March 26, 1940. M. B. MASON 2,194,508

ELECTRIC CLOCK

Filed March 24, 1938

Fig. 1.

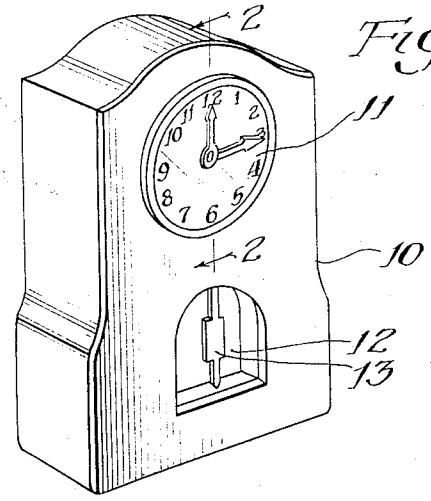


Fig. 2.

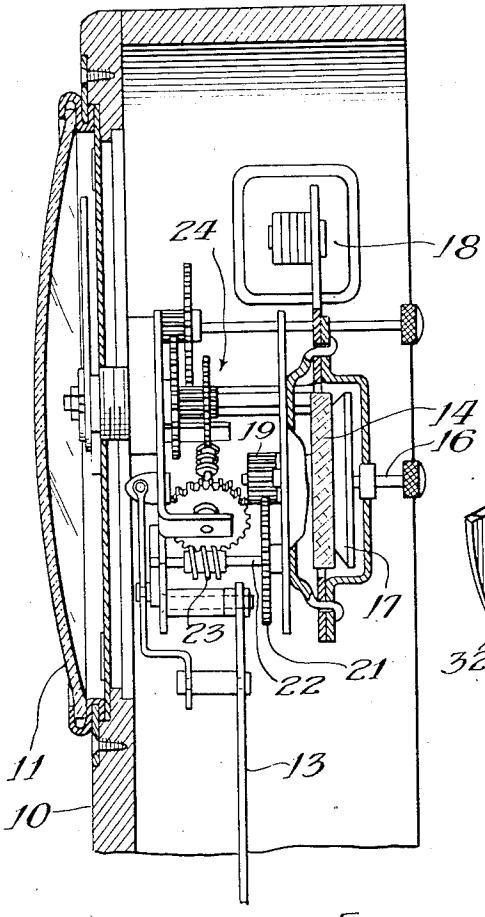


Fig. 3.

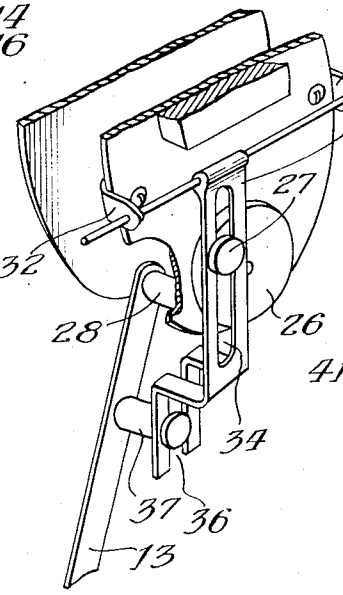


Fig. 5.

