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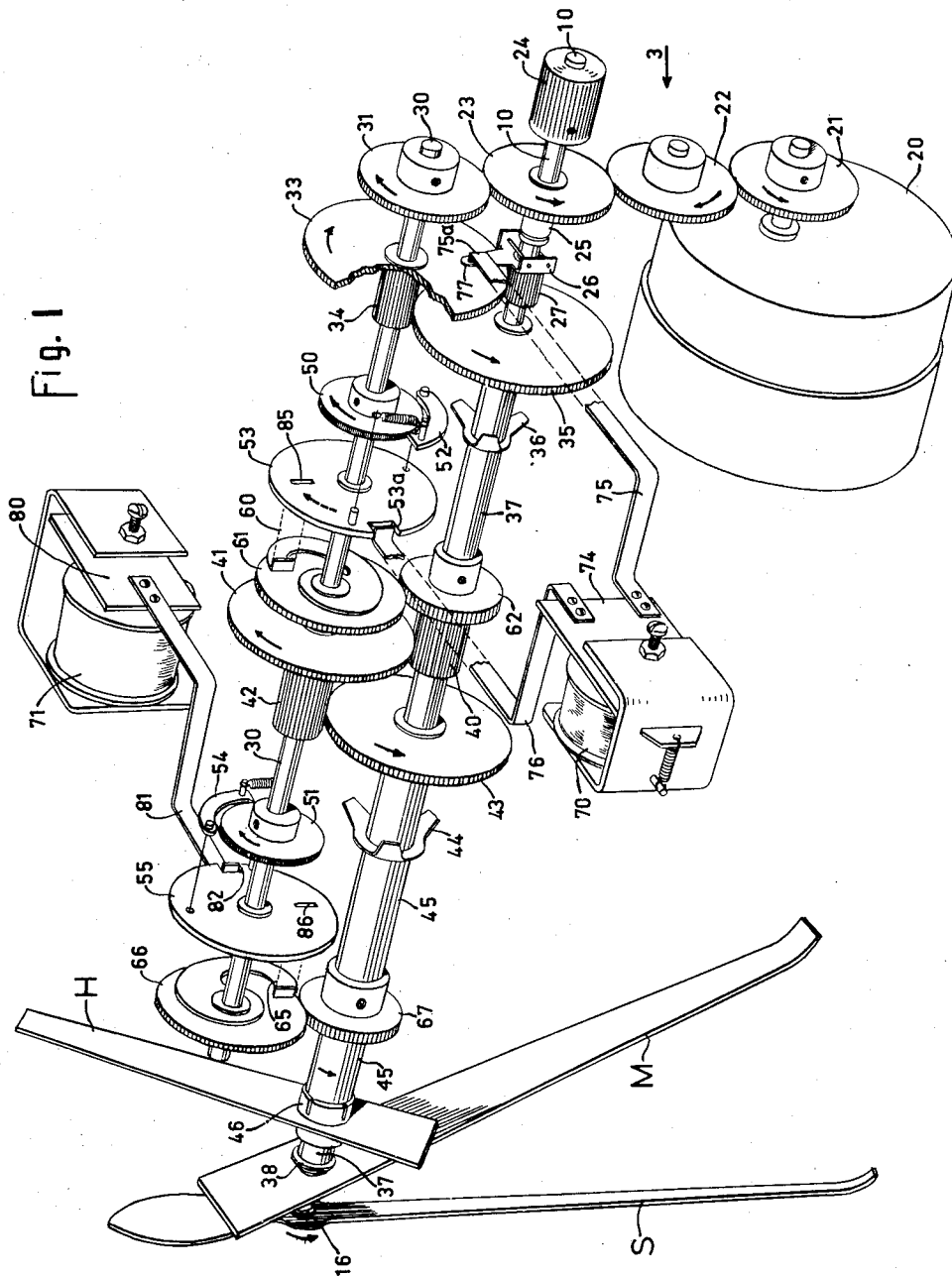
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2,900,787

