

[54] REMOTE SENSING AND CONTROL SYSTEM

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[58] Field of Search 340/408, 150, 151, 206, 340/163, 164, 167, 152 R; 343/6.5 R; 179/65 R

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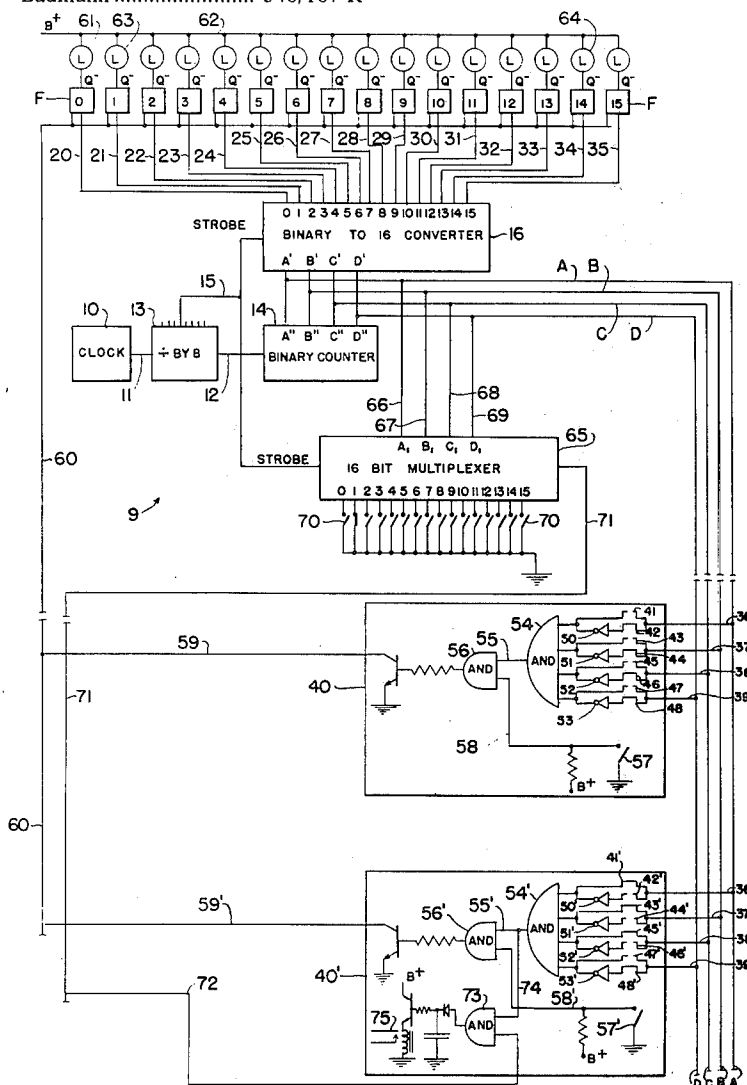
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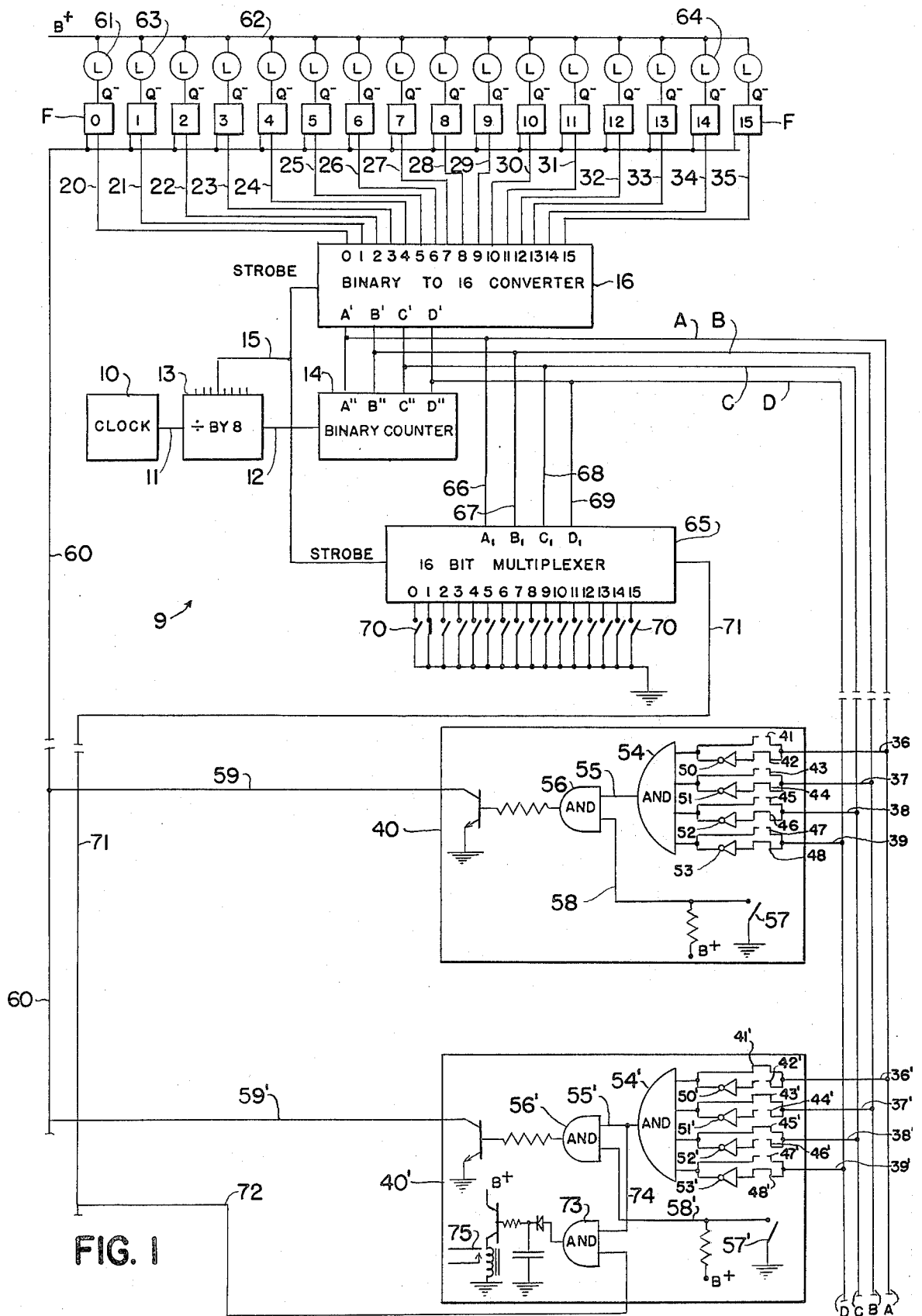
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[57] ABSTRACT

