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E. F. STODDARD ET AL

2,724,232

CLOCK CORRECTING MEANS OF MORE THAN ONE HOUR RANGE

Filed April 7, 1953

3 Sheets-Sheet 1

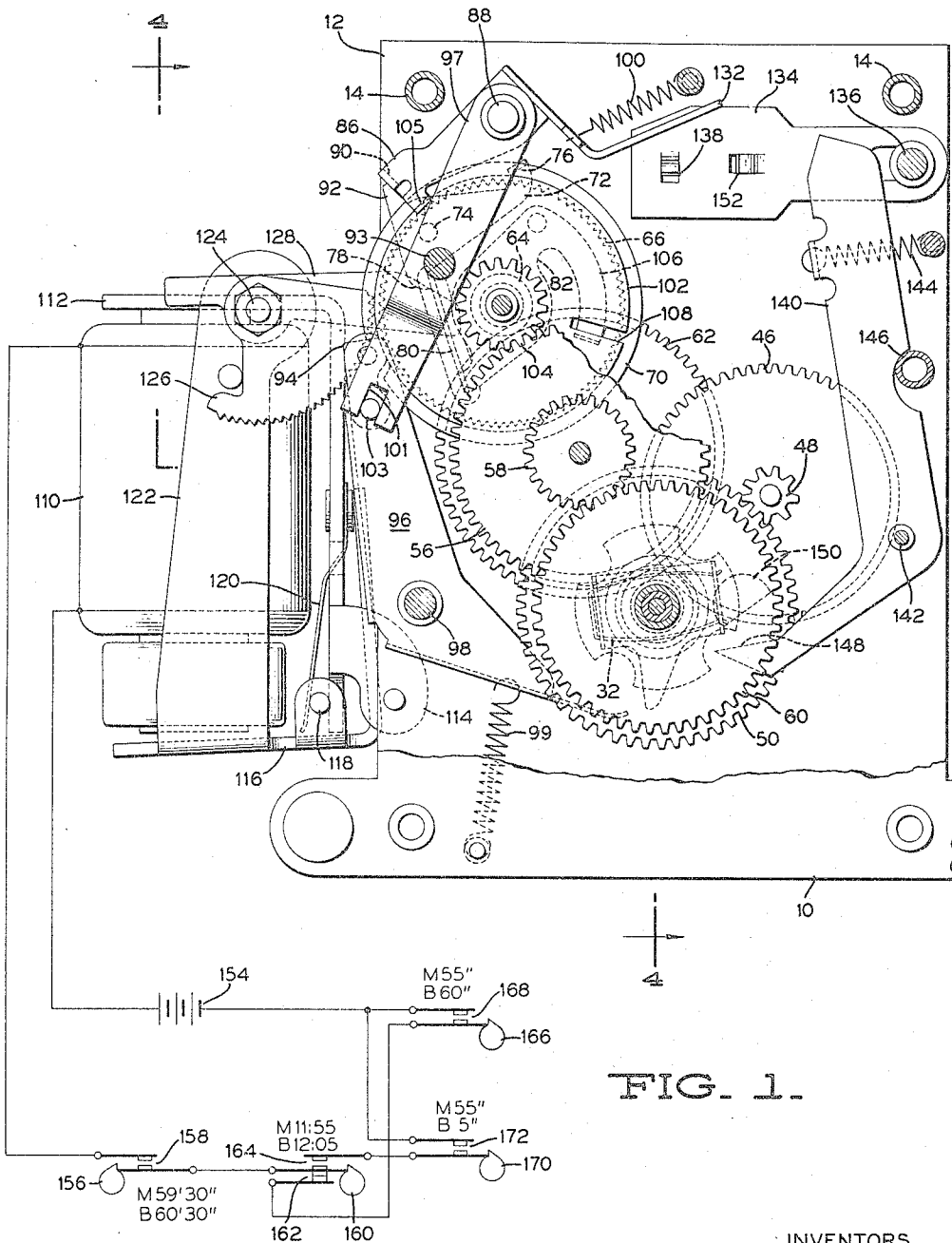


FIG. 1.

