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Restrepo

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[54] **WATCHMAN'S TOUR ALARM SYSTEM**

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[52] **U.S. Cl.** **340/306,** 340/309.1, 346/144

[51] **Int. Cl.** **G07c 1/20**

[58] **Field of Search** ..... 340/305, 306, 309.1, 340/309.4, 309.5, 311, 312; 346/144; 58/152 B

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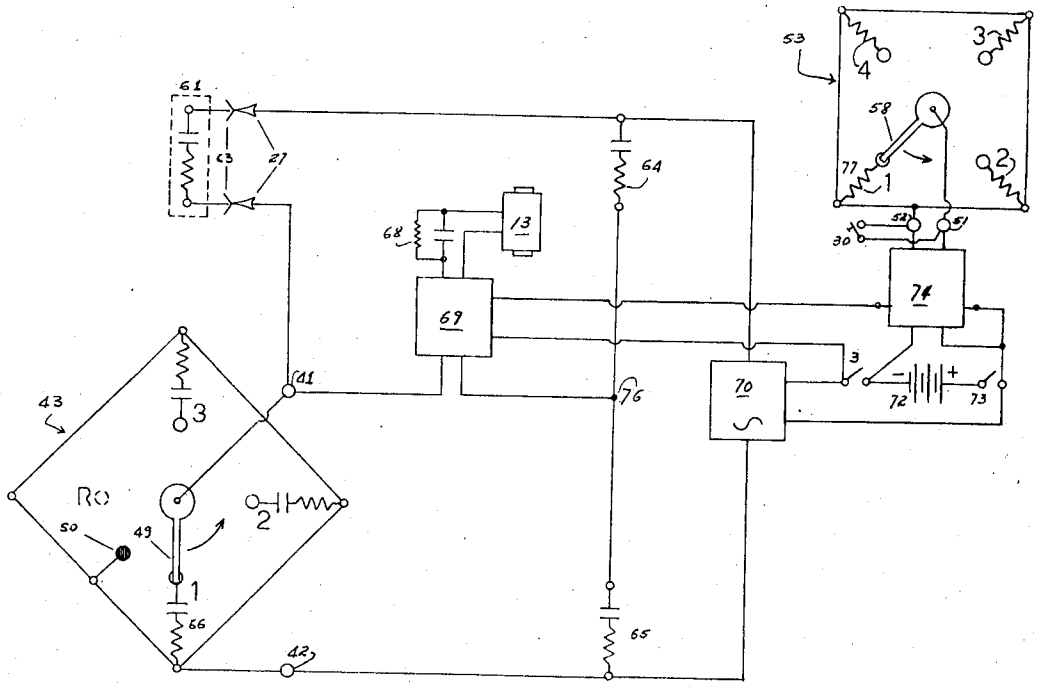
Assistant Examiner—William M. Wannisky
Attorney—Alvin Browdy et al.

[57] **ABSTRACT**

An alarm system establishes, according to a preset program, the order and the minimum time schedule to be followed by a watchman in checking control stations on his vigilance rounds. The watchman carries a portable control assembly which must be plugged into each fixed control station in the proper order and after the elapse of a minimum time before the portable control assembly will shift to correspond to the next fixed control station. If the entire round is not completed and the portable control assembly plugged into a main control station within a predetermined time, an alarm will be triggered.

