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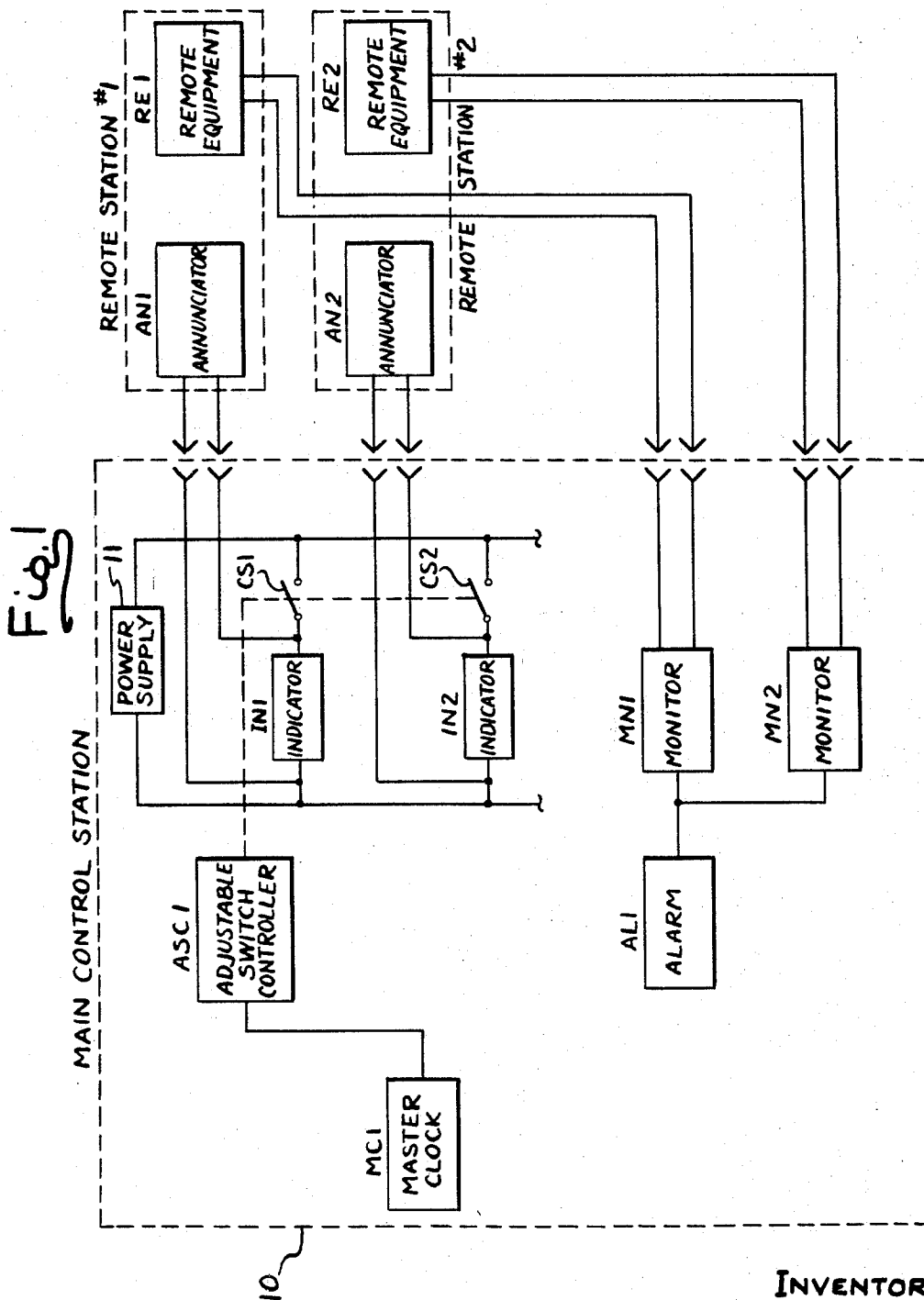
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3,430,222

REMOTE SIGNALING SYSTEM

Filed Sept. 22, 1964

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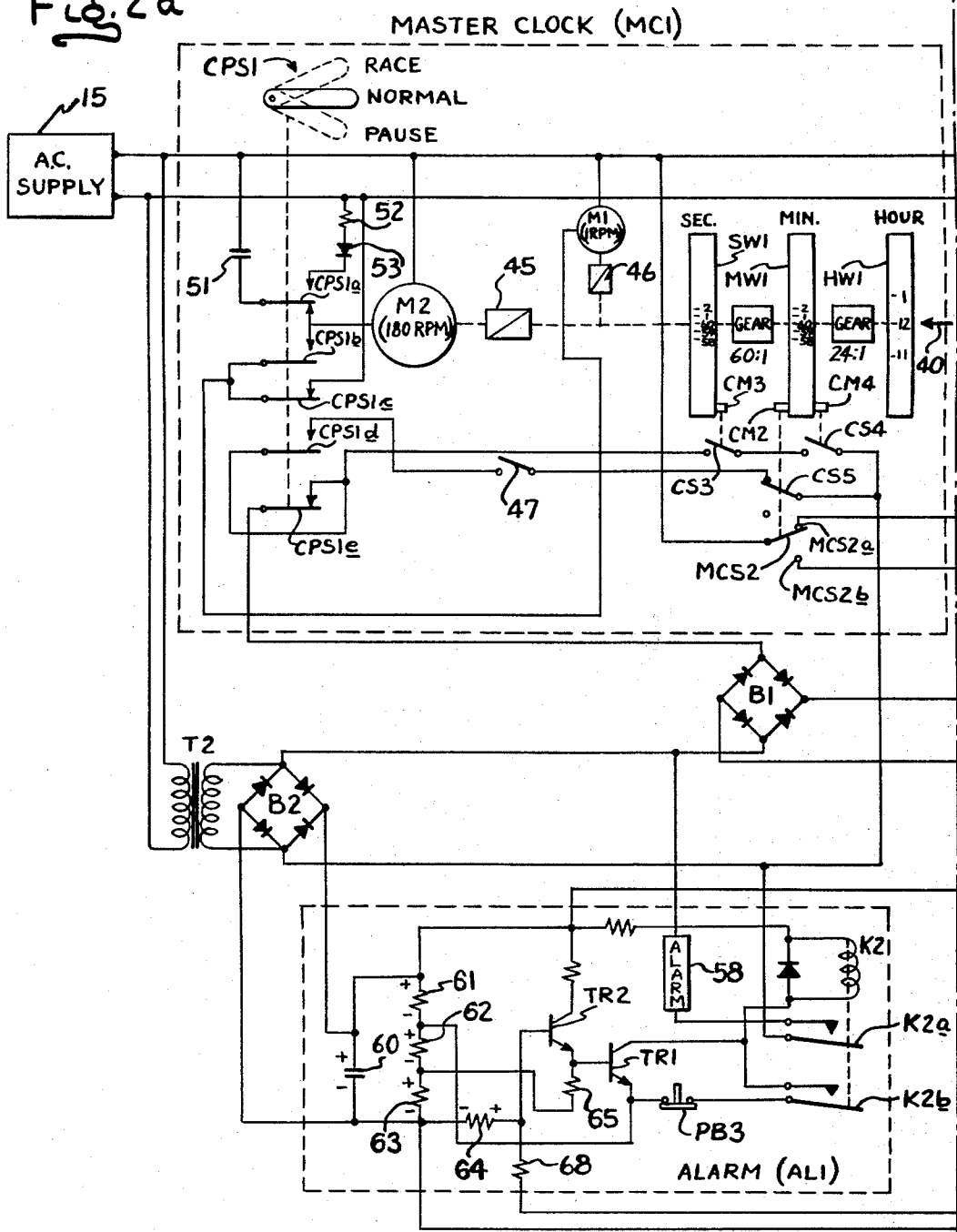
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Fig. 2a