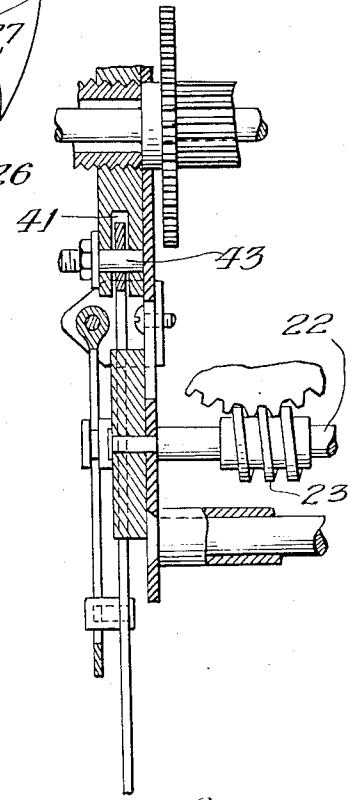
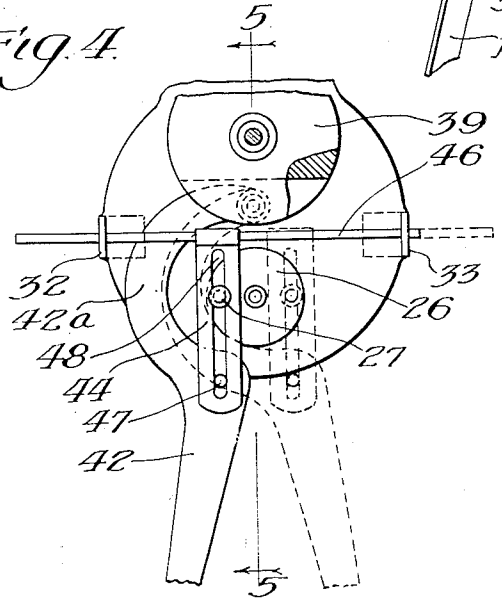


Fig. 4.



Inventor:
Morris B. Mason,
By: Belt, Wallace & Cannon
Attorneys

Patented Mar. 26, 1940 2,194,508

UNITED STATES PATENT OFFICE

2,194,508

ELECTRIC CLOCK

Morris B. Mason, Chicago, Ill., assignor to Joseph L. Stone, Chicago, Ill.

Application March 24, 1938, Serial No. 197,892

10 Claims. (Cl. 58—26)

My invention relates in general to electric clocks. It relates more in particular to indicating devices for electric clocks, and, specifically, to an indicator having the general appearance of a pendulum.

Conventional time keeping instruments in general comprise a train of gears usually called a time train, means operated by the time train to indicate the time, and driving means for the time train. The driving means may, in itself, have no controlled or controllable movement, in which case the speed at which the time train is operated is governed by an escapement mechanism, or a pendulum which, for the most part, is the equivalent of an escapement mechanism. The drive means may be a synchronous motor, in which case the use of special controlling devices such as escapement mechanisms or pendulums is not required. In the so-called synchronous motor clock, however, it is customary to have some indicating device to show whether or not the clock is in operation, since normally by neither visual nor audible means would the person looking at the clock otherwise know that it is operating. This indicating means in the ordinary synchronous motor clock sometimes takes the form of a second hand, but more often the form of a small flicker disk visible through an aperture in the dial face. Neither of these indicating devices is adequately visible under all circumstances, and both suffer in that they do not lend themselves to the production of distinctive types of time pieces.

My invention is concerned with the use of a pendulum-like indicator and novel drive therefor. I am aware that attempts have been made to utilize pendulums with electric clocks, either electrically spring wound clocks, in which case the pendulum functions as an escapement mechanism, or in synchronous motor clocks, in which the pendulum functions substantially as a true pendulum in so far as its swinging action is concerned.

The principal object of my invention is the provision of an improved electric clock having improved indicating means of the general character identified.

Another object is the provision of a positively driven indicator, so controlled in its action as to have, to the ordinary observer, substantially the swinging characteristics of the true pendulum.

A further object is the provision of such an indicator which may be operated in either a pendulous position or in an upright position, depending upon the design of the clock as a whole, including the case.

A still further object is the provision of an improved indicator which lends itself to adaptation and cooperation with various designs of clocks, including various casings for clocks.

Another object of my invention is the provision of a novel mechanism for operating a swinging indicator, in the nature of a clock pendulum, and which indicator may be used, among other ways, as a means for imparting animation to display and advertising devices and for attracting attention thereto.

In general, I accomplish the objects of my invention by the provision of a crank, preferably making one complete revolution every second, driven from the time train. The motion of the crank is translated into reciprocating motion by means which produces a regular uniform movement, and in which the irregularity of motion normally common to ordinary crank drives is eliminated. From the thus controlled, regularly moving, reciprocating part, I oscillate a pendulous body by a mechanical connection which prevents imparting irregularity of motion to the pendulous body such as would normally occur. The movement thus imparted to the pendulous body (which, as already suggested and as will be described, may function if it projects upwardly rather than hands down) is a regular reciprocating movement, differing from the movement obtained if a direct connection were made from a crank or similar drive means, and also differing from the true pendulum movement in which the pendulum is traveling at its greatest speed when it reaches the vertical center line, and gradually loses speed as it reaches its maximum period.