9 Claims, 7 Drawing Figures



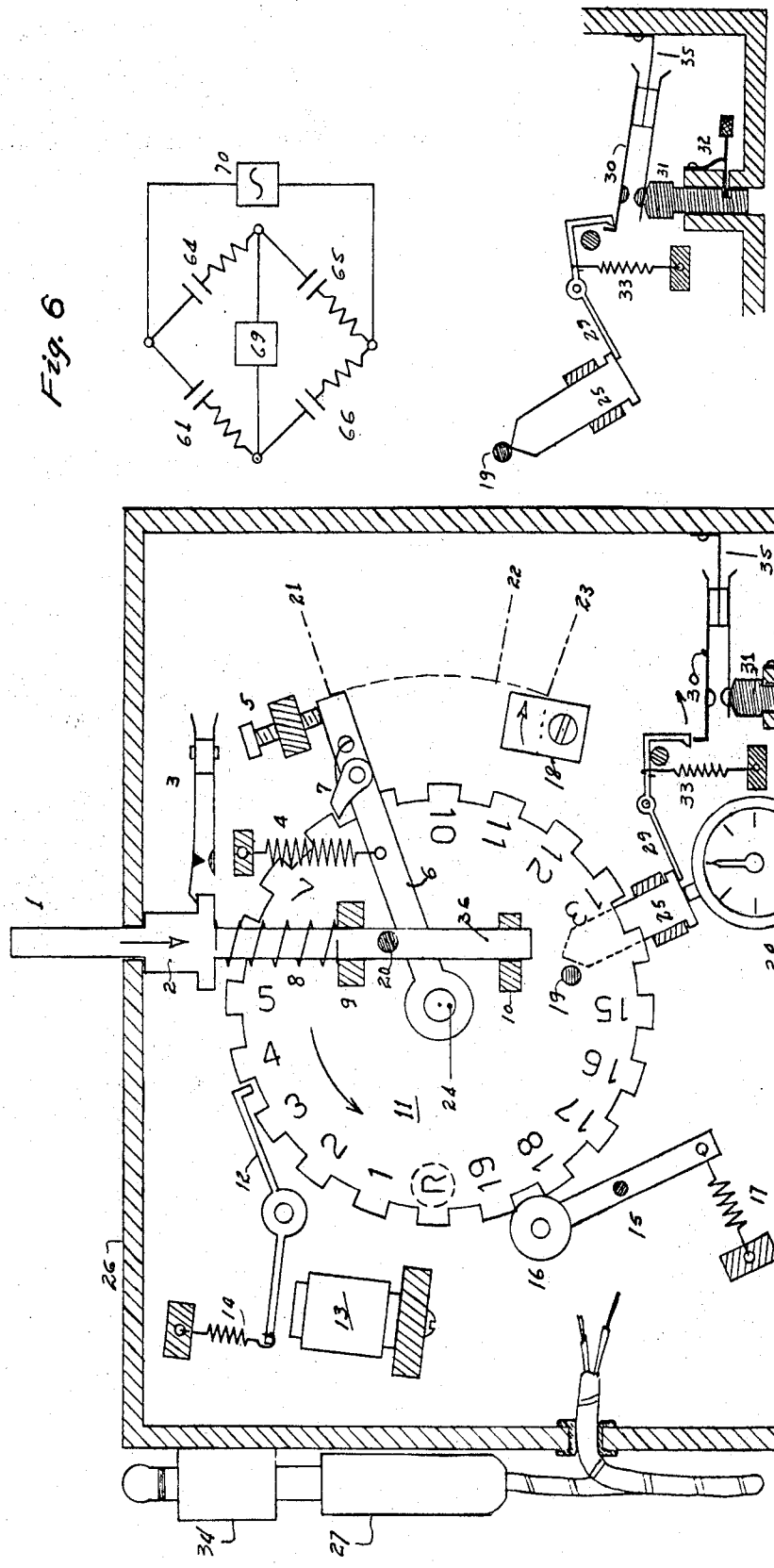


FIG. 1

FIG. 2

Fig. 6

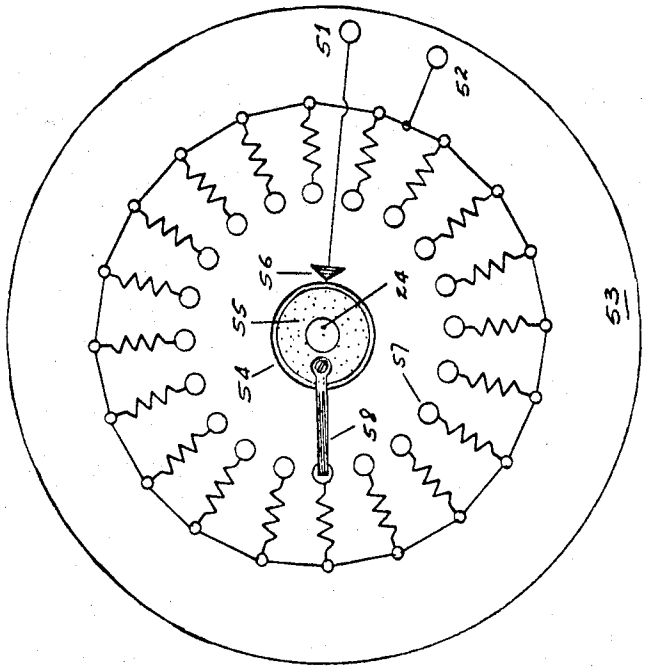

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FIG. 4

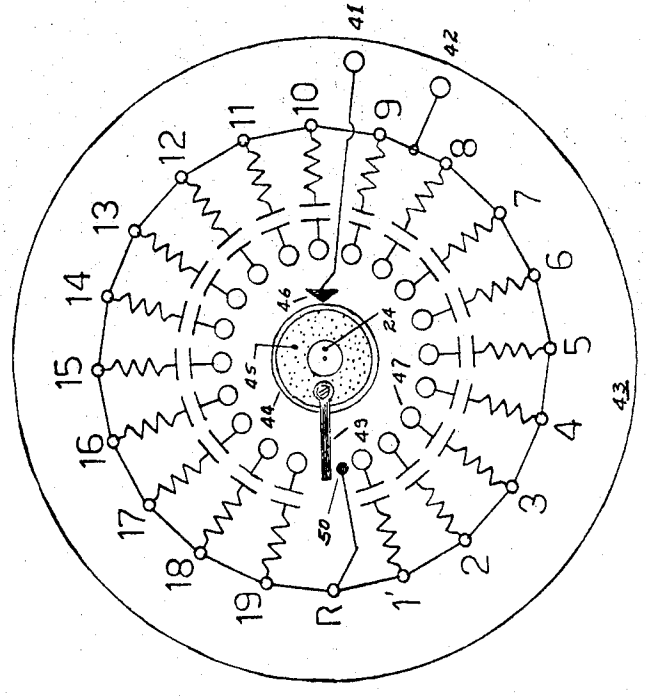