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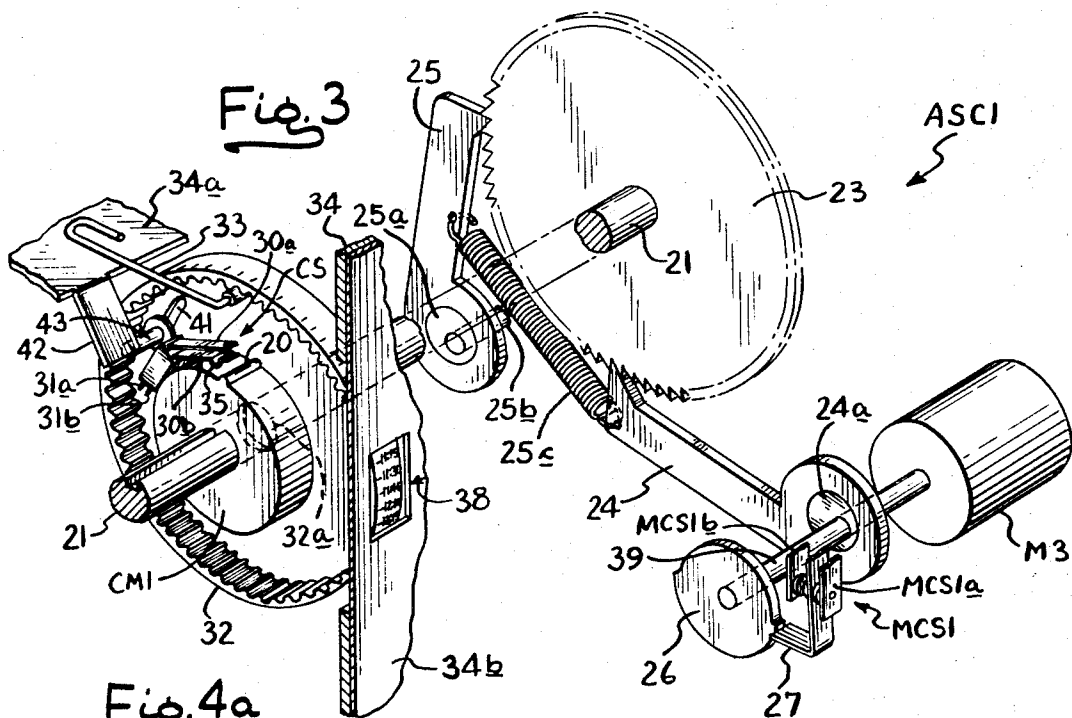
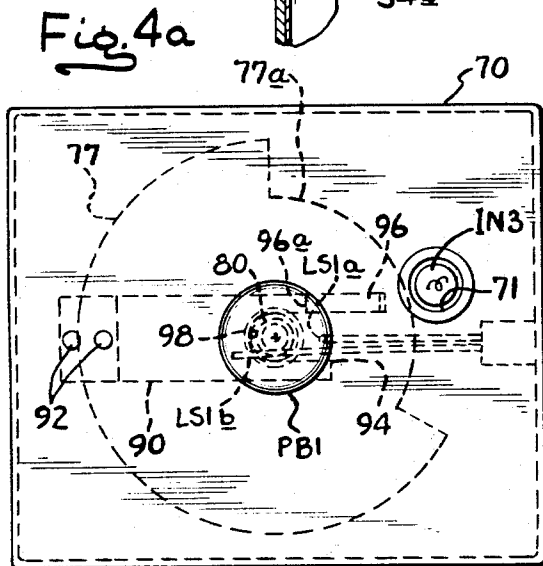
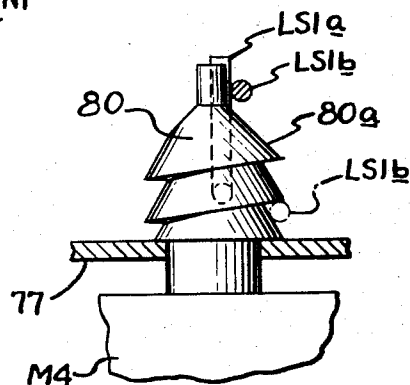
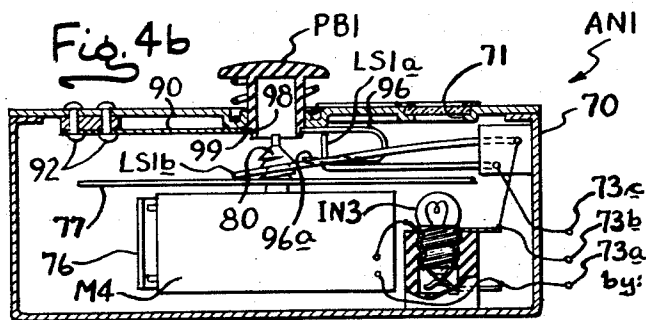
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REMOTE SIGNALING SYSTEM

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15 Claims

Int. Cl. G08b 1/08

The present invention relates to a remote signaling system and, more specifically, to a system for rendering a remote annunciator operative at a preselected time during a selected interval, for example, a twenty-four hour period.

A primary object of this invention is to provide a new and improved signaling system for signaling a plurality of remote locations at preselected times. Another object is to provide a signaling system with an annunciator whose initial operation is controlled by a simple, accurate timer and whose continued operation and re-setting for subsequent operation are controlled independently of the timer. A related object is to provide such a system wherein a plurality of annunciators are rendered operative at respective preselected times.

Another primary object is to provide a new and improved remote signaling system. A more specific related object is to provide such a system in which a remotely located annunciator may be rendered operative at a desired time by a signal transmitted from a control station and in which the continued operation and preparation for subsequent operation of the annunciator may be controlled at the remote location independently of the control station.

A further primary object is to provide simple and accurate drive mechanism for a timer switch. A related object is to provide an improved step drive for a timer switch suitable for controlling the initial energization of an annunciator.

Still another primary object is to provide a timer controlled signaling system in which the timer may be rapidly and accurately brought into correspondence with a desired time reference such as actual time. A related object is to provide such a system wherein an operator has control over the operative state of the annunciator when the timer is advanced at an accelerated rate. Another related object is to provide such a system wherein the annunciator is maintained in an inoperative state when the timer is maintained in a pause condition.

A more specific object of the present invention is to provide a remote signaling system wherein the initiation of energization of an annunciator is controlled by a timer switch but wherein the duration of the operative period of the annunciator is independent of the interval during which the timer switch is closed.

Yet another primary object is to provide a new and improved annunciator. A more specific object is to provide an annunciator suitable for use where it is desired to have the initial energization of the annunciator controlled by a timer and the continued operation and re-setting of the annunciator controlled independently of the timer. A related object is to provide such an annunciator where the annunciator provides both an aural and visual indication when it is energized. Another related object is to provide such an annunciator with a memory of its operative state in the event of a power failure. Still another object is to provide such an annunciator where the aural indication is a ringing sound and the visual indication is a flashing light.

A general object is to provide a new and improved remote signaling system which provides a desired indication at a remote location at a preselected time during a given time interval whereby an operator is directed to perform

a desired operation. Another general object is to provide such a system which may be readily adapted for use in connection with an automatic hotel wake-up system or the like, a different annunciator being located in each hotel room and the system being preset to render each annunciator operative at a preselected time.

Still another general object of the present invention is to provide a new and improved remote signaling system characterized in its compactness, simplicity, economy, long life and reliability. An additional object is to provide a new and improved annunciator also characterized in its compactness, simplicity, economy, long life and reliability.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings, in which:

FIGURE 1 is a block diagram of a remote signaling system embodying the present invention;

FIGS. 2a and 2b, when combined, form a schematic diagram of the circuit shown in FIG. 1;

FIG. 3 is a perspective view of a selector switch arrangement which may be used in the circuit shown in FIGS. 2a and 2b; and

FIGS. 4a, 4b and 4c are respectively a top elevation view, a cross-sectional side elevation view and a fragmentary, cross-sectional front elevation view of an annunciator which may be used in the circuit shown in FIGS. 2a and 2b.

The invention will be described in connection with producing an indication at a remote location whereby an operator is directed to perform a desired operation on remotely located equipment. It will be readily appreciated, however, that the invention may be utilized in connection with any application requiring the producing of an indication at a remote location. For example, the invention may be utilized in connection with a hotel wake-up system wherein indications are to be produced at different remote locations, i.e., in different rooms, at different times.

In accordance with the present invention, a desired number of annunciators are located at remote locations and means are provided at a main control location for causing the annunciators to be rendered operative at independently preselected times during a given time interval. More specifically, in the exemplary arrangement, the means at the main control location are preset to cause the annunciators to be rendered operative at desired times during a day.