Other objects and specific features of the invention will be apparent from a consideration of the following detailed description taken with the accompanying drawing wherein:

Fig. 1 is a perspective view showing a clock equipped with the indicating means of my invention;

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows, and illustrating in elevation the main parts of the time train and the main parts of the drive to the indicating means;

Fig. 3 is a fragmentary perspective view showing the main parts of the indicator drive;

Fig. 4 is a fragmentary elevational view showing a modified form of pendulous body and drive therefor; and

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

The drawing shows the improvements of my invention made on a conventional synchronous motor clock, and, in considering the detailed construction thereof, the main embodiment of Figs. 1 to 3, inclusive, will first be described.

The design shown in Fig. 1 is more or less conventional in its main parts and comprises a case 10, a dial face 11, an opening 12, and a pendulous body 13 comprising the indicator, the lower portion of the pendulous body showing in the opening 12. The clock is provided with conventional hands and dials with characters for indicating position of the hands. No second hand is shown, but a second hand may be employed, if desired, and any of the usual time indicating means capable of being actuated by a time train may be employed.

Since my invention is not primarily concerned with the clock per se, nor with the synchronous motor employed in accordance with the embodiment shown to drive the time train, I have not attempted to illustrate in complete detail all of the parts thereof. The clock, however, comprises a rotor 14 of simple type mounted on a shaft 16 which is equipped with a flywheel 17. The shaft is mounted in suitable bearings in a frame provided, and the rotor is driven by pole pieces (not shown) which receive their driving magnetic force from a coil indicated generally at 18. A pinion 19 drives a gear 21 carried on shaft 22. Because of the speed at which the rotor 14 is operated, and the gear ratio between pinion 19 and gear 21, shaft 22 is rotated at a speed of 60 R. P. M., that is to say, one complete revolution per second. The shaft 22 carries a worm 23 from which the time train, generally indicated by the reference character 24, is driven. Since the time train is not a part of my invention, and moreover the structure thereof may be modified extensively without departing from the scope of my invention, the time train will not be described in detail, although it is sufficiently clearly shown so that those skilled in the art may trace its action, should they wish. Although I have referred to the time train 24, the pinion 19, gear 21, and shaft 22 may be considered a part of the time train. The indicator of my invention is driven from the shaft 22 which forms a part of the time train. Obviously in other arrangements of time train mechanisms the drive for the indicator of my invention may be differently placed, as those skilled in the art will readily understand.

The shaft 22 is provided with a disk or wheel 26, equipped with a headed pin 27 spaced from the center thereof. This structure comprises in effect, therefore, a crank driven by the shaft 22, and the motion of this crank is converted into a uniform reciprocating motion of the indicator.

The indicator or pendulous body 13 is freely pivoted at its top to a pin 28 mounted in a portion of the frame. In the drawing, the pin is shown as provided with a spacer in the form of a tube, but any suitable mounting may be provided which will permit the pendulous body to swing freely about its axis while still maintaining a fixed position otherwise.

To accomplish the functions with which my invention is concerned, there is obviously a two-step transmission of power, first from the crank to a body capable of having true reciprocating motion imparted to it, and then from such body to the pendulum. In the simplest form of accomplishing this result, a single reciprocating part is employed.

A yoke 29 is provided with a cross piece 31 slidable in guides 32 and 33. The yoke is provided with a slot 34 in which the pin 27 snugly but slidably engages. The lower portion of the yoke is bent at a double right angle and is provided with a slot 36 in which a pin 37 engages. The pin is carried by the pendulous body 13 and is provided with a spacer and head for the purpose of retaining the parts in proper position, but the pin is snugly but slidably confined in the slot 36.