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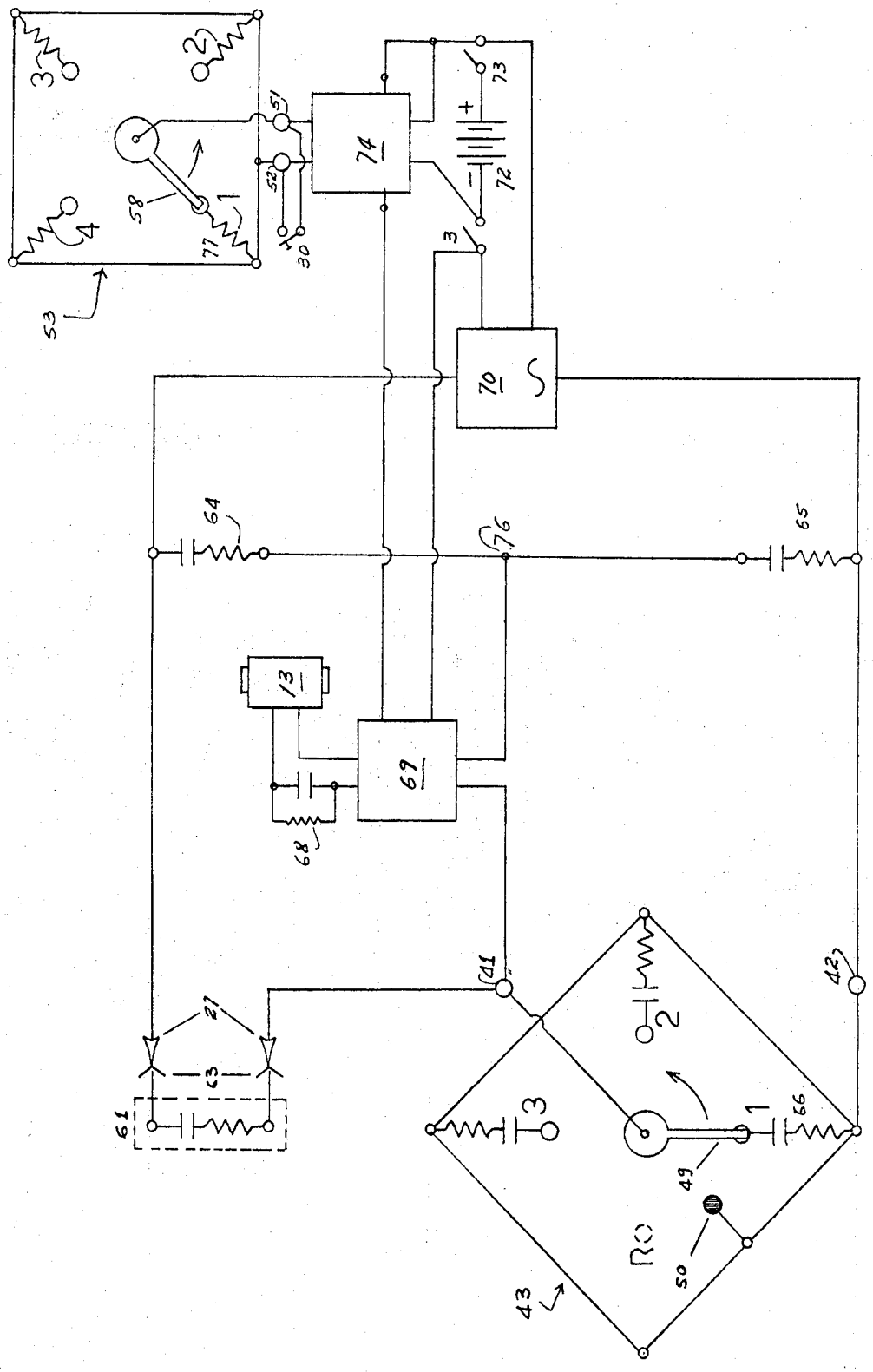
FIG. 3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RO
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FIG. 5