Referring to FIG. 1, a pair of annunciators AN1 and AN2 are shown as being associated with different pieces of remote equipment RE1 and RE2 which may be located at different remote stations or locations. However, it will be readily appreciated that any desired number of annunciators and associated pieces of remote equipment may be controlled by the disclosed system and the invention is intended to cover the control of any desired plurality of such units. Additionally, a main control station 10 is shown which includes means for controlling the operation of the annunciators through control switches CS1 and CS2. As may be seen, the annunciators AN1 and AN2 are respectively connected to an energizing power supply 11 through the control switches CS1 and CS2. Additionally, indicators IN1 and IN2 in the main control station 10 are respectively connected in parallel with the annunciators AN1 and AN2 for producing indications at the main control station when the associated annunciators are rendered operative.

In order for the annunciators to be rendered operative at preselected times during a given time interval, pre-settable means must be provided in the main control station for controlling the closing of the control switches

CS1 and CS2. For this purpose, an adjustable switch controller ASC1 and a master clock MC1 are provided. The adjustable switch controller is preset to control the closing of the control switches CS1 and CS2 at independently preselected phases during each cycle of operation thereof and the master clock MC1 controls the speed at which the adjustable switch controller is swept through each cycle, i.e., the master clock regulates the times at which the annunciators AN1 and AN2 are rendered operative. Accordingly, the master clock MC1, the adjustable switch controller ASC1 and the control switches CS1 and CS2 cooperate to control the operations of the annunciators AN1 and AN2 so that the annunciators are rendered operative at independently preselected times during a given time interval.

In its exemplary form, the main control station also includes means for monitoring the remote equipment and for rendering an alarm AL1, located at the main control station, operative when undesired conditions are detected in the remotely located equipment. For this purpose, monitors MN1 and MN2 are provided which are independently associated electrically with the pieces of remote equipment RE1 and RE2. Upon detecting a prescribed out-of-tolerance or faulty condition in the associated piece of remote equipment, the monitors MN1 and MN2 render the alarm AL1 operative whereby an operator is apprised of the out-of-tolerance or faulty condition.

In order to provide a better understanding of the present invention, reference is made to FIGS. 2a and 2b wherein an exemplary schematic diagram corresponding to the remote signaling system shown in block form in FIG. 1 is illustrated. As may be seen in FIG. 2b, the annunciator AN1 includes an indicator lamp IN3 which is illuminated to provide a visual indication and a motor M4 which actuates an associated clapper to provide an aural indication when the annunciator is rendered operative. A lock-in switch LS1 is also associated with the motor M4 and, as will become apparent, the switch LS1 is provided for the purpose of bypassing the associated control switch CS1 when the annunciator is rendered operative. In like manner, the annunciator AN2 includes an indicator lamp IN4 and a motor M5 having a clapper and a lock-in switch LS2 associated therewith. Energizing potential for the annunciators AN1 and AN2 is supplied by an A-C source 15 (FIG. 2a) through a transformer T1 (FIG. 2b).

The indicators IN1 and IN2 provided at the main control station, which are respectively connected in parallel with the annunciators AN1 and AN2, are also illustrated as indicator lamps. Accordingly, upon the associated annunciators being rendered operative, the lamps IN1 and IN2 will be illuminated to provide a visual indication at the main control station of annunciator operation at the remote station.

The adjustable switch controller ASC1 is disclosed as including a motor M3 which controls the operation of a cam member CM1 and a single pole-double throw motor control switch MCS1. The cam member CM1, in turn, controls the operation of the control switches CS1 and CS2 at preselected positions during its total travel, while the control switch MCS1 conditions the motor M3 for intermittent operation. As the description proceeds, it will be apparent that the motor M3 is intermittently rendered operative whereby the cam member CM1 is stepingly advanced through its total travel at a desired rate.

Referring to FIG. 3, the details of an exemplary form of the adjustable switch controller ASC1 are shown. The cam member CM1 together with a switch, corresponding to one of the control switches CS1 and CS2, are disclosed as a rotary-selector switch which may, for example, be constructed in accordance with the teachings of the co-pending application Ser. No. 443,491, filed on Mar. 29, 1965, now Patent No. 3,329,780, which has a common assignee. The switch includes a cylindrical cam member

CM1 which has a boss or protuberance 20 formed on the outer surface thereof and which is mounted on a shaft 21 for rotation therewith. The shaft 21 is driven by the motor M3 through a ratchet-pawl arrangement so that the cam member CM1 is stepingly advanced through each revolution.

As may be seen, the ratchet-pawl arrangement includes a ratchet wheel 23, a driving pawl 24 and a locking pawl 25. The driving pawl 24 is driven by the motor M3 through an eccentric cam 24a so that during each revolution of the motor shaft, the pawl is driven into engagement with a detent or tooth in the ratchet wheel whereby the ratchet wheel is advanced one step and the pawl is then retracted.

The locking pawl 25 serves to detent the ratchet wheel 23 to establish definite positions therefor and also prevents the wheel 23 from backing up when the drive pawl 24 is retracted in frictional contact therewith. Locking pawl 25 is rotatably mounted on an eccentric adjusting cam 25a which turns with a stub shaft 25b journaled on a stationary support (not shown). This arrangement permits the locking pawl 25 to be adjusted relative to the ratchet wheel 23 by turning the shaft 25b to alter the setting of the eccentric cam 25a. The spring 25c assists the drive pawl 24 on its driving stroke, and also maintains a continuous inward biasing force on both pawls 24 and 25.

As mentioned above, the motor control switch MCS1 is provided so that the motor M3 is intermittently rendered operative whereby the cam member CM1 is stepingly advanced through its total travel. For the purpose of controlling the operation of the switch MCS1, an off-set cam member 26 is mounted on the shaft of the motor M3 and a cam follower 27, which rides along the outer surface of the cam member 26, is formed integrally with the contact arm of the switch MCS1. Due to the fact that the cam member 26 is off-set, the contact arm of the switch MCS1 is maintained in engagement with the upper terminal MCS1a during one-half of each motor revolution and is maintained in engagement with the lower contact terminal MCS1b during the other half of each motor revolution.

Let it be assumed that the contact arm of switch MCS1 is in engagement with terminal MCS1b, i.e., cam follower 27 on the lower step of cam 26, and power is applied to terminal MCS1b so that the motor M3 is rendered operative and the shaft 39 is rotated. As rotational movement is imparted to the shaft 39, the pawl 24 is advanced into engagement with a tooth in the ratchet wheel 23 so that the ratchet wheel, shaft 21 and thus the cam member CM1 are rotated. During the first one-half revolution of the shaft 39, the cam member CM1 will have been rotated one step, i.e., a fraction of its total travel. When the shaft 39 completes the aforesaid one-half revolution, the contact arm of MCS1 is driven out of engagement with terminal MCS1b and the motor M3 is therefore deenergized. The stroke of the contact arm, as it leaves terminal MCS1b, is sufficient to bring it into engagement with terminal MCS1a. Subsequently, when power is applied to terminal MCS1a, the motor M3 is again energized until the shaft 39 is rotated to drive the contact arm out of engagement with terminal MCS1a and the motor is deenergized. This causes the shaft 39 to be rotated another one-half revolution. During this latter one-half revolution, the pawl 24 is retracted and the contact arm returns to terminal MCS1b. In view of the foregoing, it follows that the cam member CM1 is advanced one step during each revolution of the motor M3. Additionally, it follows that, if power is alternately applied to the terminals MCS1a and MCS1b at the end of prescribed time intervals, the cam member CM1 will be stepingly advanced along its total travel at a rate equal to the pulse repetition rate applied to each of the terminals.

In the exemplary arrangement, a switch assembly CS, which corresponds to the control switches CS1 and CS2 in FIGS. 2a and 2b, is provided for the purpose of produc-

ing an automatic switch operation. As may be seen, the switch assembly includes a pair of contact members 30a and 30b which may be connected in the remote signaling system by means of terminals 31a and 31b. For the purpose of this description, it will be assumed that the upper contact member 30a is rigid, whereas the lower contact member 30b is flexible. Additionally, it will be assumed that the contact members 30a and 30b are normally not in engagement, i.e., the switch CS is open. The switch assembly CS is secured to a cup-like set wheel 32 for rotational movement therewith and the wheel has a centrally located circular aperture 32a for receiving the shaft 21 so that the wheel 32 may be rotated relative to the shaft and thus relative to the cam member CM1. A detent spring 33 is provided for engaging detents in the inner surface of the cup-like wheel 32 so that the wheel may be located in a desired position, the detent spring 33 being secured to a plate 34a which forms a part of a main housing or panel 34.