RESET MECHANISM FOR TIME INDICATING CLOCK

Filed Oct. 3, 1956

3 Sheets-Sheet 1



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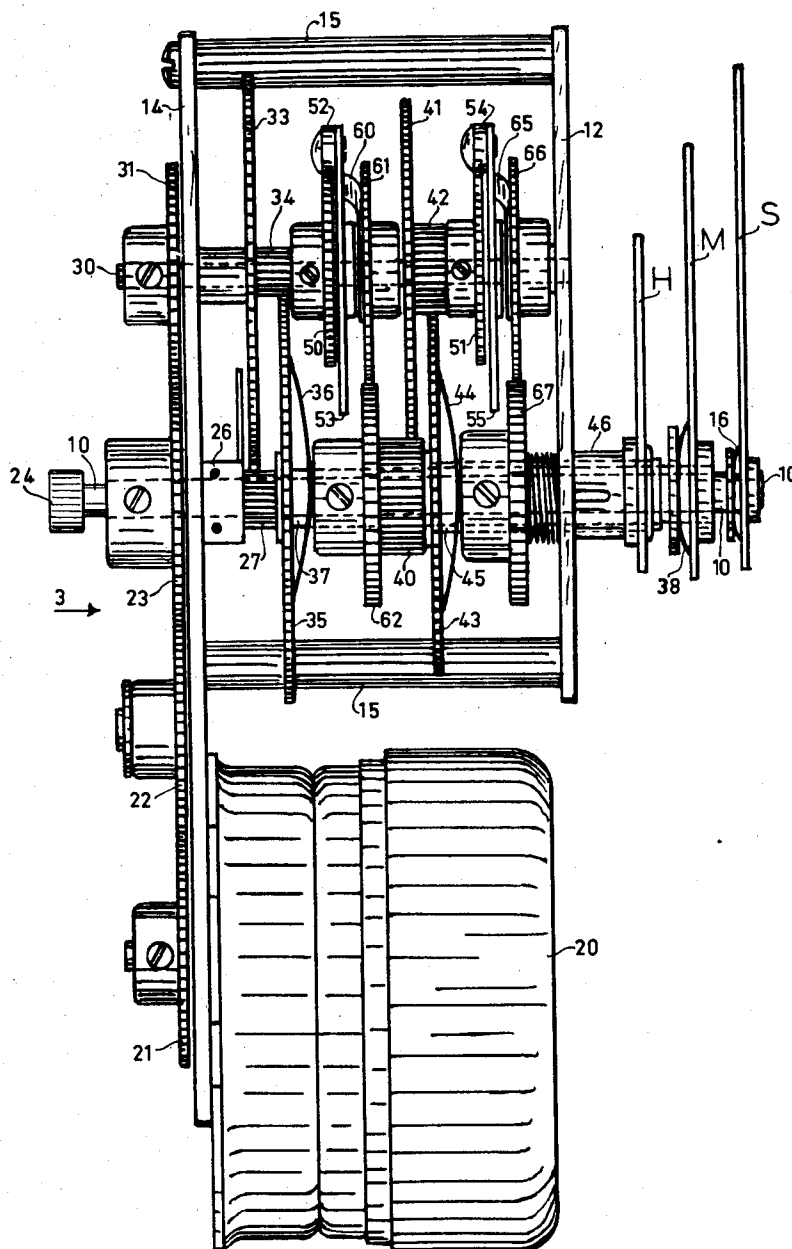
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Fig. 2



