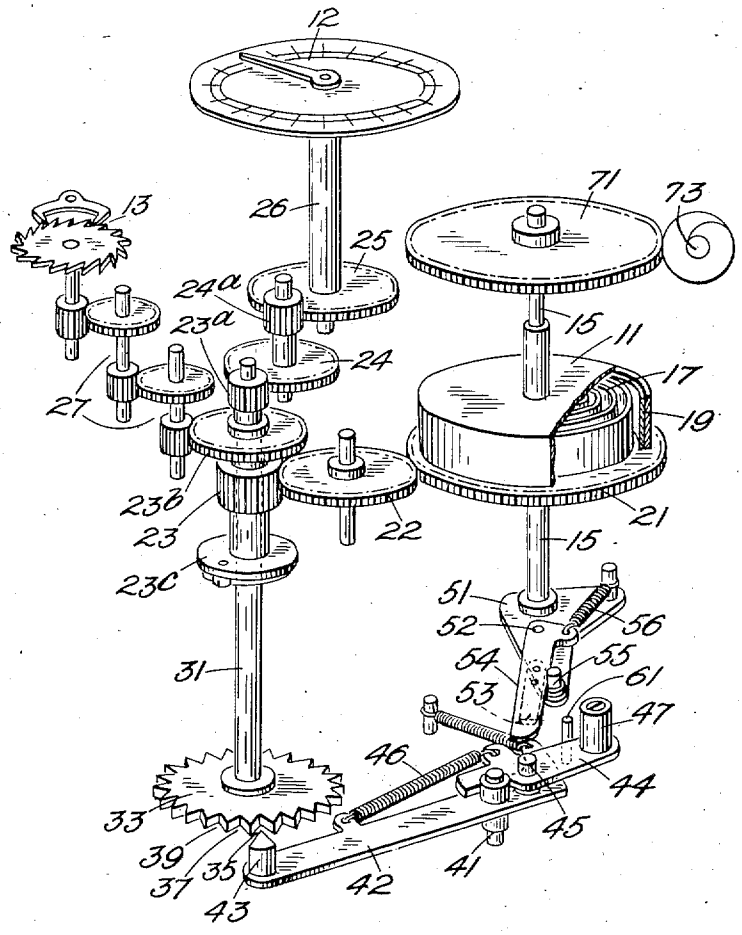
Feb. 25, 1936. R. C. GRASEBY 2,031,705

TIMEPIECE AND THE LIKE

Filed May 12, 1934



Robert C. Graseby.
Inventor,

Per, C. Lyle Fraser
Atty.

Patented Feb. 25, 1936 2,031,705

UNITED STATES PATENT OFFICE

2,031,705

TIMEPIECE AND THE LIKE

Robert Constantine Graseby, New Malden, England

Application May 12, 1934, Serial No. 725,378
In Great Britain August 3, 1933

3 Claims. (Cl. 58—26)

The present invention concerns improvements in or relating to time-pieces and the like which are controlled by synchronization with a source of alternating electric current that has its frequency controlled so as to be constant as is the case with many electric supply systems at the present day, and which is of the kind (hereinafter referred to as the kind specified) in which the time mechanism is always horologically driven but is electrically synchronized irrespective of whether it is operating fast or slow, in which the winding arbor of the time mechanism is continuously rotated by a synchronous motor, and in which the synchronizing correction is permitted by a frictional connection in the drive. In this way the time mechanism is corrected at set intervals irrespective of the rating of the escapement. Such an instrument has the advantage that if the electric supply fails, the instrument continues to function by reason of its horological drive.

A previously proposed clock of the kind specified had its horological drive wound from the same electric motor that effected the synchronization. This clock, however, had a very short correcting interval, so short indeed that practically half its duration was approximately less than the limit of accuracy to which the clock could be read, this giving normally an adjusting period of 10 seconds or less. It is to be noted that in order to overcome the frictional connection the correcting movement should be in the nature of a hammer blow, so that with such a frequent adjustment there was naturally considerable wear on the parts. This clock also had many reciprocatory or oscillatory parts.

The main object of the present invention is to provide correcting mechanism having set intervals of correction which are very long compared with the limit of accuracy to which the clock can be read so that it need operate only comparatively infrequently and consequently the wear on the mechanism is comparatively slight; indeed the wear on the correcting mechanism may be comparable with the wear on the time mechanism. Such a correcting mechanism gives long life with reasonable accuracy, since with a reasonably adjusted clock the inaccuracy during an interval of one hour is so small as to be negligible for practical purposes.