For the purpose of causing the contact members 30a and 30b to be moved into and out of engagement with one another, i.e., for the purpose of controlling the opening and closing of the switch, a "U-shaped" cam follower 35 is formed integrally with the lower contact member 30b. The switch assembly CS is so mounted on the wheel 32 that the boss 20 on the cam member CM1 engages the cam follower 35 when it is rotated therepast. When the cam follower 35 is not engaged by the boss 20, the contact members 30a and 30b are in their open or non-engaging positions. When the boss 20 engages the cam follower 35, the lower contact member 30b is driven into engagement with the upper contact member 30a so that the switch is closed. In view of the foregoing, it follows that, if the cup-like wheel 32 is rotated until the switch assembly CS is in a desired relative position in respect of the cam member CM1, the switch will be closed when the boss 20 reaches a desired angular position during each revolution of the cam member CM1. Since the rate at which the cam member CM1 is steppingly rotated is dependent on the rate at which power is alternately applied to the contacts MCS1a and MCS1b, it follows that the time at which the switch is closed is likewise dependent thereon.

If it is assumed that the switch assembly CS is to be presettable so that the switch is closed at a desired quarter-hour during a twenty-four hour period, then ninety-six equally spaced detents must be provided in the wheel 32 for engagement by the detent spring 33, and the cam member CM1 must be driven through one revolution each twenty-four hours. Additionally, ninety-six equally spaced teeth must be provided in the ratchet wheel 23, and each stroke of the pawl 24 must correspond to one tooth so that ninety-six steps are provided in the total cam travel which correspond to the ninety-six quarter-hours in a twenty-four hour period. In order for the cam member CM1 to be driven one step every quarter-hour so that it is driven through a revolution every twenty-four hours, one pulse must be applied to each of the contacts MCS1a and MCS1b every fifteen minutes, with sufficient time allowed between the pulses applied alternately to the two contacts for the motor M3 to complete a half revolution.

As may be seen, a portion of the wheel 32 projects through a slot in the main housing or panel 34 and a window in an escutcheon plate 34b so that the wheel 32 may be manually engaged for rotational movement. Additionally, time markings are provided on the outer surface of wheel 32 and a time indicating arrow 38 is provided on the escutcheon plate 34b for providing a visual indication of the preset time for closure of the switch.

For the purpose of limiting the rotational movement of the wheel 32, a pin 43 is slidably mounted in an arcuate slot 41 of wheel 32. As the wheel 32 is rotated in the clockwise or counterclockwise direction, a position is reached in which the pin 43 engages an extending arm

42 of the plate 34a so that further rotational movement of the wheel 32 is prevented. The slot 41 is provided to allow some arcuate movement of the pin 43 whereby the wheel 32 is permitted to be rotated through a full 360 degrees, but no more, since it is desirable to limit the amount of rotational movement of the wheel 32 to 360 degrees to prevent the leads connected to the terminals 31a and 31b from being cumulatively wrapped around the shaft 21.

While only a single switch arrangement is shown in FIG. 3, it will be understood that a plurality of switch assemblies CS and associated set wheels 32 may be associated with a common cam member or commonly driven cam members and that the switch assemblies may be independently preset to be closed at desired relative positions during each revolution of the cam member or cam members.

For the purpose of controlling the application of power to the terminals MCS1a and MCS1b (FIGS. 2a and 2b), a single pole-double throw motor control switch MCS2 has been provided in the master clock MC1. As may be seen, power is supplied to the motor M3 from the A-C supply 15 through the series arrangement of the motor control switches MCS2 and MCS1. If the contact arms of the switches MCS1 and MCS2 are respectively in engagement with their upper terminals MCS1a and MCS2a, it will be apparent that power is supplied to the motor M3 so that the motor is energized. Likewise, if the contact arms of the switches MCS1 and MCS2 are respectively in engagement with their lower terminals MCS1b and MCS2b power is supplied to the motor M3 so that the motor is energized. In view of the foregoing description of the operation of the adjustable switch controller ASC1, it follows that, if the contact arm of the switch MCS2 is alternately moved into engagement with its opposite terminal at the end of prescribed time intervals, the cam member CM1 is advanced through its total travel at a desired rate.

For the purpose of controlling the switching of the contact arm of switch MCS2 between engagement with terminals MCS2a and MCS2b, the master clock includes control means which, in turn, includes, in its exemplary form, three cylindrical members or wheels SW1, MW1 and HW1. The three wheels are clock wheels and are respectively designated the seconds wheel, the minutes wheel and the hours wheel. The seconds wheel SW1 is mounted on a shaft driven through a one-way clutch 46 by a motor M1 which operates at a speed of one r.p.m. so that the seconds wheel makes one revolution per minute. The minutes wheel is mounted on a shaft which is connected to the motor driven seconds wheel shaft through a 60:1 ratio gear so that the minutes wheel makes one revolution for every sixty revolutions of the seconds wheel, i.e., the minutes wheel makes one revolution per hour. Finally, the hours wheel HW1 is mounted on a shaft which is connected to the minutes wheel shaft through a 24:1 ratio gear so that the hours wheel makes one revolution for every twenty-four revolutions of the minutes wheel, i.e., the hours wheel makes one revolution per twenty-four hours or per day.

The actual switching operation of the motor control switch MCS2 is controlled by a cam member CM2 formed integrally with the minutes wheel MH1 which causes the contact arm of the switch MCS2 to be alternately driven into engagement with the terminals MCS2a and MCS2b at prescribed times during each revolution of the minutes wheel. For the purpose of this description, it will be assumed that the cam member CM2 is designed to cause the contact arm of switch MCS2 to be driven into engagement with the opposite terminal at the end of each 45 degree rotation of the minutes wheel. That is, the contact arm is driven into engagement with the opposite terminal eight times during each revolution of the minutes wheel and, thus, in the exemplary arrangement, eight times during each hour (at the end of every 7½ minutes). As

a result, the motor M3 is energized and, thus, made to turn one-half revolution at the end of every $7\frac{1}{2}$ minutes whereby the cam member CM1 (FIG. 3) is advanced one step every fifteen minutes, i.e., every quarter-hour.

For the purpose of providing a running indication of the time represented by the clock wheels SW1, MW1 and HW1, a time indicating arrow 40 is positioned adjacent the wheels and time representing marks are provided on the outer surfaces of the wheels. Accordingly, sixty equally spaced marks are provided on the outer surfaces of the seconds wheel SW1 and the minutes wheel MW1 which are sequentially numbered from one to sixty. These markings thus represent the sixty seconds during each minute and the sixty minutes during each hour. In like manner, the hours wheel HW1 is provided with twenty-four equally spaced marks which may, if desired, be divided into two sequentially numbered groups of twelve, one for AM and the other for PM, as shown in FIG. 2a. The instantaneous clock hand positions represented by the seconds wheel, the minutes wheel and the hours wheel are indicated by the numbers laterally adjacent the arrow 40.

It will be appreciated that the output of the clock MC1 (as represented by the closures of switch MCS2) can, if desired, be used to operate a plurality of adjustable switch controller modules such as ASC1.

A brief description of the operation of the remote signaling system as thus far described may be helpful. In response to the application thereto of power from the A-C supply 15, the motor M1 is operating at a speed of one r.p.m. causing the seconds wheel SW1 to rotate at a speed of one revolution per minute, the minutes wheel MW1 to rotate at a speed of one revolution per hour and the hours wheel HW1 to rotate at a speed of one revolution per day. During each revolution of the minutes wheel MW1, the position of the contact arm of switch MCS2 is switched eight times, i.e., at the end of every $7\frac{1}{2}$ minute time interval, so that the motor M3 is energized for one-half revolution every $7\frac{1}{2}$ minutes and the cam member CM1 is advanced one step in its total travel every fifteen minutes. At a preselected time during the twenty-four hour time interval required for the cam member CM1 to be stepping driven through its total travel, the control switch CS1 is closed thereby connecting the indicator light IN1 across the secondary of the transformer T1 powered by the A-C supply 15. As a result, the indicator light IN1 at the main control station 10 is illuminated. Additionally, the indicator light IN3 of the remotely located annunciator AN1 is illuminated and the motor M4 therein is energized, causing the clapper to be operated. Consequently, an aural indication and a visual indication are provided by the remotely located annunciator at a desired time so that, for example, an operator is directed to perform a desired operation on the piece of remotely located equipment RE1. At the appropriate time, when the control switch CS2 is closed, the annunciator AN2 will, in like manner, be rendered operative so that both a visual indication and an aural indication are provided thereby at remote station No. 2, directing the operator to perform some operation on remote equipment RE2.