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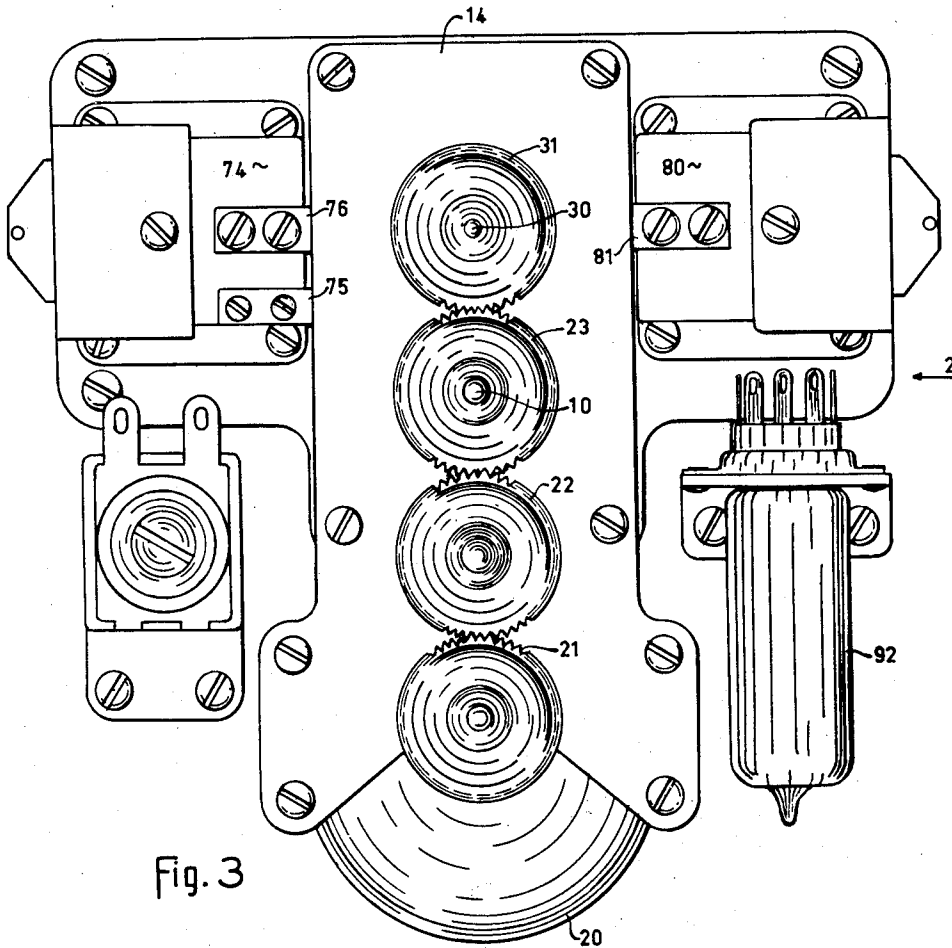
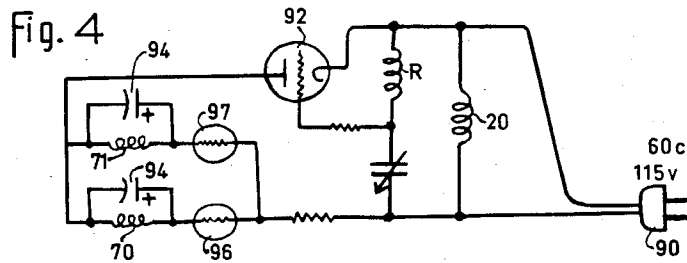
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RESET MECHANISM FOR TIME INDICATING
CLOCK

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Application October 3, 1956, Serial No. 613,698

1 Claim. (Cl. 58—34)

This invention relates to means for correcting time indicating clocks to standard time as represented by a master clock, and with a range of correction of 1 second to 12 hours for 12-hour clocks and 1 second to 24 hours for 24-hour clocks, and further relates to such error-correction of secondary clocks by remote automatic control.

The general object of the invention is to provide simple, accurate and improved means responsive to certain control pulses for effecting such error-correction of a secondary clock.

A further object of the invention is to effect hourly error-correction of a secondary clock by a mechanism responsive to a short electric pulse transmitted to the secondary clock automatically by a master clock at a predetermined second of each hour and to effect a greater error-correction in either 12-hour or 24-hour clocks by a mechanism responsive to a longer electric pulse similarly transmitted.