A further object is to provide correcting mechanism which shall have a minimum of reciprocatory or oscillatory parts in contradistinction to rotary parts whereby wear is reduced owing to the elimination of the necessity for reversing. In the construction to be described the correction lever and its cam arm are the only oscillatory parts.

One feature of the invention is a time-piece or the like of the kind specified in which the correcting movement is in the nature of an instantaneous stab and withdrawal such that there is no liability for it to produce a lock on the drive, in which the winding arbor is connected to its winding motor through rotary in contradistinction to reciprocatory connections, and in which the correcting mechanism has set intervals of correction which are very long compared with the limit of accuracy to which the clock can be read so that it need operate only comparatively infrequently and consequently wear on the mechanism is comparatively slight.

The invention will become more fully apparent from the following description, in conjunction with the accompanying diagrammatic drawing, of one illustrative construction according to the invention.

In the drawing,

The figure is an exploded diagrammatic perspective view of so much of the illustrative construction as is necessary for the understanding of the invention.

A time-switch comprises usual mechanism by which a spring-driven drum 11 drives a time indicator indicated generally at 12 equivalent to clock hands under control of a usual escapement 13. The drum 11 contains a winding shaft 15 to which is attached a main spring 17 (in this case a 60-hour spring) which is not attached to the drum 11 but which drives it by frictional contact with its interior in known manner as indicated at 19; thus overwinding of the spring 17 does not damage the mechanism since the spring 17 can slip on the interior of the drum 11. The mechanism by which the drum 11 drives the time indicator (clock hands) comprises a toothed ring 21 fixed to the drum 11, and gear wheels 22, 23, 23*a*, 24, 24*a*, 25 and spindle 26; the escapement 13 controls this drive through gearing indicated generally at 27 which meshes with gear wheel 23*b*.

In order to provide for synchronous correction, the following mechanism is provided.

Instead of being fixed to the spindle 31 as is gear wheel 23*a* the gear wheels 23 and 23*b* are driven from the spindle 31 through a friction slip-device comprising a spring contained within a casing indicated at 23*c*; thus relative movement is possible between the wheel 23*b* and its spindle 31. In this construction the spindle 31

is the minute spindle of the mechanism, which makes one revolution in one hour. If the device were intended to act as a clock instead of as a time-switch, a minute hand would be fixed to the spindle **31**. Also fixed to this spindle **31** is a toothed correction disc **33** provided with V-shaped gaps as **35**, **37**, **39** between adjacent teeth. In this particular construction there are 24 teeth, so that the distance between two adjacent teeth should rotate past a given point in 2½ minutes. Adjacent to the correction disc **33** there is pivoted to the frame on a pivot-pin **41** a correction lever **42** having at one end a V-shaped nose **43** which is adapted to enter and locate in any one of the gaps as **35**; the other end of the lever **42** is formed for safety reasons with a portion **44** pivoted on a pin **45** which is normally held in position by a strong spring **46**. Upon the portion **44** is pivoted a roller **47**. The correction lever **42** is rocked suddenly at predetermined intervals as will now be explained. Mounted on the winding shaft **15** is cam-disc **51** upon which is pivoted at **52** a double cam-arm **53**, **54**, which is normally held in radial position against a stop **55** on the cam-disc by a spring **56**. The cam-disc **51** is by any convenient means rotated (once in 62½ minutes) from a synchronous motor. Upon the frame there is mounted a stop **61** which is located in the path of movement of the cam-arm part **53**.

As the cam-disc **51** continues to rotate counterclockwise after the part **53** has contacted with the stop **61**, the cam-arm will be rocked from its radial position to permit the part **53** to pass the stop **61**. When it passes the stop **61** the spring **56** will snap it back into radial position and in this movement the part **54** will strike the roller **47**; the correction lever **42** will be suddenly rocked and its nose **43** will be suddenly forced into the adjacent V-shaped gap as **35** and then as suddenly released. If the gap **35** is exactly opposite the nose **43** when this occurs the correction disc **33** is not affected; if however the time mechanism is running incorrectly, either fast or slow, the correction disc will be rotated slightly relatively to the escapement control wheel **23***b* and will rotate the spindle **31** correspondingly and will so rotate the time indicator into synchronism with the synchronous motor. It is to be noted that because the lever **42** is both suddenly struck and suddenly and immediately released by a single snap movement of the part **53**, the nose **43** does not in any way tend to lock the correction disc **33**. The disc **33** is struck, moved and released instantaneously.