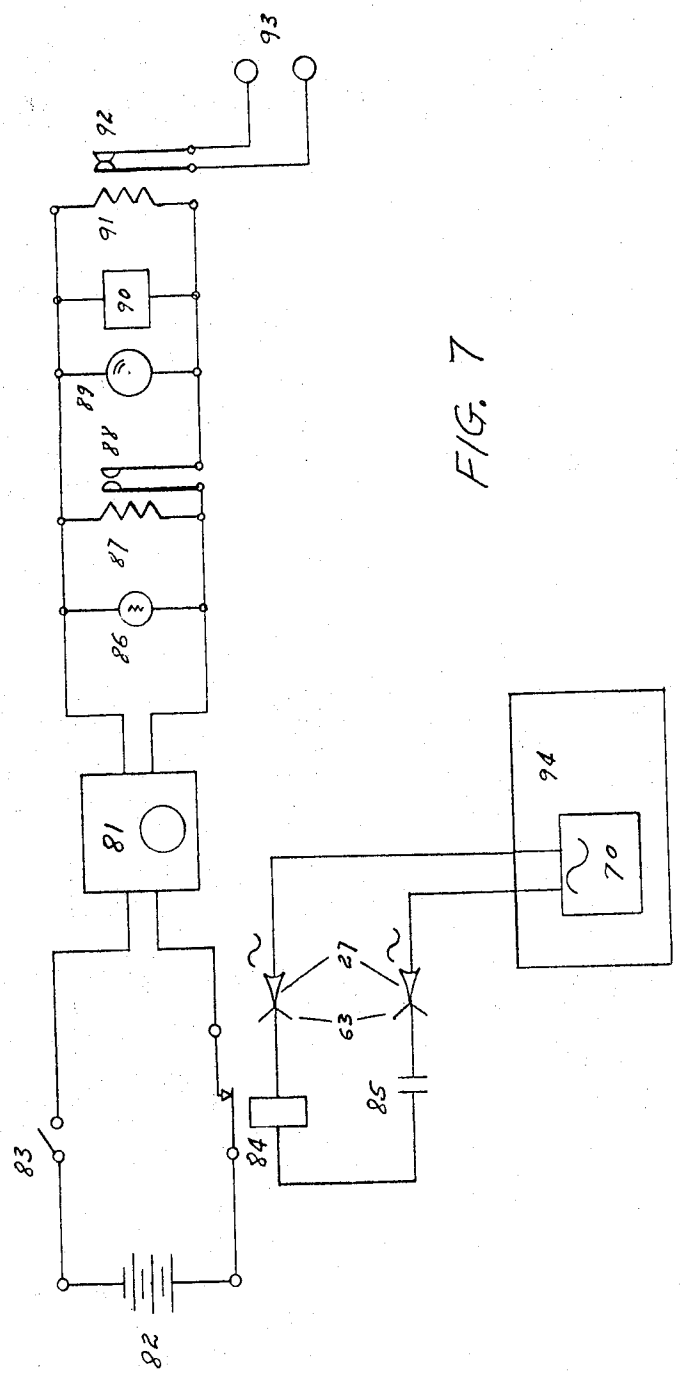

FIG. 7

WATCHMAN'S TOUR ALARM SYSTEM

FIELD OF THE INVENTION

The present invention relates to an alarm system for use in conjunction with a watchman's vigilance rounds and more particularly to a system including a series of fixed control stations each having a different predetermined electrical reactance associated therewith and a portable control assembly which will only function if plugged into each control station in a predetermined order and minimum time schedule.

SUMMARY OF THE INVENTION

This invention relates to a portable assembly comprising mechanical, electrical and electronic means cooperating together in order that a watchman's rounds may be carried out in a preset path and time program.

A series of fixed control stations are arranged at key points around a building or area to be protected. The watchman carries a portable assembly which is programmed to advance only when the correct control station is approached after a predetermined minimum time lapse between stations.

A timer in a central control unit is started when the watchman begins his rounds. Unless the watchman returns within a predetermined time period, a general alarm is triggered. The portable assembly which the watchman carries will only deactivate the central control unit timer at the end of his rounds if all of the fixed control stations have been checked in the predetermined order with the minimum time spent between stations.

A preferred embodiment of the present invention will now be summarized. A number of control stations is arranged along the round of a watchman. Each control station comprises a sheet metal box housing an electrical element, useful as an electrical reference sample, which is encased and hidden within a plastic material body. The box is provided with a two-pole plug socket electrically connected to the two terminals of the electrical reference sample.