INVENTORS
EMORY F. STODDARD
EDWARD L. REIDY

BY

Geoffrey Knight
ATTORNEY

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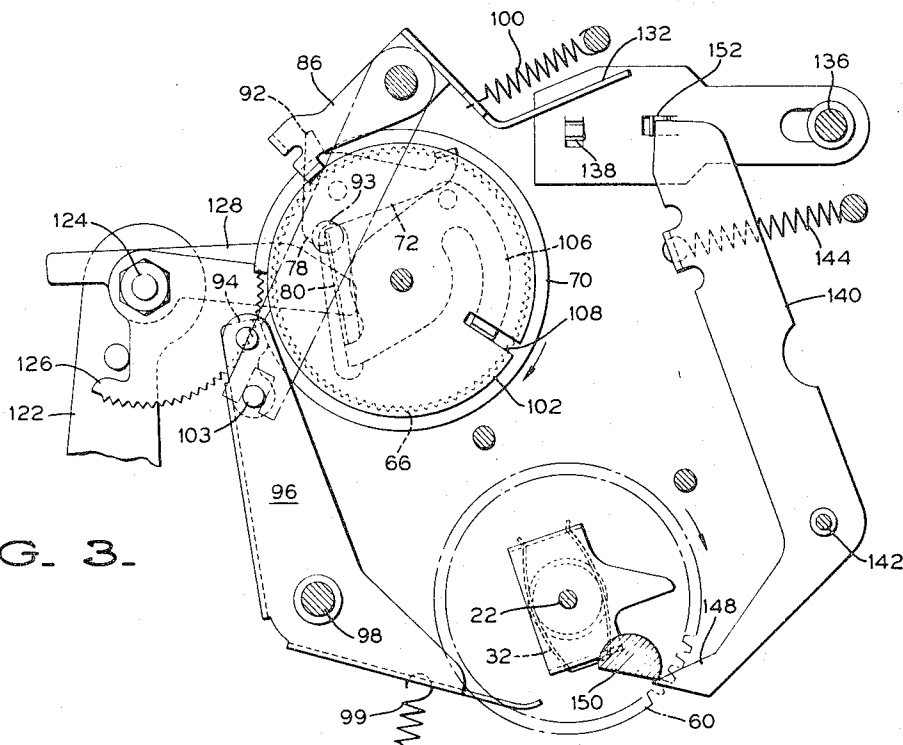


FIG. 3.

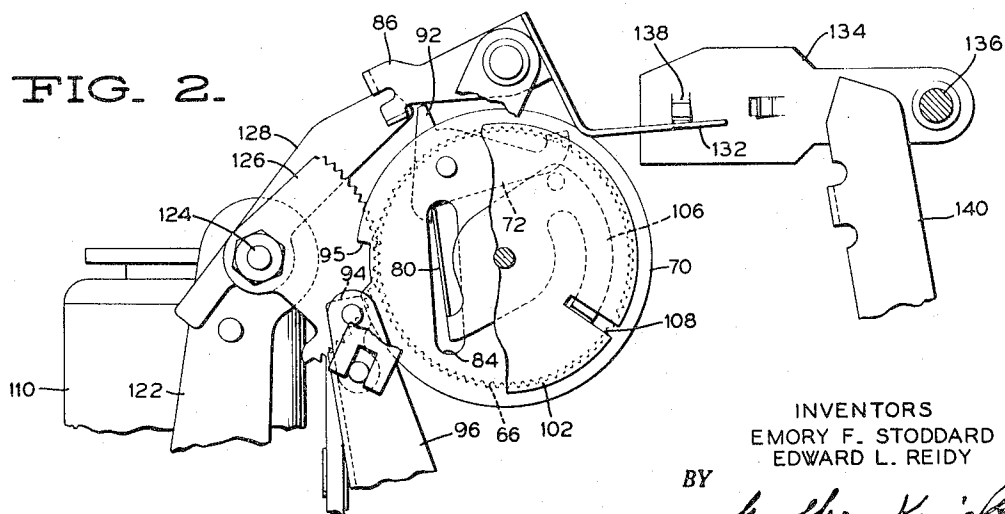


FIG. 2.