Once an annunciator AN1 or AN2 is rendered operative or energized, it is desirable for the annunciator to remain operative until a desired remote operation is performed. It will be apparent that, in the absence of lock-in means, the operated annunciator will be rendered non-operative once the contacts of relay K1 are opened or the associated control switch CS1 or CS2 is opened. In the exemplary arrangement, the lock-in switches LS1 or LS2 are provided in the annunciators AN1 or AN2 for performing this lock-in function, the lock-in switches bypassing the contacts of relay K1 and the control switches CS1 and CS2 when closed. As previously mentioned, the lock-in switches are closed when the associated motors M4 and M5 in the annunciators AN1 and AN2 are energized. Thus, once an annunciator is energized, it locks itself in the energized condition. For the purpose of

deenergizing the annunciators, push buttons PB1 and PB2 are associated with switches LS1 and LS2, a switch being opened and an annunciator being deenergized thereby when the associated push button is depressed. Since the push buttons are located at the remote locations, it follows that, once an annunciator is energized, it can thereafter be deenergized only by depressing a push button at the remote location. Accordingly, an operator is directed to perform a desired operation on the remote equipment until he depresses the associated push button.

Aside from performing this operation, the only way that the annunciator operation can be shut off, once started, is by cutting off the power supply. To cover the possibility of a power failure, there is provided an annunciator in accordance with this invention which includes a mechanical memory feature allowing the device to remain in its actuated condition during a power-off interval and consequently to resume its operation when the power is later turned back on.

In accordance with this and other aspects of the present invention, a novel annunciator is provided which produces both an aural indication and a visual indication upon being energized. More specifically, the annunciator provides an aural indication in the form of a ringing or buzzing and a visual indication in the form of a flashing light which does not produce radio interference. Additionally, the annunciator is provided with time delayed switch closing means which, in the exemplary arrangement, is utilized for locking the annunciator in the energized condition once it is energized.

Referring to FIGS. 4a-4c, it may be seen that the annunciator AN1 has a main housing 70 which has a window 71 formed therein. Motor M4 is mounted in the housing 70 and is connected to a pair of input terminals 73a and 73b so that the motor is energized when power is supplied across the input terminals. Additionally, indicator lamp IN3 is mounted in the housing behind the window 71 and is likewise connected to the input terminals 73a and 73b for energization in response to the application of power thereto.

For the purpose of producing an aural indication when the motor M4 is energized, a clapper 76 is associated therewith which is rendered operative when the motor is energized. Since the details of combining a clapper with a motor for operation when the motor is energized are well known to those skilled in the art, the details will not be set forth herein. In order to produce the effect of a flashing light, a shutter 77 is interposed between the lamp IN3 and the window 71 and is mounted on the shaft of the motor 72 for rotation therewith. As may be seen, the shutter 77 has an off-set portion 77a and allows light from the lamp IN3 to pass through the window 71 only when the off-set portion thereof is so positioned that no part of the shutter is interposed between the lamp and the window. Accordingly, light from the lamp will pass through the window 71 only during a portion of each revolution of the shutter 77 so that a flashing effect is provided by the annunciator. This means of producing a flashing light effect is free of radio interference.

In its exemplary form, the annunciator also includes the contacts LS1b and LS1a (corresponding to switch LS1 of FIGS. 2a and 2b) which are respectively connected to input terminals 73b and 73c so that a completed circuit is provided across these input terminals when the contacts are in engagement. For the purpose of this description, it will be assumed that contact LS1b is flexible and contact LS1a is rigid. For the purpose of causing the contact LS1b to be moved into engagement with contact LS1a a delayed time period after the motor M4 is energized, a screw-like post member 80 is provided which is mounted on the shaft of the motor M4 for rotation therewith and which has a helical ramp 80a formed therein for engaging the flexible contact LS1b. If it is assumed that the flexible contact LS1b is in engagement with the lower portion of the ramp 80a (as indicated

by the dotted representation of contact member LS1b in FIG. 4c) when the motor M4 is deenergized, the contacts LS1a and LS1b are then not in engagement due to their horizontal spacing, and an open circuit is provided between terminals 73b and 73c. Subsequently, when the motor M4 is energized and the post member 80 is rotated, the contact LS1b rides up the helical ramp 80a and side-wardly moves into engagement with the contact LS1a (as indicated by the solid representation of contact member LS1b in FIG. 4c) so that a circuit is completed between terminals 73b and 73c. Thus, a prescribed time period after the motor is energized, as determined by the time required for the contact LS1b to ride up the ramp 80a into engagement with the contact LS1a, a circuit is completed between terminals 73b and 73c.

For the purpose of resetting the contacts LS1a and LS1b to the open, nonengaged position, the push button PB1 is provided. When the push button PB1 is depressed, the flexible contact LS1b is driven down the screw-like member 80 until it is once again in engagement with the lower portion of the ramp 80a and laterally displaced from the fixed contact LS1a. The opening of contacts LS1, in this manner, deenergizes the lamp IN3 and motor M4. But, if the push button PB1 should be released before the deenergized motor M4 has coasted to a full stop, the continuing rotation of the helical member 80 may again close the contacts LS1 and, thus, lock the annunciator back in the energized condition. To avoid waiting for the motor to coast to a stop, there is provided a mechanical brake 90 in the form of a flat-leaf spring, one end of which is secured by rivets 92 to the underside of the top wall of the housing of annunciator AN1. The free end of the leaf spring divides into a pair of prongs 94 and 96, defining between them a crotch 98 for receiving the shaft of the push button PB1. A shoulder 99 formed on the push button shaft enables it to engage the member 90. The inherent resilience of this member 90 causes it to yieldably bias the push button PB1 upwardly by bearing against shoulder 99, thus serving as a return spring for the push button. In addition, when the push button is depressed against the spring force, to open contacts LS1, the member 90 is forced downward until a curled-under finger 96a, formed on the end of the prong 96, engages the shutter disk 77 as the latter rotates with the coasting motor M4. Consequently, the downward force on push button PB1 causes member 96a to brake the rotation of disk 77 and motor M4 so that the annunciator AN1 comes promptly to a fully stopped condition. Then the push button PB1 can be released without further waiting and without risk that the annunciator AN1 will reenergize itself.

As previously mentioned, the lock-in switches LS1 and LS2 are provided to lock in the annunciators around the contacts of the relay K1 and switches CS1 and CS2 so that once the annunciators are energized, they will remain energized until the lock-in switches LS1 and LS2 are opened. Accordingly, a prescribed time interval after an annunciator is rendered operative the associated lock-in switch is closed to lock it in the operative condition. Once an annunciator of this type is energized, it will remain energized until the push button PB1 or PB2 at the remote location is depressed, no deenergizing means being provided in the main control station. Thus, an operator at the remote location is continuously directed to perform a desired function until he depresses the push button. If the power should fail while the annunciator is thus "locked in," the annunciator motor M4 ceases operating, thus shutting off the aural indication of the clapper 76 and the visual indication of the lamp IN3. But this condition persists only during the power-off interval. Movable contact LS1b remains in engagement with fixed contact LS1a to provide a mechanical memory of the energized condition throughout this interval. Consequently, when the power is later turned on, the clapper 76 and the lamp IN3 of the annunciator will again be operated.

It will be appreciated that the other annunciators in the system, such as AN2, may be similarly constructed, and that the foregoing description would apply equally thereto.

Each closure of the control switches CS1 and CS2 lasts the full fifteen-minute interval between stepping movements of the cam CM1. This means that, when triggered, the annunciators AN1 and AN2 could be continuously energized through respective switches CS1 and CS2 for a full fifteen minutes independently of the push buttons PB1 and PB2. The operator at the remote station would be unable to turn the annunciator off by means of the push button during this entire time. To avoid this, means are provided for conditioning the annunciators AN1 and AN2 for operation so that the control switches CS1 and CS2 are effective to render the associated annunciators AN1 and AN2 operative only during a prescribed portion of the time interval when the cam member CM1 is at each position along its total travel. For this purpose, the contacts K1a and K1b of a relay K1 are connected in series with the respective control switches CS1, CS2. The relay contacts are normally open and are closed in response to energization of the relay K1. As a result, the annunciators AN1 and AN2 are rendered operative only when the associated control switches CS1 and CS2 are closed and the relay contacts K1a and K1b are likewise closed (i.e., when the relay K1 is energized). As may be seen, power is supplied to the relay K1 by the A-C supply 15 through a transformer T2 and a full wave rectifying bridge network B1.