Another related object is to provide means for effecting up to 12 or 24 hours error-correction in a secondary clock in the time period of 1 minute upon reception of a control pulse.

An important feature of the invention relates to improved clutch means for advancing the minute hand or the hour hand of a secondary clock at a rate greater than normal.

This invention is illustrated in the form of an electronically reset clock which is driven by a synchronous motor and which is automatically regulated or reset with respect of a time error between itself and the master clock. The resetting mechanism is commonly triggered by an electric pulse of high frequency superimposed on the electric power lines that supply the clock motor energy. A simple selective circuit admits and amplifies signals of proper frequency to an electronic relay tube which in turn passes the energy to the clock-control electromagnets.

In the preferred construction, a countershaft is provided having ratchets fixed thereon and revolved continuously at one r.p.m. Provision is made to couple one of these ratchets to the minute hand drive for correction of less than one hour's delay, and to couple the other ratchet to the hour hand drive for correction of a major delay.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claim.

A preferred form of the invention is shown in the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of the improved reset mechanism;

Fig. 2 is a right-hand side elevation of the mechanism shown in Fig. 1, and looking in the direction of the arrow 2 in Fig. 3;

Fig. 3 is a rear elevation, looking in the direction of the arrow 3 in Figs. 1 and 2; and

Fig. 4 is a wiring diagram.

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Clock gear train

Referring particularly to Fig. 1, there are shown a second hand S, a minute hand M and an hour hand H, assembled on their respective arbors in the usual manner.

The second hand S is rotated by a center shaft 10 mounted in a rigid clock frame comprising a front plate 12 (Fig. 2), a back plate 14 and spacing studs 15. The second hand S is held on the shaft 10 by a friction disc 16, and the shaft 10 extends entirely through the clock frame. A knob 24 at the rear end of the shaft 10 is provided for manual setting.

A synchronous motor 20 continuously rotates equal gears 21, 22 and 23 at 1 r.p.m. The center shaft gear 23 is loose on the shaft 10 but its hub 25 frictionally engages a clutch member 26 secured to the pinion 27 which is fast to the shaft 10. The shaft 10 and second hand S are thus continuously but frictionally driven by the synchronous motor 20 at 1 r.p.m. during regular operation.

A countershaft 30 (Figs. 1 and 2) is mounted above and adjacent to the center shaft 10 and is positively and continuously rotated at 1 r.p.m. by a gear 31 engaged with the center shaft gear 23 and of the same size.

The minute hand M is driven from the center shaft pinion 27 through a gear 33 loose on the shaft 30, a pinion 34 fixed to the gear 33, and a gear 35 and sleeve assembly loose on the center shaft 10.

The gear 35 has a friction connection 36 to the minute sleeve 37. This sleeve 37 extends lengthwise along the shaft 10 and rotates the minute hand M through a friction member 38.

A pinion 40 fixed on the minute sleeve 37 drives a gear 41 loose on the countershaft 30. A pinion 42 is secured to the gear 41 and drives a gear 43 and sleeve assembly loose on the sleeve 37. The gear 43 has a friction connection 44 to the hour sleeve 45.

This sleeve 45 is loose on the minute sleeve 37 and extends along said minute sleeve to engage and rotate the hour hand H through a friction member 46.

The gear train thus far described is more or less conventional, except that all gearing is assembled on two parallel and adjacent shafts, and that numerous and special-purpose friction connections are provided.

The normal transmission of motion from the synchronous motor to the clock hands is as follows: from motor 20 to motor gear 21 to idler gear 22 to second gear 23 and gear hub 25 to clutch member 26 and second pinion 27 to clock shaft 10 and thus to friction washer 16 and second hand S; and from pinion 27 to minute intermediate gear 33 and minute intermediate pinion 34 to minute gear 35 through friction clutch 36 to minute sleeve 37 and thus to minute friction washer 38 and minute hand M; and from minute sleeve 37 to minute pinion 40 to hour intermediate gear 41 and hour intermediate pinion 42 to hour gear 43 through friction clutch 44 to hour sleeve 45 and through to friction bushing 46 and hour hand H.