A portable control assembly, comprising mechanical, electrical and electronic means, establishes, according to a preset program, the order and the minimum time schedule to be followed by the watchman to check the full array of control stations. The portable assembly has a two-pole plug tap connected thereto by a flexible cable and suitable for connection to the control station socket. Also the portable assembly has a button which must be pushed down by the watchman each time he connects the portable assembly to each control station in order to automatically compare the electrical value of the electrical element or sample reference element with the electrical value of a comparison element located within the portable assembly. In the event that the reactance values of the sample reference element and the comparison element are the same, a switching key of the assembly is shifted to a new comparison element to be compared with the sample reference element in the next control station. A device cooperating with an electronic circuit of the portable assembly shall establish the minimum lapse of time that must elapse to perform the next comparison. Each properly checked control station will shift the switching key finger which marks the control station to be checked by means of a sequential numbering shown through an inspection opening.

When the watchman checks the penultimate control station, an indicia will appear through the assembly inspection opening, the letter R for instance, which means that when checking the last control station an electrical pulse will be sent via a connecting line to a central control unit causing an electronic time delay means, to be described hereinafter, to cancel the time it had built-up. As stated above, the central control unit is provided with an electronic time delay device which is set by the security monitor to a lapse of time that would allow the watchman to carry out his full watchman round. Whether due to watchman oversight or any other reason he does not reach the time resetting station in the greatest preset time, twenty minutes for instance, one or several suitably located alarm lamps will be activated thus showing the watchman that the preset time for completing his round is about to elapse. If in spite of the luminous advice the restoration is not carried out within an additional time, three minutes for instance, a loud sound alarm will be activated and simultaneously an internal counter provided in the central control unit will record the failure. If in spite of the sound signal the restoration does not occur within another preset lapse of time, three minutes for instance, a general sound alarm will be excited or an electrical signal will be sent to a central station thus indicating an emergency condition.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation cross-sectional view of the portable assembly.

FIG. 2 is an enlarged cross sectional view showing in detail the mechanical means for controlling the operation of the sprocket wheel in the portable assembly.

FIG. 3 is a top plan view showing the arrangement of the selector key and pulse generating means comprised in the portable assembly.

FIG. 4 is a plan view showing the arrangement of the selector key cooperating with the time delaying means.

FIG. 5 is a detail of the electrical circuit used for performing the checking operation.

FIG. 6 is a circuit diagram of a portion of the circuit of FIG. 5 in Wheatstone bridge form.

FIG. 7 is a block diagram of the alarm system connected to the central station.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The portable assembly shown in FIG. 1 comprises a housing 26 which houses a sprocket wheel 11 which in the preferred embodiment of the invention has twenty teeth and is fixedly mounted on a shaft 24 which is journaled on its ends.

When the watchman wishes to effect a comparison at a control point, he pushes down the button 1 which shifts the axis 36 thereof through fixed bushings 9 and 10 located at fixed levels in such a way that a projection 20, projecting from axis 36, presses an arm 6, pivotable about shaft 24, downwardly, causing it to pivot from the position shown by dashed line 21 to that shown by dashed line 22, stopping against movable stop 18 mounted on the assembly housing. In this way pawl 7 located on arm 6 jumps over one tooth, then goes into one recess and partially jumps over the next tooth. Simultaneously, by this step, a portion 2 of axis 36 having the greatest diameter is moved downwardly, thus closing a switch 3 thereby activating the electronic circuit

which performs the comparison and control process as will be explained hereinafter.

In the event that the comparison process meets the particular design features of the system, i.e., if the control station order was followed within the proper time schedule, a "correct comparison" pulse is generated which activates the electromagnet 13 long enough to cause the retaining armature 12 to release the sprocket wheel 11 thus permitting the advancement of one or two of the teeth as required, as it will be explained hereinafter.

When the button 1 is released, the arm 6 turns back urged by a spring 4 which is joined by one end thereof to a projection affixed to the housing. As the arm 6 in its back movement engages the sprocket wheel 11 by means of the pawl 7, the wheel will be advanced through the angle comprised between one recess and the next one, i.e., the sprocket wheel will advance the necessary extent to bring one signal number into register with the inspection opening shown in the drawing registering with the indicia R. Button 1 will be snapped back by the spring 8 up to its retaining stop. An adjustable stop 5 is useful for accurately setting the rest position of the arm 6. A roll 16 arranged on one end of an arm 15 is pressed on the recesses between teeth of the sprocket wheel 11 by means of a tension spring acting on the other end of arm 15. The roll 16 serves to accurately clamp in place the wheel after each advancing motion of the wheel thus preventing the rotation thereof that otherwise would be caused by the jerking of the portable assembly.

By turning the movable stop 18 through a 180° extent in the direction of the arrow, around its offset pivot, a greater downward displacement of the arm 6 is allowed thereby attaining an advancing action on the sprocket wheel 11 through a distance corresponding to a two tooth separation since with such an arrangement the pawl 7 is permitted to fall in the next recess, i.e., it jumps over two teeth.