For the purpose of controlling the flow of current to the relay K1, a pair of control switches CS3 and CS4 are interposed between the secondary of transformer T2 and the bridge network B1. The operation of the control switch CS3 is controlled by a cam member CM3 which is formed integrally with the seconds wheel SW1. Thus, the seconds wheel SW1 controls a switching operation as well as providing an indication of time. For the purpose of this description, it will be assumed that the switch CS3 is closed for 12 degrees during each 360 degree revolution of the seconds wheel SW1 beginning when the "sixty" seconds mark is adjacent the time indicating arrow 40. Accordingly, the switch CS3 is closed for approximately two seconds every minute. The operation of the control switch CS4 is similarly controlled by a cam member CM4 which is formed integrally with the minutes wheel MW1. Also for the purpose of this description, it will be assumed that the switch CS4 is closed for 4½ degrees during each 90 degree portion of the 360 degree revolution of the minutes wheel MW1, it being further assumed that the closure is centered about each fifteen-minute or quarter-hour representing mark. Accordingly, the switch CS4 is closed four times during each minutes wheel revolution, i.e., four times per hour, each closure occurring when the minutes wheel is in a quarter-hour position. In view of the foregoing, it may be seen that the switches CS3 and CS4 are simultaneously closed for approximately a two second time period during the fifteen-minute time interval when the cam member CM1 is at each position in its total travel. Thus, the relay K1 is energized and the annunciators AN1 and AN2 are thereby conditioned for energization only during the two second period. The annunciators are designed to be easily triggerable by a two second pulse, i.e., the speed of motor M4 is more than sufficient to advance contact LS1b all the way up the ramp 80a within two seconds to assure that the annunciator AN1 will be locked in the energized condition after an energizing pulse of that duration.

The relay K1, in addition to limiting the duration of the energizing pulse applied to an annunciator, also serves to prevent sneak circuits which would otherwise occur whenever a plurality of annunciators AN1 and AN2 happen to be set for triggering in the same fifteen-minute interval. Suppose there were no relay contacts K1a and K1b and instead the leads 110 and 108 were permanently

connected to a common point 100. Suppose further that both annunciators AN1 and AN2 are energized concurrently and an operator at one of the remote stations attempts to shut off his own annunciator (e.g., AN1) by depressing push button PB1, while the annunciator AN2 at the other remote station continues to operate. Even with the button PB1 depressed to hold switch LS1 open, the potential available at terminal 102 of the energized annunciator AN2 would keep annunciator AN1 also energized via a sneak circuit comprising leads 103, 104, 106 and 108, the assumed common point 100, and leads 110, 112, 113 and 114. Thus, the push button PB1 would be ineffective to shut off annunciator AN1 while annunciator AN2 is energized. The same difficulty would be encountered in trying to shut off annunciator AN2 while annunciator AN1 is energized. In general terms, when a plurality of annunciators is energized concurrently, the only way to turn any one of them off would be to turn all of them off by depressing their respective push buttons simultaneously, a difficult problem of coordination since the annunciators would normally be at different remote locations. Depressing all of the push buttons in succession would not be effective to shut off the annunciators, because as soon as one of the push buttons PB1 was released while the motor M4 was still energized through the sneak circuit, the helical member 80 would begin to move the contact LS1b up into position to again lock the annunciator AN1 in the energized condition. It will now be appreciated that the relay contacts K1a and K1b avoid this sneak circuit problem by disconnecting leads 110 and 108 from the common point 100 after closing for the two second interval required to allow the annunciators to lock in the energized condition.

In order for the remote signaling system to function correctly so that the annunciators AN1 and AN2 are rendered operative at desired times during a day, some means must be provided for presetting the master clock so that the time represented by the clock wheels SW1, MW1 and HW1 is the correct time. In the exemplary arrangement, a second driving motor M2 is provided for driving the clock wheels. As may be seen, the shaft of the motor M2 is connected to the shaft of the seconds wheel SW1 through a one-way clutch 45. Accordingly, when the motor M2 is energized, the shaft of the seconds wheel is driven at a speed determined by the operating speed of the motor M2. Due to the presence of the one-way clutches 45 and 46, the motors M2 and M1 do not drive each other. If it is assumed that the motor M2 operates at a speed of one hundred and eighty r.p.m., it will be readily appreciated that the clock wheels will be driven at a much faster speed when the motor M2 is energized. Accordingly, the time represented by the clock wheels may be rapidly altered by energizing the motor M2 so that the time represented thereby is rapidly swept past the actual time. Subsequently, if both motors M1 and M2 are deenergized, the actual time will eventually catch up with the time represented by the clock wheels. Once the time represented by the master clock and the actual time are in phase, the motor M1 is again energized and the time represented by the master clock will continue to correspond to the actual time.

For the purpose of controlling the operation of motors M1 and M2, whereby the master clock may be preset, a multi-contact clock preset switch CPS1 has been provided. In its exemplary form, the switch CPS1 has three positions: a normal position wherein the clock wheels are driven by the motor M1, a race position wherein the clock wheels are driven by the motor M2, and a pause position wherein both motors M1 and M2 are deenergized. Power is supplied to the motor M1 by the A-C supply 15 through contact CPS1c of the clock preset switch CPS1. When the switch CPS1 is in the normal or race position, the contact CPS1c is closed so that the motor M1 is energized. Conversely, when the switch CPS1 is in the pause position, the contact CPS1c is open and the motor M1 is deener-

gized. On the other hand, power is supplied to the motor M2 by the A-C supply 15 through the series circuit of contacts CPS1c and CPS1b of the switch CPS1. When the switch CPS1 is in the normal or pause position, the contact CPS1c is closed but the contact CPS1b is open so that the motor M2 is deenergized. Conversely, when the switch CPS1 is in the race position, the contact CPS1c remains closed and the contact CPS1b is also closed so that the motor M2 is energized.

For the purpose of preventing overtravel of the clock wheels when the motor M2 is deenergized, a momentary braking circuit is associated with the motor M2. The braking circuit includes a capacitor 51, a resistor 52, and a diode 53. A charging path for the capacitor 51 is provided through the resistor 52, the diode 53, and a contact CPS1a of the switch CPS1. When the switch CPS1 is thrown to the race position, the contact CPS1a completes a charging circuit for the capacitor 51 so that a charge is attained thereon during the time period when the master clock is in the race condition. Subsequently, when the switch CPS1 is thrown out of the race position, the capacitor charging circuit is open and the capacitor 51 is connected in series with the motor M2. As a result, the capacitor discharges through the motor M2 and thereby imparts a momentary braking action to the motor so that the shaft thereof is rapidly stopped upon deenergization of the motor M2.

In view of the foregoing, it will be apparent that the master clock may be readily preset so that the time represented thereby corresponds to the actual time. To effect such presetting, the switch CPS1 is thrown to the race position until the time represented by the master clock slightly exceeds the actual time. The switch CPS1 is then thrown to the pause position until the actual time corresponds to the time represented by the master clock, at which time the switch CPS1 is thrown to the normal position. Subsequently, the time represented by the master clock will correspond to the actual time. Additionally, it will be readily appreciated that, during the race operation of the master clock, the cam member CM1 will be rapidly advanced along its total travel to a position slightly in advance of the position representative of the actual time. During the time interval when the master clock is in the pause position, the cam member CM1 will remain in the same position so that, when the switch CPS1 is thrown to the normal position, the position of the cam member CM1 in its total travel corresponds to the actual time.

In setting the clock MC1 by means of switch CPS1, the clock may possibly be held in the pause condition at just the right time setting for triggering one of the annunciators AN1 or AN2. If this happened, the annunciator would operate continuously during the pause interval and the operator at the remote station would be unable to shut off the annunciator by means of the push button PB1 or PB2, because the switches CS3, CS4 and CS1 or CS2 would then be held motionless in position to energize the annunciator independently of the push button. To prevent this from happening, the switch CPS1 includes contacts CPS1e which open when the switch is in the pause position, to open the circuit of switches CS3 and CS4 and relay K1. This disables the relay contacts K1a and K1b and, thus, prevents operation of the annunciators AN1 and AN2 while the system is in the pause condition.