INVENTORS
EMORY F. STODDARD
EDWARD L. REIDY

BY

Geoffrey Knight
ATTORNEY

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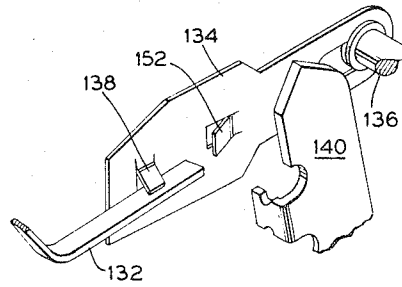
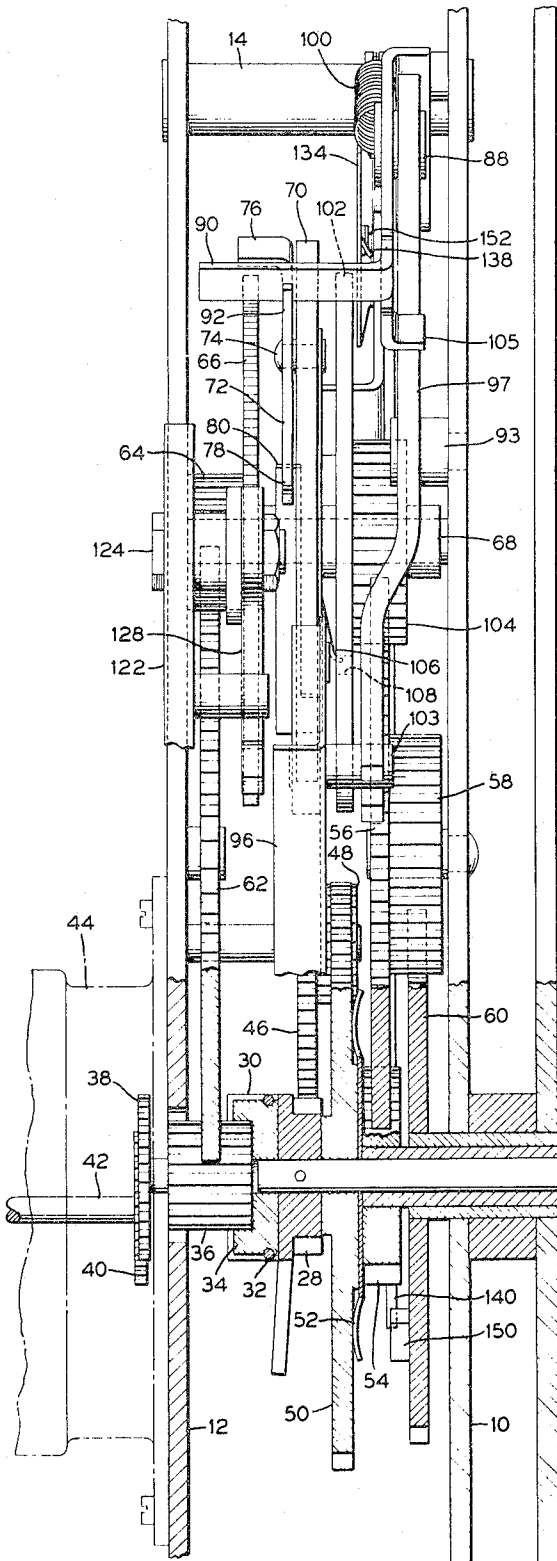


FIG. 5.

FIG. 4.

INVENTORS
EMORY F. STODDARD
EDWARD L. REIDY
BY *Geoffrey Knight*
ATTORNEY

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CLOCK CORRECTING MEANS OF MORE THAN ONE HOUR RANGE

Emory F. Stoddard, Vestal, and Edward L. Reidy, Endicott, N. Y., assignors to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application April 7, 1953, Serial No. 347,306

4 Claims. (Cl. 58—35)

This invention relates to clock correcting means of the type which is capable of bringing a clock to correct time when in error by more than one hour.

The invention can be regarded as a modification of the invention disclosed in the copending application of David F. Cole, Serial No. 347,314, filed April 7, 1953 and its object is to provide an improvement of the clock correcting means shown in said application.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawings:

Fig. 1 is a front elevation of a clock embodying the invention, with parts broken away.

Figs. 2 and 3 are elevational views of portions of the mechanism shown in Fig. 1, with the parts in different positions.

Fig. 4 is a section substantially on the line 4—4 of Fig. 1.

Fig. 5 is a detail perspective view of the latch mechanism.