Sprocket wheel 11 is provided with an offset cylindrical projection 19 protruding from both faces thereof. As will be explained hereinafter in connection with the description of the electrical alarm system, when the sprocket wheel 11 goes from the R position shown in FIG. 1 to the 1 position, i.e., through a one tooth advancement, it must be done suddenly, regardless of whether button 1 is released slowly or quickly. When arm 6 starts to advance the sprocket wheel 11, axis 36 is fully pushed down and therefore its lower portion stops the angular path of the projection 19 thus preventing the sprocket wheel 11 from turning except only through a few degrees. When the axis 36 rises and clears the path of projection 19 the projection 20 on the axis 36 will have moved to some distance from arm 6 since the wheel 11 having been blocked, the upward displacement of the arm 6 had been impeded due to the engagement between pawl 7 and the wheel 11. Therefore when the path of projection 19 is cleared both the wheel and the arm will suddenly advance in counterclockwise direction until the arm strikes against the projection 20 of the axis 36.

When the wheel passes from R position to position 1, i.e., when advancing one additional tooth to the position shown in FIG. 1, the portion of projection 19 on the rear of wheel 11 causes the element 25, slidingly mounted within a fixed guiding bore, to be radially shifted outward thus pushing the button of a clock device 28 setting the same to zero time. The member 25 simultaneously drives the armature 29 permitting the motion of a contact 30 to be explained hereinafter.

A button 31 is slidably lodged within a sleeve provided in the housing 26 for being pushed by a key after one full wheel revolution, i.e., after one watchman round, in order to close the contact 30. When contact 30 is closed, the preset time schedule between control stations is cancelled. When pushing down the button 31 until a pawl 32 is engaged within a groove in the bottom, the contact 30 is closed and its free end bears against the bottom end of the armature 29. When the rear portion of the projection 19 strikes against the sliding member 25, the armature 29 pivots against the tension of spring 33, releasing contact 30 and permitting the contact 30 to open due to the flexibility of the support 35 which flexibly connects the switch 30 to the frame 26, as shown in FIG. 2.

Referring to FIG. 3, the shaft 24 which is fixedly joined to the wheel 11 is also fixedly attached to an electrically insulating disc 45 bearing a contact finger 49 for a ring 44 acting as a collector ring.

A disc 43 is constructed from insulating material and is fixedly mounted parallel to the back of the sprocket wheel 11. A switching key which is mounted on the disc 43 is provided with a number of contact positions equal in number to the number of teeth provided on the wheel 11 with an additional position 50 positioned between the contact positions numbered 19 and 1 and which performs the function of restoring the system.

Each one of the contact positions 47 is coupled to a capacitor series connected to a resistance. All of the resistances are connected together by the outer connector thereof thus forming a common connecting ring. The finger 49, which is fixedly joined to the ring 44 and the disc 45 which is in turn fixedly joined to the shaft 24, goes from one contact position to the next, each time the sprocket wheel advances one tooth. A terminal 41 is connected to a sliding contact 46 which slides on the ring 44. As the connecting finger 49 may attain several contact positions, this makes it possible that, at the terminals 41 and 42, there appear the several values of the resistance-capacitor sets which are connected to the nineteen positions of the embodiment shown in the drawing as the finger 49 goes over the several contact positions due to the advancing of the sprocket wheel. When the finger 49 passes from the R position shown in FIG. 3 to the contact position 1, it transiently contacts the contacting position 50 because this is an intermediate position between two stationary positions. Thus, the contacting position 50 transiently bridges the terminals 41 and 42 which causes a restoring pulse to be generated.

Between the sprocket wheel 11 and the disc 43, and parallel thereto, there is fixedly mounted a disc 53 (FIG. 4). A connecting finger 48 being fixed to a ring 54 and a disc 55 which is in turn fixedly attached to shaft 24, goes from one contact position 57 to the next one, each time the wheel is advanced by one tooth. A terminal 51 is connected to a sliding contact 56 which slides on the ring 54 and, as the contact finger may attain several contact positions, this makes it possible that, at terminals 51 and 52, there appear the 20 values corresponding to the resistances connected by one end to each one of the contact positions 57 and by the other end to a common connecting ring connected to terminal 52. Each resistance value, as will be fully explained

hereinafter, sets the minimum time for the watchman to spend going from one control station to the next one.

DESCRIPTION OF THE PREFERRED ELECTRONIC CIRCUIT

As stated hereinbefore, each control station has an electrical element therein, connected to a plug socket, such electrical element serving as a reference sample for performing the comparison carried out by means of the portable assembly. In the preferred embodiment of the invention, the electrical element is comprised of an electrical means or group of electrical means providing some amount of electrical reactance to the electric current supplied to the portable assembly, such a group being comprised of a resistor and a capacitor series connected together at **61** and their free ends joined to a plug socket **63** to be connected with the plug **27**, in turn suitably electrically connected to the electrical circuit of the portable assembly, as seen in FIG. **5**.