When the clock MC1 is in the race condition, the two second period during which the annunciators AN1 and AN2 can be triggered is telescoped into a much shorter time because the clock wheels SW1 and MW1 turn much faster and, therefore, produce much shorter closures of switches CS3 and CS4. This causes a problem when it is desired to actuate the annunciators AN1 and AN2 during race operation if any of them are due to be triggered at any of the time settings which the clock MC1 races through. For example, suppose there is a power failure shortly before one of the annunciators is due to be triggered, and as a result the clock MC1 stands idle until

past the triggering time. Then, the power failure is discovered and corrected, and the clock MC1 is raced ahead to reset it to the proper time. In this situation, it might be desirable to trigger the annunciator as the clock races through the time set for triggering. In this way, the annunciator signal, though late, is eventually given instead of being omitted entirely. Or, to take another situation, the operator may wish to make a test to determine whether the annunciators are operating properly, by running the system quickly through a simulated long time period at race speed. In either case, the annunciators should be triggerable during race operation. But the problem encountered is that the closure of switches CS3 and CS4 produced during race operation is too brief to produce detectable operation of an annunciator, and also too brief to give the contact LS1a time to run up the ramp 80a for locking the annunciator in energized condition. For this reason, when the master clock MC1 is in the race condition, means different from those employed in the normal operation are used to control relay K1. A control switch CS5 is provided which is connected in parallel with the series arrangement of control switches CS3 and CS4 through a contact CPS1d of the switch CPS1 that is closed when the switch is placed in the race condition. Thus, power for the relay K1 is supplied through control switch CS5 when switch CPS1 is in the race position. The operation of the control switch CS5, like the operation of the motor control switch MCS2, is controlled by the cam member CM2 formed integrally with the minutes wheel MW1. In view of the foregoing description of the operation of the motor control switch MCS2, it will be readily appreciated that the control switch CS5 is alternately switched between the open and closed positions eight times during each revolution of the minutes wheel MW1. As a result, the relay K1 will be alternately energized and deenergized eight times, so that any conditioned annunciators AN1 and AN2 are energized for operation four times, during each racing revolution of the minutes wheel MW1. Consequently, if an annunciator was preset to be rendered operative during the time swept through when the master clock is in the race condition, it will be rendered operative. Furthermore, each closure of the switch CS5 lasts for 45 degrees of a revolution of wheel MW1, which is two and one-half seconds under race conditions, or long enough to operate and lock in the annunciators AN1 and AN2.

For situations in which it is desired to race the clock MC1 ahead without triggering any of the annunciators, a defeat switch 47 is inserted in series with control switch CS5. Opening of the defeat switch 47 takes the control switch CS5 out of circuit and prevents it from operating the relay K1, while closing of the switch 47 has the opposite effect.

As previously set forth, the remote signaling system includes means for monitoring the operation of the remote equipment and for rendering an alarm AL1 operative when a faulty or out-of-tolerance condition is detected. For the purpose of this description, it will be assumed that a faulty or out-of-tolerance condition exists in the respective pieces of remote equipment RE1 and RE2 when associated switches FS1 and FS2 are closed. In the exemplary arrangement, energizing power is supplied to the monitoring units MN1 and MN2 by the A-C supply 15 through the transformer T2, a full wave rectifying bridge network B2 and the fault detecting switches FS1 and FS2 in the pieces of remote equipment RE1 and RE2. The monitor MN1 includes an indicator lamp IN5 which is illuminated in response to closure of the switch FS1. Additionally, the monitor MN1 includes a capacitor 55 which passes a signal from the bridge network B2 to the alarm AL1 when the switch FS1 is initially closed. In like manner, the monitor MN2 includes an indicator lamp IN6 and a capacitor 56.

In the exemplary arrangement, a single alarm AL1 is provided for indicating the detection of an out-of-tol-

ance or faulty condition in either of the remote pieces of equipment RE1 and RE2, the particular remote equipment wherein the out-of-tolerance or faulty condition exists being indicated by the indicator lights IN5 and IN6. The alarm AL1 includes an aural alarm sounding device 58 (such as a buzzer) which is connected across the secondary winding of the transformer T2 through the normally open contact K2a of a relay K2. The energization of the relay K2 and, thus, the energization of the alarm device 58, is controlled by a transistor TR1, shown as an NPN type transistor. The operation of the transistor TR1 is, in turn, controlled by a second transistor TR2, also shown as being of the NPN type. As will be apparent, the transistor TR2 is rendered conductive in response to closure of either of the switches FS1 or FS2 so that the transistor TR1 is rendered conductive and the relay K2 is energized whereby the buzzer 58 is energized.

As may be seen, the output of the bridge network B2 is supplied to the alarm circuit AL1. A smoothing capacitor 60 is connected across the bridge network output for causing a substantially steady state input voltage having a polarity as designated, to be applied to the alarm circuit. For the purpose of regulating the potential applied to selected parts of the alarm circuit, a voltage-dividing network consisting of resistors 61, 62 and 63 is connected in parallel with the capacitor 60. The base of the transistor TR2 is connected to the lower terminal of the resistor 63 through a current limiting resistor 64 and the emitter of transistor TR2 is connected to the upper terminal of the resistor 63 through a resistor 65. As a result, the emitter of transistor TR2 is normally maintained positive with respect to the base thereof so that the transistor is normally nonconductive. The base of transistor TR1 is connected to the emitter of transistor TR2 and is thus connected to the upper terminal of the resistor 63 through the resistor 65, the upper terminal of resistor 63 corresponding to the lower terminal of resistor 62. On the other hand, the emitter of transistor TR1 is connected to the upper terminal of resistor 62. Consequently, the emitter of transistor TR1 is also normally maintained positive with respect to the base so that transistor TR1 is likewise normally nonconductive.

When one of the fault detecting switches FS1 or FS2 is closed, a voltage-dividing network consisting of resistor 64 and a resistor 68 is connected across the capacitor 60 through diode 85 or 86 and capacitor 55 or 56. Assuming that the values of the resistors in the alarm circuit are correctly chosen, the base of transistor TR2 is driven positive with respect to the emitter thereof, as a result of the voltage drop developed across resistor 64, so that transistor TR2 is rendered conductive. In response to conduction of the transistor TR2, current flows through the resistor 65 driving the base of transistor TR1 positive with respect to the emitter thereof so that transistor TR1 is also rendered conductive. In response to conduction of transistor TR1, the relay K2 is energized so that the alarm sounding device 58 is likewise energized.

It will be apparent that under steady state fault conditions, i.e., when the switch FS1 or FS2 remains closed, the associated capacitor 55 or 56 will attain a charge, causing the current through the voltage divider of resistors 64, 68 to approach zero. As a result, a time will be reached when the voltage drop across resistor 64 is so low that the transistors TR1 and TR2 are again rendered nonconductive and the relay K2 is deenergized. In the absence of additional circuitry, the alarm sounding device 58 will also be deenergized when the relay K2 is deenergized. However, it is desirable for the alarm sounding device 58 to remain energized until turned off by an operator who has noted the fault and ordered corrective action. For the purpose of maintaining the relay K2 and the alarm sounding device 58 in the energized conditions once the transistor TR1 is rendered conductive, a normally open relay holding contact K2b is connected in parallel with the collector-emitter circuit of the transistor TR1 for bypass-

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ing the transistor when the relay K2 is energized. Consequently, once the relay K2 is energized, it and the alarm sounding device 58 will remain energized until a normally closed push button PB3 connected in series with the relay K2 is depressed.

We claim as our invention:

1. In a remote signaling system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a switch control cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its total travel which is representative of a desired time, cam control means for steppingly advancing the switch control cam member through prescribed portions of its total travel when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, and means for initially presetting the time representative cam member to a position in its total travel representative of the actual time so that the switch control cam member is likewise preset to a position in its total travel representative of the actual time and the annunciator is rendered operative at a desired time.

2. In a remote indicator system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a rotatable, cylindrical cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its revolution, cam control means including a ratchet and pawl assembly for steppingly advancing the cam member through prescribed portions of its revolution when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel so that the cam member is advanced one step at each position, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, and means operable to rapidly advance the time representative cam member through its total travel to a position representative of the actual time so that the cylindrical cam member is advanced to a position in its revolution representative of the actual time and the annunciator is rendered operative at a desired time.