In the drawing the invention is shown embodied in a synchronous motor secondary clock rather similar in its general construction to the one shown in Larrabee patent, No. 2,569,815. The clock mechanism is mounted between two plates 10 and 12 connected into a rigid frame by pillars such as 14. The seconds hand 16, the minutes hand 18, and the hours hand 20 are mounted, respectively, upon nested shafts 22, 24 and 26. At its rear end the shaft 22 has pinned to it a pinion 28 which is an integral part of a cage 30. A U-shaped spring 32 mounted in cage 30 bears frictionally in a groove of a round clutch collar 34 revolvably mounted on the inner end of shaft 22. The clutch collar 34 has an internally toothed socket which receives a pinion 36 driven at the rate of one revolution per minute through gears 38 and 40 by the shaft 42 of a synchronous motor 44. Gears 38 and 40 are merely diagrammatic representations of a reduction gearing which provides the proper rate of revolution of the pinion 36.

The seconds shaft 22 drives the minutes shaft 24 through a conventional gear train consisting of gears 46, 48 and 50. The latter gear turns at the rate of one revolution per hour, its rotation being transmitted through a spring spider 52 to a gear 54 rigidly fixed to the minutes shaft 24. In a similar way the hours shaft is driven from the minutes shaft through gearing consisting of the gears 56, 58, 60, the latter being rigidly fixed to the hours shaft 26.

An idler gear 62 meshing with the pinion 36 drives another pinion 64 rigidly fixed to a serrated disc 66, called the reset drive ratchet. This disc rotates continuously at the rate of one revolution per minute on a shaft 68. Coaxial with the reset drive ratchet 66, and mounted on its same shaft 68, is a stop disc 70. A clutch dog 72 pivotally mounted at 74 on the disc 70 has an ear 76 which

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overhangs the reset drive ratchet 66. A tail portion 78 of the clutch dog bears against a spring extension 80 of a formed sheet spring member 82 (see also Fig. 2). This spring member is riveted to the opposite side of the stop disc 70 from the dog 72 and its spring extension 80 extends through an elongated slot 84 of the stop disc. By the spring extension 80 the pivoted clutch dog is urged in clockwise direction, tending to engage the reset drive ratchet 66. However, the clutch dog is normally held disengaged by a trigger 86 pivoted at 88 on a bar 97 which is rockably mounted on a stationary pin 93 projecting rearwardly from the front plate 10. A spring 100 urges the trigger counterclockwise on its pivot, so that an ear 105 of the trigger rests on the bar 97. The trigger is also provided with an arm 90 (Fig. 4) extending rigidly rearward from the trigger across the path of an arm 92 on the clutch dog. The stop disc is held forward in the latched position by a square shouldered detent 94 on a lever 96 pivoted at 98 in the frame plates and urged clockwise by a spring 99. The detent block 94 engages in a notch 95 of the disc 70, while a pin 103 on the lever 96 engages in a notch 101 of the bar 97, to determine the position of the latter. If the trigger 86 is rocked slightly clockwise to release the arm 92, in a manner to be described presently, the clutch dog is released and engages the continuously running reset drive ratchet 66.

The stop disc 70 starts a rotation at the rate of 1 R. P. M. with the ratchet 66. The detent block 94 is cammed out of notch 95, rocking clockwise the bar 97 and moving the trigger 86 slightly forward to the position shown in Fig. 3. The trigger remains in the slightly forward position shown in Fig. 3 while the detent block 94 rides on the periphery of stop disc 70. At the end of the revolution of the stop disc the detent block 94 drops into the notch 95 suddenly, just as the tail 92 of the clutch dog arrives in front of the arm 90. The bar snaps counterclockwise and the arm 90 strikes the tail 92 of the clutch dog, knocking the latter out of engagement with the ratchet disc 66.

Revolvably mounted on the shaft 68 adjacent stop disc 70 is a slotted disc 102, which may be called the "minute hand setting disc." This disc has fixed to it a gear 104 which meshes with the gear 56. The slotted disc 102 is thereby driven at the normal rate of one revolution per hour. The spring plate member 82 has a spring arm 106 the end of which stands outward against the disc 102, for coaction with a slot 108 therein.

