unit with respect to the time indicating train, and means controlled by the breaking of the current to the motor for moving the spring motor train into driving connection with the time indicating train whereby the latter is driven by the spring motor train whenever the electric motor ceases to drive.
2. The device of claim 1 in which the movable mounting for the spring motor train and escapement is a rocking frame.
3. The device of claim 1 in which the movable mounting for the spring motor train is a pivoted rocking frame.
4. The device of claim 1 in which the means includes an armature carried by the movable mounting for the spring motor train.
5. The device of claim 1 including a clutch operatively connected between the electric motor

and the time indicating train, and mechanism for connecting said controlled means to said clutch to separate the motor from the time indicating train upon breaking of the current and to operatively connect the motor to the time indicating train upon the making of the current.

6. The combination with the motor train of a clock having a time-indicating train, an electric motor for driving said motor train, a pivoted frame, electro-magnetic means energized by the passage of current to the motor, an armature on said frame in inductive relation with said means, a clutch, means connecting said clutch and said frame and adapted to be operated by movement thereof about its pivot for disconnecting and connecting the motor train to the time indicating train, a spring motor train mounted on the frame and adapted to be carried into and out of driving engagement with said time indicating train, and means for preventing the spring motor train from moving when the armature is attracted to the electro-magnetic means.

7. In an electric clock having synchronous motor driven gears and a time indicating train mounted in a main frame, a secondary frame pivoted to rock in said main frame and carrying a spring driven escapement controlled train, means for stopping the escapement controlled train upon movement of the secondary frame in one direction, clutch means for connecting said gears to the time indicating train, clutch operating means movable with the secondary frame, means responsive to the motor current for moving said secondary frame and thereby throwing in said clutch, spring means tending to oppose said last movement and on interruption of current to rock said frame in the opposite direction to throw out said clutch and simultaneously start the escapement mechanism and cause the spring driven train to mesh with the time indicating train.

8. In combination, a time indicating train, an electric motor train and a spring motor train including a spring motor, gear means for winding the spring of the spring motor, electro-magnetic means responsive to the motor current for meshing said gear means with the time-indicating train and at the same time both connecting the electric motor train with said time indicating train and disconnecting the spring motor train from the time indicating train.

9. In combination, a main frame, a time indicating train and a synchronous motor train mounted in cooperative relation in said main frame, a secondary frame pivoted to oscillate in the main frame, an escapement controlled spring motor train carried by said secondary frame, a spring carried by the main frame in a position to engage and stop the escapement mechanism of the spring motor train at one extremity of the oscillation of the secondary frame, means responsive to the motor current for holding the secondary frame in this position, additional means for urging the frame to its other extremity so that on failure of the motor current the frame is rocked to said other extremity to bring the spring motor train into mesh with said time-indicating train and the spring disengages and starts the escapement mechanism.

10. In a timing device, a main frame, a clock frame pivoted therein, a clock train in said clock frame including a balance wheel, means for turning the clock frame about its pivot to one position and other means for turning the frame about its pivot to another position, and means fixed with respect to the main frame and so lo-

cated as to bear against the balance wheel in one of said positions and to spin the balance as the frame is rocked to the other position.

11. In a clock, a time indicating train, a pivoted frame adapted to move with respect to said train, an escapement controlled motor driven train mounted in said frame and adapted to be brought into and out of engagement with said time indicating train by rocking of the frame, means for rocking said frame to cause said engagement and other means to rock said frame in an opposite direction to break the engagement.

12. A timing device comprising time indicating means, a motor for driving said means, a clutch for connecting said motor to said means, additional means for driving said time indicating means independent of said motor, means for connecting said additional means with said time indicating means and means actuated by said connecting means for operating said clutch to connect and disconnect said motor simultaneously as it disconnects and connects said additional means with said time indicating means.

13. In combination with an electric clock, a rocking movement carryover consisting of a rocking frame containing a marine escapement and drive.

14. In combination, a support, a time indicating train in said support, a rocking frame pivoted on said support, a spring motor train in said rocking frame including a spring motor, a marine escapement and drive and having gears adapted to mesh with said time indicating train, means for rocking said frame in one direction to cause said gears to mesh with said time indicating train, means on said support engaging said escapement for starting said spring driven train on movement of said frame into said gear meshing position and for stopping said spring driven train on movement from said position into stopping position, a winding gear on said support adapted to mesh with said spring driven train when said frame is rocked in the opposite direction into said-stopping position and means for turning said winding gear to thereby store power in said spring motor.