In the operation of this drive, as the disk 26 is rotated by the shaft 22, and the pin which forms part of a crank mechanism as pointed out moves bodily about the center of the driving shaft, this pin reciprocates vertically in the slot 34. At the same time, the cross piece slides laterally in its guides, and the entire assembly including the cross piece, because of this arrangement, has a regular and uniform reciprocating motion. The pin 37 also moves in the slot 36, as the regular and uniform reciprocating motion of the yoke assembly is imparted to the pendulous body and causes it to reciprocate with a uniform motion about its pivot.

The modification shown in Figs. 4 and 5 functions on the same principle, the main difference being the details of mounting the pendulous body, and the modified structure of the yoke made possible by the resulting modifications and positions of the parts. In Figs. 4 and 5, I employ the same reference characters as utilized in Figs. 1 to 3, inclusive, except as to those parts which have a modified structure, and, as to these parts, new reference characters are employed.

Immediately above the disk 26, a stud 39 is provided which, in a sense, is a part of the frame structure of the motor, being utilized in the assembly of the entire motor mechanism with a clock face and dial, none of which are described in detail here since they do not comprise an important part of the present invention. This stud is provided with a slot 41 into which the upper apertured end of a pendulous body 42 projects. A pin 43, extending through the lower part of the stud at the slotted portion thereof, serves as a pivot on which the pendulous body 42 is reciprocated. The pendulous body as shown in this figure is provided with a curved portion 42a, so shaped as to clear the disk 26 previously described in connection with the main embodiment. This permits the pendulous body 42 to be reciprocated in a plane substantially coincident with the plane of the disk 26. A yoke 44 in the form of a flat member is provided and this yoke has an integral cross piece 46 which is adapted to slide laterally in the guides 32 and 33. The pendulous body is provided with a pin 47, and both the pin 47 and the pin 27 engage snugly but slidably in a single slot 48 provided in the yoke. Notwithstanding the somewhat modified construction, this form of mechanism functions with substantially the identical result described in connection with the embodiment of Figs. 1 to 3, inclusive.

It will at once be seen that, while the pendulous body 13 (or 42 in the modified form) may be employed in the position of the ordinary pendulum in a clock, it differs from a pendulum in several ways. In the first place, its action is uniform and does not depend at all for its movement on the weight of a falling body attached to a confining member to convert the movement of gravity into a movement about a pivot. The

drive is positive and uniform at all portions of its period of movement. Moreover, the pendulous-like body of my invention has no effect as a movement control device such as the ordinary escapement mechanism. In spite of the positive drive, however, there is only a very slight, noticeable consumption of power, so slight indeed that the ordinary synchronous motor clock designed to consume only adequate power for driving the time train and time indicating means will function when modified by the addition of my indicator. In other words, by comparison to the total power output, the power consumed by the device of my invention is substantially as negligible as that consumed by indicating devices, such as second hands, heretofore employed.

The indicator of my invention may be seen at relatively long distances, at least as far away as the dial face and hands can be seen. It lends itself to many novel designs, which at the present stage of development of the synchronous motor clock is primarily the factor that governs sales, and, in addition thereto, the said indicator and its operating mechanism may be used for the purpose of imparting animation to display and advertising devices and for the purpose of attracting attention thereto and, to this end, the said indicator and its operating mechanism may be utilized for such purposes wherever a rotatable shaft, driven by the usual 110 V. current, is available.

Moreover, the new clock has the advantage that, if the clock mechanism is stopped and is to be started, operation may be initiated by grasping the pendulous body and swinging it sharply to one side. This is facilitated by the fact that, because of the pendulous position of the pendulous body, it tends to stop at a position away from dead center. Substantially the dead center position of the crank in so far as the present drive is concerned is illustrated in Fig. 3. It will be seen that, if the pendulous body **13** is pushed toward the left in this figure, very little, if any, motion will tend to be imparted to the crank. If, however, the parts stop with the pendulous body **13** hanging directly downwardly, any movement of the pendulous body will impart a movement to the crank, and, therefore, to the shaft **22** and the rotor **14**. This function may be increased somewhat by providing a relatively substantial weight to the lower part of the pendulous body, although, since a positive drive is provided, the weight should not be great enough to place an undue load on the motor.