The electrical circuit used performing the checking operation is substantially based on the so-called Wheatstone bridge arrangement as shown in the diagram of FIG. **5** and FIG. **6**. In the diagram of FIG. **5** the reactance set is fed from an AC source or oscillator **70** connected to the battery **72** of the portable assembly through a servicing switch **73**. According to a rated frequency of oscillator **70**, the group **64** has the same reactance as the group **65** and therefore, if the group **61** located in the control station is of the same reactance value as that of the group **66** belonging to the portable assembly, and selected by the selector key **43**, according to the Wheatstone bridge principle, no potential difference will appear between points **41** and **76**. When there is no potential difference between points **41** and **76** and switch **3** is in the on position (when the watchman is effecting the comparison operation, he holds the button **1** pushed down (FIG. **1**)), the oscillator **70** and the unit **69** will be energized. As previously stated, the oscillator **70** supplies alternating current for the comparison process and unit **69** is so featured as to send current to magneto **13** when a comparison process does not show potential difference between points **41** and **76**.

Thus, the system acts as an inverse amplifier operating in such a way that when electrical current does appear between points **41** and **76**, it does not send electrical current to magneto **13** arranged for attracting the armature **12** (FIG. **1**) and thus does not release the sprocket wheel **11** allowing it to advance. In the event proper comparison is obtained, i.e., the sample element **61** matches the electrical reactance of element **66**, an electrical pulse will be sent by unit **69** to magneto **13**, provided the switch **3** is in on position and the time delay means **74** allows the electrical flow to the positive lead of the power supply **72** as will be explained hereinbelow. A set capacitor-resistance **68** comprises a high capacitance and a high rated resistance and the purpose thereof is to prevent the watchman from charging the battery **72** when leaving button **1** pushed down, since magneto **13** will receive an electrical short pulse while discharging the group **68**. It is the object of the resistance of the group **68** to slowly discharge the capacitor when the reading unit **69** has no current.

The sample electrical group **61** and the comparison electrical group are each comprised of a series connected resistance and capacitor, having as their main purpose to make it difficult to determine the resistance value through electrical measuring.

The time/delay means **74** is designed to establish the minimum time within which the watchman must perform one comparison and the next one, thus causing him to stay between the concerned stations for the desired preset time. For each value of the groups of reactance **66** of the selector key **43**, there will be one value of resistance **77** because both selector keys are controlled by the shaft **24**. For sake of simplicity in the drawing, in FIG. **5** each key was depicted as having four positions, instead of the twenty positions. In the preferred arrangement of the invention the time delay means **74** is electronic in nature and its operation is based on a resistance-capacitor set, generally termed RC set, wherein the capacitor has a constant value and the resistance will have values which may change for each **57**-position of the selector key **53**, such that for each value of the set resistance, there will correspond a distinct time for the time delay cycle of the time delaying means **74**. As a further feature, such time delaying means starts a new time delay cycle each time the circuit of the resistance is opened, that is, each time the finger **58** of the key **53** changes from one contact position to the next. The several resistance values will appear at the terminals **51** and **52** and therefore, when switch **30** is actuated by inwardly shifting the button **31** (FIG. **2**), the former will remain closed as explained above until the watchman's round ends, that is, when the sprocket wheel **11** goes from the R position to position **1**. When bridging the terminals **51** and **52** any selected resistance is shunted and the time delay means **74** has no time delay cycle and therefore this allows for a direct electrical path from the positive supply line to the reading unit **69**, and therefore in such a round there will be no requirement of minimal time between control stations.

The central control unit is located at a fixed position and is comprised of a case containing electrical, electronic and mechanical elements cooperating together to control the watchman's round in a fully automatic way. The central control station sets the maximum time the watchman must require for his vigilancy round as it has been preset in an electronic time delay means. The case is a closed assembly provided with a door, closed by a key, through which access is gained to the interior elements.

The central control station is provided with a power supply **82** (FIG. **7**) which may be electrically connected, or not to the main supply of the premises wherein the alarm system is set up.

The central control unit sends current through a hand switch and a replay **84** to an electronic or electromechanical time delay means **81**. The time delay means **81** is able to start a time delay cycle upon receiving supply current and allows flow therethrough when the time delay cycle, which has been programmed in the presetting dial, is completed, and until the breaking of the current supply, in which case the time delay cycle suddenly turns back to zero time whether the time delay cycle is at its beginning or it has been completed.

The detailed description of the time delay means whose operation has been described above has been omitted herein, and the detailed description of the several electronic components has been omitted also, since these elements, separately considered, are not a

part of the present invention and are well known in the art.