When the clock is on time the slot 108 and the spring arm 106 have the positions shown in Fig. 1 at the time a correction signal is received. When the clutch dog 72 is engaged the stop disc 70 makes a revolution in one minute, the end of the spring arm 106 traveling in clockwise direction in a circle and bearing upon the disc 102. By the time the spring arm 106 has completed this circuit the slot 108 has moved down to a position such that the end of the spring arm just comes into contact with the lower edge of the slot as the stop disc 70 is latched up. On the other hand, if the clock is slow the slot 108 will be at some higher position than that shown in Fig. 1 and the end of the spring arm 106 will engage the lower edge of the slot and move the disc 102 forward at the rate of 1 R. P. M., instead of the rate of 1 revolution per hour, at which it is driven by the normal clock gearing. This accelerated motion of the disc 102 is transmitted through the gears 104, 56 and 54 to the minutes shaft and through the gears 58 and 60 to the hours shaft, restoring the minutes and hours hands to correct time.

The correction signal is received by a correction magnet 110 mounted by its yoke 112 and ears 114 upon the frame plate 12. An armature 116 is mounted on the yoke 112 by its pin 118 engaged by a spring 120. An arm 122 of the armature carries at its upper end a pivot pin 124

on which is mounted a toothed rocking sector 126. When the magnet 110 is energized the armature rocks clockwise and the toothed sector 126 engages the continuously rotating reset drive ratchet 66, being rocked thereby in counterclockwise direction in Fig. 1. If the toothed sector 126 is held in engagement with the toothed disc 66 for a period of say 3 seconds of continuous signal an arm 123, called the "delay cam," rigidly but adjustably connected to the toothed sector, is raised far enough to engage arm 90 of the trigger 86. Thereby the trigger is lifted and the clutch is released for engagement.

12 hour correction

The mechanism described so far is rather similar to that disclosed in the above-mentioned Larrabee patent and is sufficient to correct the clock for errors within a single hour. In accordance with the present invention means are provided to enable the same mechanism to be used for correction of the clock for greater errors. By the additional means now to be described errors up to 12 hours can be corrected.

The trigger 86 has a tail 132 which extends parallel to a reset latch in the form of a spring plate 134. This reset latch is rigidly mounted at its right end on a fixed post 136 projecting rearward from the front plate 10, in such a way that the reset latch normally lies close to the tail 132, but can be flexed away from it toward the back plate 12. If the signal which energized the magnet 110 continues long enough, say 10 seconds instead of 5 seconds, the tail 132 will be moved far enough to engage under a detent lug 138 on the reset latch 134 (Figs. 2 and 5). When this occurs the trigger 86 will not be moved to release the clutch dog at the end of one revolution, but will remain clear of the clutch dog arm 92 until the trigger is released from the lug 138. In this way the slotted disc 102 can be made to rotate continuously for a plurality of revolutions by the stop disc 70 and the spring arm 105, driving the minute and hour hands forward through a corresponding number of hours.

The latch plate 134 is flexed to release the tail 132 of the trigger 86 by a so-called 12 hour latch reset arm 140 pivoted on a fixed pin 142 on the frame plate 10. The arm 140 is normally held by a spring 144 against a stop 146. Its lower end 148 extends leftward into the path of a pin 150 on the gear 60 which is fixed to the hours shaft 26. As the pin 150 travels around it cams the reset arm 140 counterclockwise (Fig. 3), causing its upper end to deflect the latch plate 134 backward, by camming against an outstanding lug 152.

The operation of the device will now be described with reference to the circuit diagram shown in Fig. 1, also to the operational views shown in Figs. 2, 3 and 5.

Fig. 1 shows the circuit of magnet 110 powered by a battery 154 and controlled by the following cams:

1. Cam 156, which closes its contact 158 once an hour at 59' 30" and opens it at 60' 30".

2. A cam 160, which transfers its contact spring to close contact 164 at 11 o'clock, 55 minutes, each 12 hours and transfers the contact spring back to close contact 162 at 12 hours 5 minutes. These contacts thus remain in the position shown for all but the 10 minute period from 11:55 to 12:05 of each 12 hours.

3. A cam 166, which closes its contact 168 from 55 seconds to 60 seconds of each minute.

4. A cam 170, which closes its contact 172 from 55 seconds to 5 seconds each minute.

With the contact 162 in its normally closed position, at 59' 30" of the hour, contact 158 closes, preparing a circuit which will be closed by contact 168 at 55 seconds of that minute, to the correction magnet 110. The correction magnet will remain energized for five seconds, a period long enough to trip the trigger 86, but not to latch it on the lug 138. The stop disc 70 will thus go through one cycle and will be latched up at the end of one minute. This will correct the clock for slowness up to one hour.