In this particular construction not only the cam-disc **51** but also the winding shaft **15** is driven from a synchronous motor; in fact, both are driven from the same synchronous motor. To effect this the winding shaft **15** is driven through gearing **71** from the shaft **73** of a synchronous motor, the arrangement being such that the main spring **17** is constantly overwound by a considerable amount, in this case in a ratio of 5 to 1; thus, if the motor stops for 5 hours and the main spring **17** unwinds for that time, then the motor on re-starting will in 1 hour have rewound the spring fully. Thus the timepiece is always spring (horologically) driven, but the winding shaft **15** is wound electrically. The cam-disc **51** in order that it shall be driven by the motor-shaft **73** is fixed to the winding shaft **15**.

The operation is as follows:—Assume that the time mechanism is very badly adjusted and is going slow by half a minute every hour. The correction disc **33** will therefore be lagging. At the expiry of 62½ minutes the synchronous motor will have rotated the cam-disc **51** one rotation. Consequently the cam-arm **54** will strike the roller **47** and rock the correction lever **42**; the nose **43** will enter the adjacent V-shaped gap **35** which will not be exactly opposite the nose and will force the correction disc **33** forwardly and so through the gears **23***a*, **24**, **24***a*, and **25** will move the spindle **26** into correct synchronous position; gears **23** and **23***b* are not moved as they are only friction tight on the spindle **31**, so there is no interference with the escapement. Thus the time mechanism is corrected every 62½ minutes. It will be understood that if the clock is reasonably adjusted (for example, so that it goes fast or slow only by a minute or so a day) the amount of adjustment at each correction stroke is very small. Indeed if the synchronous motor stops for several hours it will in these circumstances be able to make a proper correction when it re-starts, seeing that even in that time the variation from true time will be less than 1¼ minutes, i. e. than half the width of the V-shaped gap **35**.

By rotating the correction disc **33** once in 60 minutes while the cam-disc **51** rotates once in 62½ minutes, it is provided that normally the nose **43** enters, every time it operates, a gap next to the gap it last entered; thus the nose enters any individual gap only once in 24 rotations of the correction disc, that is, once in 24 hours; consequently, wear on the teeth of the correction disc is small.

What I claim is:—

1. Time-piece to be operated from a synchronous motor, comprising an indicating device, a driving spring, a driving connection therebetween including a slowly rotating element, a shaft to be driven by the synchronous motor, a tooth-gapped synchronizing member operatively connected with said element, a co-acting synchronizing toothed member, snap actuating means for periodically engaging said toothed member in said gapped member with a sharp stabbing action, loading means acting upon said toothed member for instantaneously retracting it from said gapped member, and a driving connection between said shaft and actuating means whereby the latter is driven with a period differentiated from the time of rotation of said element by the quotient of that time divided by the number of tooth-gaps of the tooth-gapped member so that the toothed member engages successively in the said tooth-gaps.

2. Time-piece to be operated from a synchronous motor, comprising an indicating device, a driving spring operatively connected with said device, a shaft to be driven by the synchronous motor, a rotary tooth-gapped synchronizing member operatively connected with said device, a toothed co-acting synchronizing member, a lever carrying said member at an end, a support operatively connected with said shaft for rotation thereby, a hammer device pivoted on said support and rotatable therewith, a loading spring acting between said support and hammer device, the other end of said lever extending into the path of said hammer device, and a stop located in the said path just in front of said lever-end, and adapted for arresting said hammer device until the continued rotation of said support permits said hammer device to slip past said stop under the influence of its loading spring

and to strike said lever-end with a momentary hammer-blow producing a stab-like engagement of the toothed member in the tooth-gapped member.

3. Time-piece according to claim 2, wherein the lever consists of two parts one of which carries the toothed synchronizing member and the other forms the end struck by the hammer device, a pivotal connection between the two parts, stop means preventing the said other lever-part from turning on the pivotal connection towards the hammer device, and a spring, stronger than the loading spring, arranged to act between the two parts in such a direction as to tend to turn the said other lever-part towards the hammer device.

ROBERT CONSTANTINE GRASEBY.