Reset mechanism

The improved reset mechanism will now be described.

Two ratchets 50 and 51 are fixed to the countershaft 30 and are revolved positively and continuously at 1 r.p.m. The ratchet 50 at correction time will engage and drive a pawl 52 pivotally mounted on a disc 53. The ratchet 51 will similarly engage and drive a pawl 54 on a disc 55. The disc 53 has a clutch connection 60 to a gear 61 loose on the shaft 30 and engaging an equal gear 62 fast on the minute sleeve 37.

The disc 55 has a similar clutch connection 65 to a gear 66 loose on the shaft 30 and engaging an equal gear 67 fast on the hour sleeve 45.

When the pawl 52 engages the ratchet 50, the minute sleeve 37 and minute hand M will be revolved at the relatively fast speed of 1 r.p.m. instead of 1 r.p.h. When the pawl 54 engages the ratchet 51, the hour sleeve 45 and hour hand H will be revolved at the relatively fast speed of 1 r.p.m. instead of one revolution in 12 or 24 hours.

Automatic control of reset mechanism

The automatic control of the reset mechanism involves advancing the three clock hands to zero positions when in error, and holding them in zero positions until the correction period or periods have expired. The following mechanism is involved:

Two electro-magnets 70 and 71 control the reset mechanism.

The magnet 70 has an armature 74 carrying two control arms 75 and 76. The second-hand stop arm 75 has a hook-shaped end 75a which normally clears an arm 77 on the clutch member 26, which clutch member frictionally drives the main shaft 10 and second hand S. When the magnet 70 is energized, the end 75a is moved up to engage the arm 77 of the clutch member 26 at a definite point in the rotation of said clutch member and with the second hand at zero.

The armature arm 76 is normally seated in a notch 53a in the disc 53 and also lifts the pawl 52 out of contact with the ratchet 60. The arm 76 releases both the disc 53 and the pawl 52 when the magnet 70 is energized.

Similarly the armature 80 of the magnet 71 supports an arm 81, the end of which normally engages a notch 82 in the disc 55 associated with the hour hand correction. The arm 81 also lifts the pawl 54 from the ratchet 51. The arm 81 releases both the disc 55 and the pawl 54 when the magnet 71 is energized.

The spring clutch member 60 on the gear 61 is adapted to snap into a slot 85 in the disc 53 at a certain point in the rotation of the disc, and the spring clutch member 65 on the gear 66 similarly enters a slot 86 in the disc 55.

The reset discs 53 and 55 are loose on the shaft 30 and are held stationary by the arms 76 and 81 except when released for time correction.

Control circuit

The control circuit is shown diagrammatically in Fig. 4. The usual 60 c. 115 v. current is supplied for the motor 20 at the terminal plug 90. A band pass tuned circuit L and C blocks the 60 c. current from the special control mechanism.

An electronic trigger tube 92 is included in the control circuit and also smoothing capacitors 94 to reduce chatter of the solenoid armatures. A short time delay device 96 and a longer time delay device 97 are also provided.

A high frequency electric impulse carried on power lines, will pass the tuned circuit, triggering the tube 92 to act on the magnet 70, if it is a short impulse, and on both magnets 70 and 71 if it is a longer impulse. The high frequency correction impulses are transmitted over the power lines at predetermined correction times by a master clock.

The short impulse is transmitted to the clock at a specified second of each of eleven consecutive hours, and effects the resetting of the minute and second hands.

The longer impulse is transmitted to the clock at a specified second of each 12-hour period and effects resetting of hour hand in addition to the minute and second hands.

Operation of control system

At a predetermined time in each one-hour period, the master clock (not shown) causes an impulse to be transmitted to the control system of proper length to energize the magnet 70 but not the magnet 71. The magnet arm 75 is thus moved into the path of the arm 77 on the clutch

26 and stops the shaft 10 with the second hand S in zero position.