15. In combination, a frame mounted to move in two directions, a time indicating means mounted to limit said movement in one direction, a winding means mounted to limit said movement in the other direction, a clock drive carried by said frame and adapted to connect with and drive said time indicating means at the first mentioned limit and to connect with said winding means at the other limit whereby in one position of the frame the time indicating means is driven and in the other position of the frame power may be stored in said clock drive by said winding means.

16. In combination, a spring motor, gearing driven by said motor, means for winding said motor, means for starting and stopping said gearing, and means cooperating with both of said means to cause the second means to operate to stop the gearing when the first means is winding the motor and to cause the second means to start the gearing upon cessation of the winding of the motor by the first means.

17. The device of claim 16 in which said winding means comprises an electric motor, a train of gears for connecting said electric motor to the spring motor and a clutch in said train of gears for disconnecting said electric motor from the spring motor upon cessation of the winding operation.

18. In combination, a frame mounted to move in two directions, an energy source mounted to limit said movement in one direction, a time indicating means mounted to limit said movement in the other direction, a clock drive carried by said frame and adapted operatively to connect with said energy source at the first mentioned limit to receive energy and adapted operatively to connect with said time indicating means at the other limit to deliver energy, whereby in one position of the frame energy is stored in said drive and in the other position of the frame said stored energy is dissipated in driving said time indicating means.

19. In a clock, a stationary frame, a pivoted frame, a gear train mounted in said stationary frame, a second gear train mounted in said pivoted frame, said second mentioned frame being pivoted in said stationary frame in such a manner that upon movement of the pivoted frame about its pivotal axis a gear in said second train will be moved into and out of driving relation with a gear in said first train, spring means acting on said pivoted frame for holding said gears out of contact, electro-magnetic means for acting on the pivoted frame for moving said frame in opposition to said spring means and to bring said gears into mesh, the pivotal axis of said frame being so related with respect to the axes of said gears and to the direction of drive of the trains that the turning force on said pivoted frame resultant from the driving of the gear of one train by the contacting gear of the other adds to the force exerted by the electro-magnetic means whereby to eliminate any chattering which otherwise might be caused by the opposing turning forces set up by the spring means and the electro-magnetic means.

20. The device of claim 19 in which a second gear is provided in the pivoted frame for meshing with a second gear in the stationary frame upon movement of the pivoted frame to disengage the first mentioned gears, the axes of said second meshing gears being so related with respect to each other and to the pivotal axis of the frame that the resultant turning force on the frame due to transmission of power between said second meshing gears adds to the turning force exerted by said spring means.

21. In a clock, a main frame and a main gear train therein, a secondary frame pivoted to oscillate in said main frame, a secondary gear train in said pivoted frame, a gear in said main gear train adapted to act as one limit of oscillation of the pivoted frame and to mesh at said

limit with a gear of the secondary train whereby one of the trains is driven by the other, means for rocking said secondary frame toward said limit and holding said gears in mesh, the pivotal axis of said secondary frame being so located with respect to the axes of said gears that the turning force on said pivoted frame resultant from the driving of one train by the other adds to the force exerted by said rocking means.

22. In combination, two trains of gears, a movable mounting for one of said trains whereby said one train is movable as a unit with respect to the other train, one of said trains including an electric motor for driving the same and the other train including and being driven by a spring motor, the proximate gears of said trains adapted to be separated or intermeshed upon movement of the movable unit and means governed by the passage or non-passage of electric current to said electric motor for respectively causing the intermeshing or the separation of said trains.

23. In combination with a time indicating train, a synchronous motor driven train, a spring motor driven escapement controlled train, a spring for pressing the spring motor driven train into driving engagement with the time indicating train, means responsive to the synchronous motor current for connecting the last gear of the synchronous motor train to the time indicating train and for simultaneously disconnecting the spring motor train from the time indicating train, said means being connected to said spring whereby upon failure of motor current the spring motor driven train is connected in driving relation with the time indicating train and at the same time the entire synchronous motor train is disconnected from the time indicating train.

24. In combination with a time indicating train, a synchronous motor driven train and a spring motor driven escapement controlled train, means responsive to the motor current for connecting the synchronous motor train to the time indicating train, and for simultaneously disconnecting the spring motor train from the time indicating train, means cooperating with said means for stopping the spring motor train, and means provided for winding the spring of the spring motor, said winding means comprising a gear which is connected to be driven by the synchronous motor train only when the spring motor train is disconnected from the time indicating train.

EDWARD E. TALIAFERRO.