At 11 hours 55 minutes contact 164 closes and contact 162 opens. At 59' 30" after 11 contact 158 prepares a circuit which is completed by the closure of contact 172 at 55 seconds. This contact remains closed for 10 seconds, a period long enough to cause the trigger 86 to be moved through an angle sufficient to engage its tail 132 under the lug 138 of the latch 134, as shown in Figs. 2 and 5. Let it be assumed, now, that the clock is one hour, 20 minutes slow, due to power outage. The pin 150 is slightly above the position shown in Fig. 1. The spring arm 106 engages in the slot 108 and brings the clock into a position within one hour of correct time at the end of the first revolution of the stop disc 70. The clutch dog is not disengaged by the trigger 86, which remains latched up at the time the clutch dog passes the trigger arm 90 on its first revolution. After this pin 150 cams the reset arm 140 and deflects the latch plate 134, releasing the tail of trigger 86. The trigger drops onto bar 97. At the end of the second revolution of the stop disc 70 detent block 94 drops into notch 95 and the clutch dog is disengaged. The clock has been restored to within one minute of correct time, the lateness of one minute which remains being due to the fact that the correction for more than one hour took an extra minute. In fact, the number of minutes which the clock will remain slow after the 12 hour correction will depend upon how many hours the clock was slow when the 12 hour correction signal was received. At 12:05 the cam 160 transfers the contact 162 to closed position and the next hourly correction signal through contact 168 will restore the clock to correct time.

If the hour hand of the clock is on time when the 12 hour correction signal arrives the latch 134 will be in the rearwardly deflected position, pin 150 being against the end 143 of lever 140. The lug 138 will therefore not be in position to latch the tail of the trigger and the correction means will respond as for an hourly correction signal.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a clock, minute and hour indicators geared together in a twelve to one ratio, means for driving said indicators at normal time rate, and regulating means for said indicators comprising reset driving means including a clutch to drive the same at an accelerated rate, means to arrest said reset driving means when said minute indicator arrives at a predetermined time indication, including a trigger for disengaging said clutch, signal controlled means for imparting a movement to said trigger proportional to the length of a signal, latch means coacting with said trigger when the latter is moved under control of a long signal, and means including an element moved synchronously with said hour indicator for releasing said latch and restoring said trigger to effective position.

2. In a clock, minute and hour indicators geared together in a twelve to one ratio, means for driving said indicators at normal time rate, a rotary element geared to said minute indicator having a radial engaging edge thereon; regulating means including a rotary member having means to engage said edge and driving means to turn said rotary member in a direction to drive said indicators forward at an accelerated rate, clutch means to couple said driving means to said rotary member, and means urging said clutch means toward engagement; trigger means movable from a normal position in which it intercepts and holds disengaged said clutch means, to either of two ineffective positions in both of which it is clear of said clutch

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means; latch means adapted to hold said trigger means when moved to one of said positions; signal responsive means adapted to move said trigger means to one of said two ineffective positions in response to one signal and to the other ineffective position in response to a different signal, and means including an element moved synchronously with said hour indicator for releasing said latch means and allowing said trigger means to be restored to clutch disengaging position.

3. A clock as described in claim 2, characterized by the fact that said trigger means is moved by said signal responsive means through a first one of said ineffective positions to the second one of said ineffective positions in which it is engaged by said latch means, the signal which causes the signal responsive means to move the trigger means to the latched position being a long signal and the other signal being a short signal.

4. Correcting means for a clock having minute and hour indicators geared together in a twelve to one ratio, comprising correction drive means, means including a clutch for coupling said correction drive means to said minute indicator, said correction drive means being

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adapted to drive said minute indicator at a rate many times faster than the normal time rate, disengaging means for said clutch adapted to operate when said minute indicator reaches a predetermined position, means to render said clutch disengaging means ineffective for a plurality of cycles, comprising latching means, signal controlled means acting to move said clutch disengaging means at a timed rate toward clutch releasing position and movable by continuation of the signal for a longer time to engage said clutch disengaging means with said latching means and means including an element moved synchronously with said hour indicator for disengaging said latching means.

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