At the same time, the arm 76 releases the disc 53 and also the pawl 52, which is mounted on the disc 53. The disc rotates idly until the spider clutch arm 60 enters the slot 85. The ratchet 50 then rotates the meshing gears 61 and 62 to advance the minute sleeve 37 and minute hand M rapidly to the predetermined position.

When the arm 76 again engages and holds the disc 53, it will lift the pawl 52, and regular clock operation is resumed. The arm 60 slips out of the slot 85 and the gears 61 and 62 can turn freely with the sleeve 37.

At the end of each 12 hour period, a longer impulse is transmitted which triggers both magnets 70 and 71. The magnet 70 initiates correction for the second and minute hands as above described, and the magnet 71 acts through its arm 81 to release the disc 55 and the pawl 54. The ratchet 51 then rotates the disc 55 until the arm 65 enters the slot 86 in the disc 55 to initiate correction of the hour hand.

The ratchet 51 then rotates the meshing gears 66 and 67 to advance the hour sleeve 45 and hour hand H rapidly to the predetermined position.

When the arm 81 engages and holds the disc 55, it lifts the pawl 54, and the arm 65 slips out of the slot 86 to release the gears 66 and 67 and the hour sleeve 45 as regular clock operation is resumed. A major error of several hours is thus quickly and simply corrected.

Discussion of operation

There follows a discussion of the manner of synchronizing specific clock elements with the three hands of the clock, so that the internal members will be essentially at the same time position as the hands.

With the end of the second-hand stop arm 75 adjacent the minute gear 33, the shaft 10 and the second hand S are revolved clockwise. Motion will be transmitted from the second hand S through the friction washer 16 to the clock shaft 10 and clutch bracket 26. The clutch bracket 26 will stop against the end of the second-hand stop arm 75 and the clock shaft will be stopped also, as the clutch bracket is fastened to it. By simply continuing to rotate the second hand until it reaches 00'' position, while keeping the clutch bracket arrested, the clutch bracket is synchronized with the second hand.

Next step is to revolve the minute hand M counter-clockwise while the minute clutch actuator 76 is holding the time disc 53 stationary by engaging a cut therein. This motion will be transmitted from the minute hand M through friction washer 38 to minute sleeve 37 and advance gear 62 to reset gear 61 and spider clutch 60. The free end of spider clutch 60 will engage in a radial slot 85 in the time disc 53 and be arrested in its movement, as will all members in the aforementioned transmission line except the minute hand M which, because of the friction washer 38, can be rotated to any position desired.

Further rotation of the minute hand M to the desired or predetermined hourly error correction time position will synchronize the spider clutch 60 with the minute hand. Since the minute hand M is driven by the minute sleeve 37 which also drives the spider clutch 60 via the two meshing gears 62 and 61, the spider clutch normally revolves at the same rate as the minute hand and is essentially at the same time position.

In the same manner, revolve the hour hand H counter-clockwise while the hour clutch actuator 81 is holding the time disc 55 stationary by engaging a cut therein. This motion is transmitted from the hour hand H through the friction bushing 46 to hour sleeve 45 and advances gear 67 to reset gear 66 and spider clutch 65. The free end of spider clutch 65 will engage in a radial slot in the time disc 55 and be arrested in its movement, as will all members in the aforementioned transmission line except the hour hand H which, because of the friction bushing 46, can be rotated to any hour position desired.

Further rotation of the hour hand to the desired or predetermined 12 hourly error-correction time position, will synchronize the spider clutch 65 with the hour hand. Since the hour hand H is driven by the hour sleeve 45 which also drives the spider clutch 65 via two meshing gears 67 and 66, the spider clutch 65 normally rotates at the same rate as the hour hand and is essentially at the same time position.