The pendulous body which comprises the indicator is shown taking the position of a pendulum, that is to say, it hangs downwardly below the clock dial. It is obvious from the construction which I employ that the indicator may be projected upwardly, employing the identical structure which we use and with practically no modifications. In this position, the drive will function in the identical manner as when the parts have the position shown in the drawing. In fact, the parts may be in substantially any position and the drive arrangement will not be affected. This feature affords still other advantages in connection with novelty and variety of design as those skilled in the art will readily understand.

I have described my invention in detail and pointed out its main features and functions. It will be understood, however, that the novelty of my invention is defined in the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a clock, a freely pivoted indicating member, a time train, a synchronous motor driving said time train, a slotted yoke, a crank driven by the said time train and having a portion engaging in the slot in said yoke, means for supporting the said yoke for straight reciprocating movement in a plane parallel to the plane of rotation of the crank, and a driving connection between the said yoke and said pivoted member whereby to impart oscillatory movement to the said pivoted indicating member throughout the entire cycle of its oscillatory movement, said pivoted member being positioned so as to be visible so that it will indicate whether or not the clock is operating.

2. In a clock, a synchronous motor, a time train driven thereby, a crank driven by said time train, a yoke mounted to reciprocate along a straight line, said yoke having a pair of slots formed therein and the said crank having a portion engaging in one of said slots, a pivoted indicating member, and a pin carried by said pivoted indicating member at a point spaced from its pivot, said pin engaging in the other of said slots in said yoke, both of said slots being at right angles to the direction of the movement of said yoke, whereby said pivoted indicating member is oscillated about its pivot by a positive drive.

3. In a clock, a frame, a synchronous motor carried by the said frame, a time train driven by the said synchronous motor, a crank driven by the said time train, a pendulous member pivoted to the frame near said crank, a yoke supported by the said frame and slidable transversely thereof, a connection between the said crank and the said yoke to translate rotatory movement of the said crank into reciprocating movement of the said yoke, and a connection between the said yoke and the said pendulous member for positively oscillating the said pendulous member about its pivot, whereby the said pendulous member serves as an indicator and may be employed to initiate operation of said synchronous motor.

4. A clock as defined in claim 3, wherein the connection between the yoke and the crank includes a pin carried by the crank and a vertical slot in the yoke to receive said pin.

5. A clock as defined in claim 3, wherein the connection between the pendulous member and the yoke consists of a vertical slot in the yoke and a pin on the pendulous member below the pivot point thereof, said pin projecting into said vertical slot in the yoke in which the pin may have slidable movement while being driven by the yoke.

6. A clock as defined in claim 3 wherein said yoke is provided with a vertical slot, a pin forming a part of the crank and projecting into the upper part of the slot, and a pin carried by the pendulous member projecting into the lower part of the slot, whereby the connections between the crank and yoke, and yoke and pendulous member, respectively, are effected.

7. A clock as defined in claim 3 wherein said pendulous member is weighted slightly at its lowermost portion whereby to facilitate movement thereof past the dead center of the crank, and whereby starting of the synchronous motor by movement of said pendulous member is facilitated.

8. A clock as defined in claim 3 wherein said crank is designed to make one complete revolution every second, whereby the positive movement of the pendulous member bears a predetermined relationship to the movement of the time train and the time indicating member driven thereby.

9. A clock as defined in claim 3, wherein said crank comprises a shaft driven by the synchronous motor and which in turn drives other portions of the time train, a disc carried by the shaft, and a pin projecting from the disc and radially displaced from the center of said shaft.

10. In a synchronous motor clock, a synchronous motor, a time train driven thereby, a crank driven by said time train and geared to rotate at constant speed, a yoke providing two slots spaced from each other and in different planes, a pendulous body pivoted away from said crank, a pin on said crank and a pin on said pendulous body, said pins being mounted for slidable movement in the respective slots in said yoke, a cross-piece connected to said yoke, and guide members in which said cross-piece is slidable, the construction being such that the pendulous body is positively reciprocated about its pivot, the pendulous body serving as an indicating means and as a means to initiate operation of the synchronous motor.

MORRIS B. MASON.