As explained hereinabove, when ending the round, the watchman connects the plug **27** into socket **63** (FIG. 7) in the last central station of the vigilance round, which is the reseting station, and which is connected to the central control unit. The last central station must receive a short electrical signal from oscillator **70**, as will be explained below, which signal passes through capacitor **85** presenting low reactance as this is a proper frequency signal. This signal is applied to the coil of relay **84** thus activating the same over a short time period, this causing in turn the opening of the armature of relay **84** for a corresponding short time, and transiently breaking off the electrical supply to the time delay means **81** and therefore turning back the time delay cycle to zero time to immediately start a new cycle. In the event the watchman does not effect the resetting of the central unit in the predetermined time, the time delay means completes the time delay cycle, thus allowing the turning on of the lamp **86** for drawing the watchman's attention.

Simultaneously, the thermal element of a time relay begins to heat a bimetal junction **88** which, after some time, acts to activate a ring **89** or some other sound alarm means and in turn this builds up a failure in an electro-mechanical counter **90**. Simultaneously, a thermal element **91** is energized which thus starts to heat the bimetal junction **92** which, after some predetermined time, acts on another general alarm system located at the premises to be protected.

The resetting pulse from the oscillator **70** appears in the plug **27** because of the following condition to be noted in FIG. **5**: The upper terminal of plug **27** is directly connected to one of the outputs of oscillator **70**; its lower terminal will be momentarily connected to the other oscillator output when passing the finger **49** over the contacting position **50**, thus establishing the following circuit: lower terminal of plug **27**, terminal **41**, finger of selector key **43**, contactor **50**, common ring, terminal **42**, lower output of the oscillator, upper output of the oscillator, and upper terminal of plug **27**, the oscillator voltage appearing in the terminals of plug **27**.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown in the drawings and described in the specification.

What is claimed is:

1. An alarm apparatus comprising:

a plurality of fixed control means for providing an electrical reference sample;

a portable control means, having a plurality of comparison elements therein equal in number to said plurality of fixed control means, for comparing the electrical reference sample provided by each of said fixed control means with one of said comparison elements; and

a central control means for triggering an alarm means if a proper signal is not fed thereinto by said portable control means within a predetermined time period;

said portable control means further including a signal means therein for providing said proper signal to said central control means only when all of the electrical reference samples provided by said plurality of fixed control means have been positively compared by said portable control means in a predetermined order.

2. An alarm apparatus in accordance with claim **1**, wherein said portable control means further includes:

advancing means for determining if said electrical reference sample and said comparison element being compared thereto are a match and advancing said comparison elements only after a match has been determined, said match being a positive comparison.

3. An alarm apparatus in accordance with claim **2**, wherein said portable control means further includes:

a timing means having at least one timing element therein for preventing said advancing means from functioning until a minimum amount of time as determined by said timing element has elapsed.

4. An alarm apparatus in accordance with claim **3** wherein:

said timing means includes a number of said timing elements equal to the number of said fixed control means plus one more representing the minimum time between the final one of said fixed control means and said central control means.

5. An alarm apparatus in accordance with claim **3** wherein:

said portable control means further includes a switch means for disconnecting said timing means.

6. An alarm apparatus in accordance with claim **1**, wherein:

said fixed control means each comprise a resistor and capacitor pair of a predetermined electrical reactance;

said comparison elements each comprise a resistor and capacitor pair of a predetermined electrical reactance; and

said portable control means compares the reactances of said fixed control means and said comparison elements by means of a Wheatstone bridge circuit.

7. An alarm apparatus in accordance with claim **1** wherein:

said fixed control means further includes a socket means attached thereto for receiving a plug and for electrically connecting said plug with said electrical reference sample; and

said portable control means further includes a plug means attached thereto for insertion into said socket means to electrically connect said portable control means with said fixed control means.

8. An alarm apparatus in accordance with claim **1** wherein, in said central control means:

said alarm means comprises at least one alarm light and alarm timing means for triggering a second general alarm means if said proper signal is not fed into said central control means within a time period as determined by said alarm timing means wherein said alarm timing means is activated upon triggering of said alarm by said central control means.

9. A method of protecting an area, comprising the steps of:

1. starting the running of a predetermined period of time at a central control station at the expiration of which an alarm will be triggered if a proper signal has not interrupted the running of said period of time prior thereto;

2. conveying to a first comparison station a portable signal giving means for providing said proper signal

only when a program of comparisons have been completed;

3. connecting said portable signal giving means to said first comparison station and if there is a positive comparison, automatically advancing said signal giving means to the second in said program of comparisons;

4. conveying connecting said portable signal giving means to each subsequent comparison station and advancing said signal giving means through the entire program of comparisons, thereby completing said program of comparisons; and

5. conveying and connecting said signal giving means to said central control system and providing said proper signal thereto thereby interrupting the running of said predetermined period of time.

* * * * *