The countershaft 30 revolves at 1 r.p.m. continuously, as do the two parts fastened to it, namely ratchets 50 and 51. If the hourly error correction electromagnet 70 receives an error-correction pulse, its clapper 74 will be attracted to the solenoid core pole face, and the second-hand stop arm 75 will move so that its end will get in position to arrest the rotation of clutch bracket 26 and therefore of the second hand S if this is in time error. If the second hand is not in time error, it will continue to rotate unimpeded.

Also, the minute clutch actuator 76 will move so as to release pawl 52 and time disc 53. The pawl will engage with ratchet 50 and rotate with it at 1 r.p.m. Pawl 52 is fastened pivotally to time disc 53 and this disc will start to rotate at 1 r.p.m. from its normal stationary position, which can be considered zero time position with respect to the time position of the spider clutch 60. At the end of one revolution, time disc 53 will be stopped at the zero position by the minute clutch actuator 76 which will also disengage pawl 52 from ratchet 50.

The radial slot 85 in the disc 53 is positioned to engage the end of the spider clutch 60 and to rotate it and the reset gear 61 to which it is fastened, if the minute hand is in time error. This motion will be transmitted at 1 r.p.m. to the advance gear 62 to the minute sleeve 37 and the minute hand, which will be advanced to correct time by the end of the error-correction period.

If the clock is on time, at signal time, the spider clutch 60 will not engage and therefore will not be driven by the time disc 53, and as a result the minute hand will continue to rotate at normal rate. The foregoing describes the resetting function each hour on hourly error-correction.

In addition, each 12 hours the electromagnet 71 receives signal energy and its armature 80 is attracted to the solenoid core pole face and the hour clutch actuator or arm 81 will move so as to release pawl 54 and time disc 55. The pawl 54 will engage with ratchet 51 and rotate with it at 1 r.p.m. The pawl 54 is pivotally fastened to the time disc 55 and this will start to rotate at 1 r.p.m. from its normal stationary position, which can be considered zero time position with respect to the time position of the spider clutch 65.

At the end of one revolution, the time disc 55 will be stopped at zero position by the hour clutch actuator 81 which will also disengage pawl 54 from ratchet 51. The

radial slot 86 in the time disc 55 is positioned to engage the free end of spider clutch 65 and rotate it and reset gear 66, to which it is fastened, if the hour hand is in time error.

Thus motion will be transmitted at 1 r.p.m. through the advance gear 67 to the hour sleeve 45 and the hour hand H, which will be revolved to correct time position by the end of the error-correction period. If the clock is on time at signal time, the spider clutch 65 will not engage and therefore not be driven by time disc 55, and as a result the hour hand will continue to rotate at normal rate.

The automatic operation of the reset mechanism involves advancing the three clock hands rapidly when in error, and releasing them in synchronism with the master clock. The hands being then in correct time, will continue to operate as usual.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what I claim is:

A time indicating clock having a second hand, minute hand and hour hand, geared together and driven so as to revolve at standard time rate; means for synchronizing specific clock-mechanism members with the clock hands so that these members will register clock time; specific reset members, held stationary except during correction time, and thus, with synchronized clock-mechanism members, registering the difference between master clock time and indicated clock time, if any; ratchets continuously revolving at 1 r.p.m. for driving said reset members, slip clutch means for permitting rapid advance of said reset members, electromagnets responsive to an electric control plus for triggering said reset mechanism; means for arresting the second hand at 00 if off-time at correction signal time; two single-revolution clutches for separately connecting and driving the minute hand and the hour hand at 1 r.p.m. to correct for any time error at correction time; and means to de-clutch the minute and hour hands and release the second hand when predetermined reset position and time indication is reached at the end of a one-minute correction period.

References Cited in the file of this patent

UNITED STATES PATENTS

2,289,636	Engel	July 14, 1942
2,569,815	Larrabee	Oct. 2, 1951
2,624,170	Benson	Jan. 6, 1953
2,724,232	Stoddard	Nov. 22, 1955
2,724,233	Cole	Nov. 22, 1955

FOREIGN PATENTS

248,871	Switzerland	Mar. 1, 1948
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