3. In a remote indicator system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a switch control cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its total travel which is representative of a desired time, cam control means for steppingly advancing the cam member through prescribed portions of its total travel when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel so that the cam member is advanced one step at each position, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, means operable to rapidly advance the time representative cam member through its

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total travel to a position representative of the actual time so that the switch control cam member is advanced to a position in its revolution representative of the actual time and the annunciator is rendered operative at a desired time, and means for insuring that the normally open switch is closed for a sufficient time interval when closed during operation of the rapidly advancing means so that the annunciator is operated.

4. In a remote indicator system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a switch control cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its total travel which is representative of a desired time, cam control means for steppingly advancing the cam member through prescribed portions of its total travel when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel so that the cam member is advanced one step at each position, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, means operable to rapidly advance the time representative cam member through its total travel to a position representative of the actual time so that the switch control cam member is advanced to a position in its revolution representative of the actual time and the annunciator is rendered operative at a desired time, and means operable to render the annunciator inoperative when the rapidly advancing means is operative.

5. In a remote indicator system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a switch control cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its total travel which is representative of a desired time, cam control means including a ratchet and pawl assembly for steppingly advancing the cam member through prescribed portions of its total travel when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel so that the cam member is advanced one step at each position, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, means operable to rapidly advance the time representative cam member through its total travel to a position beyond the position representative of the actual time, means operative to prevent the advancing means from advancing the time representative cam member so that advancement of the time representative cam member may be prevented subsequent to advancement in response to operation of the rapidly advancing means until the actual time corresponds to the time represented by the time representative cam member position, and means for rendering the annunciator inoperative when the preventing means is operative.

6. In a remote indicator system, the combination which comprises, a remotely located annunciator, means including a normally open switch for rendering the annunciator operative upon switch closure, a switch control cam member associated with the switch for causing the switch to be closed when the cam member reaches a preselected position in its total travel which is representative of a desired time, cam control means including a ratchet and pawl assembly for steppingly advancing the cam mem-

ber through prescribed portions of its total travel when energized, means including a control switch for energizing the cam control means upon switch closure, a time representative cam member associated with the control switch for causing the switch to be closed for a prescribed period of time when the time representative cam member reaches preselected positions in its total travel so that the cam member is advanced one step at each position, means for advancing the time representative cam member through its total travel in accordance with the actual passage of time, means operative to rapidly advance the time representative cam member through its total travel to a position beyond the position representative of the actual time, means operative to prevent the advancing means from advancing the time representative cam member so that advancement of the time representative cam member may be prevented subsequent to advancement in response to operation of the rapidly advancing means until the actual time corresponds to the time represented by the time representative cam member position, and brake means responsive to operation of the preventing means for abruptly terminating operation of the rapidly advancing means.

7. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, a motor, an aural indicator rendered operative upon motor energization, a pair of contacts having open and closed positions, means for normally maintaining the contacts in the open position, means including a screw-like member and responsive to motor energization for closing the contacts, an indicator lamp, and means responsive to motor energization for intermittently blocking the flow of light from the lamp so that the lamp appears to be flashing.

8. A remote signaling system as set forth in claim 7 which includes means responsive to closure of said contacts for maintaining the motor and the indicator lamp energized until the means is operated for positioning the contacts in their open position.

9. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, a motor energized upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a pair of contacts having open and closed positions, means for normally maintaining the contacts in the open position, means including a screw-like member and responsive to motor energization for providing time delayed closure of the contacts, an indicator lamp energized upon application of power to the annunciator to provide a visual indication, and means responsive to motor energization for intermittently blocking flow of light from the lamp so that the lamp appears to be flashing.

10. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, a motor which has a shaft and is energized upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a pair of contacts having open and closed positions, means including a screw-like member having a helical ramp formed therein for normally maintaining the contacts in the open position and for providing time delayed closure of the contacts upon motor energization, an indicator lamp energized upon application of power to the annunciator to provide a visual indication, and a shutter mounted on the motor shaft and physically associated with the lamp for intermittently blocking the flow of light from the lamp upon motor energization so that the lamp appears to be flashing.

11. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, a motor which has an output shaft and which is energized upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a post member associated with the motor shaft for rotation therewith and having a helical ramp formed therein, a rigid contact member mounted adjacent one end of the post member, a flexible contact member mounted in engagement with the post

member so that the ramp defines a path of movement therefor, means for displacing the flexible contact member along the post member with respect to the rigid contact member, the flexible contact member being moved along the ramp into engagement with the rigid contact member upon motor energization, an indicator lamp energized upon application of power to the annunciator to provide a visual indication, and means responsive to motor energization for intermittently blocking flow of light from the lamp so that the lamp appears to be flashing.

12. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, an outer housing having a window formed therein, a motor which has a shaft and is mounted in the housing for energization upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a screw-like member associated with the motor shaft for rotation therewith and having a helical ramp formed therein, a rigid contact member mounted adjacent one end of the screw-like member, a flexible contact member mounted in engagement with the screwlike member so that the ramp defines a path of movement therefor, a push button mounted in the housing for displacing the flexible contact member along the post with respect to the rigid contact member when the push button is depressed, the flexible contact member being moved along the ramp into engagement with the rigid contact member upon motor energization, an indicator light which is mounted in the housing adjacent the window and is energized upon application of power to the annunciator to provide a visual indication, a shutter member mounted on the motor shaft for rotation therewith and disposed between the indicator lamp and the window for intermittently blocking the flow of light through the window so that the lamp appears to be flashing, and a braking member associated with the push button and movable therewith into engagement with the shutter member when the push button is depressed so that braking action is thereby imparted to the shutter member and the motor.

13. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, a motor which has an output shaft and which is energized upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a post member associated with the motor shaft for rotation therewith and having a helical ramp formed therein, a rigid contact member mounted adjacent one end of the post member, a flexible contact member mounted in engagement with the post member so that the ramp defines a path of movement therefor, means for displacing the flexible contact member along the post member with respect to the rigid contact member, the flexible contact member being moved along the ramp into engagement with the rigid contact member upon motor energization, an indicator lamp energized upon application of power to the annunciator to provide a visual indication, and means responsive to motor energization for intermittently blocking flow of light from the lamp so that the lamp appears to be flashing, the annunciator performing a memory function in the face of a power failure since the flexible contact member remains in its position at the time of such a power failure.

14. A remote signaling system as set forth in claim 1 wherein said annunciator comprises, an outer housing having a window formed therein, a motor which has a shaft and is mounted in the housing for energization upon application of power to the annunciator, an aural indicator rendered operative upon motor energization, a screw-like member associated with the motor shaft for rotation therewith and having a helical ramp formed therein, a rigid contact member mounted adjacent one end of the screw-like member, a flexible contact member mounted in engagement with the screw-like member so that the ramp defines a path of movement therefor, a

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push button mounted in the housing for displacing the flexible contact member along the screw-like member with respect to the rigid contact member, the flexible contact member being moved along the ramp into engagement with the rigid contact member upon motor energization, an indicator lamp which is mounted in the housing adjacent the window and is energized upon application of power to the annunciator to provide a visual indication, and a shutter member mounted on the motor shaft for rotation therewith and disposed between the indicator lamp and the window for intermittently blocking flow of light through the window so that the lamp appears to be flashing.

15. In a timer controlled remote indicator system, the combination comprising clock timing means including a first pulse means for providing a first series of clock pulses at a first rate and of a first pulse duration, a second pulse means for providing a second series of clock pulses at said first rate and of a second pulse duration shorter than said first pulse duration and means synchronizing said first and second pulse means, cam means, means connected to said first pulse means and said cam means for moving and positioning said cam means an incremental distance along a path representative of an increment of time in response to each initiation by each pulse in said first series of pulses, first switch means positioned in the path of said cam means and operable thereby at a predetermined position in the path of said cam means representative of a desired time, means to adjustably position the relative position of said first switch means and said cam means along the path of said cam means, a second switch means, pulse responsive means connected to the second pulse means for operating said second switch

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means in response to the duration of each pulse of said second series of pulses, electrical indicator means, circuit means connecting a source, said second switch means, said first switch means and said indicator means for energizing the indicator means in response to the coincident operation of said first and second switch means, holding circuit means bypassing both said switch means for maintaining the energization of said indicator means in response to the energization thereof independently of both said switch means, and reset means for opening the holding circuit means to deenergize said indicator.

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