Remote units are connected in parallel to a monitoring and control center by a monitoring wire, a control wire, and a plurality of signal wave carrying wires each conveying signal waves of progressively doubled wave length. The remote units are each coded and identified by selectively routing one or more signal waves through an inverter at each unit so that the signal waves trigger an AND gate in a given time slot for each remote unit. According to the open/closed status of a switch, the triggering of an AND gate sends a signal through the monitoring wire for each unit in the time slot for that unit. The center sequentially monitors each remote unit in its time slot and indicates its status. Each remote unit may include a relay which is activated from the center through the control wire during the time slot for that unit. At the center a relay operated switch and a connection may be added to enable a status of one remote unit to control another remote unit.

17 Claims, 8 Drawing Figures





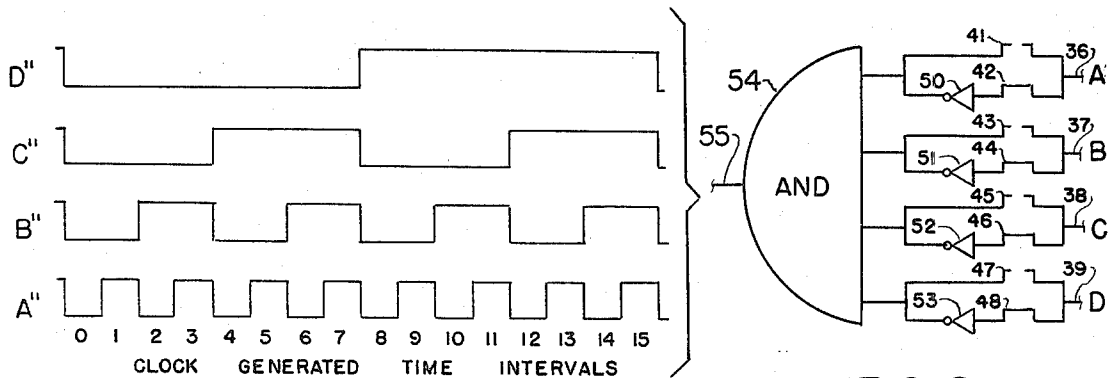


FIG. 3

FIG. 2

	D''	C''	B''	A''
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

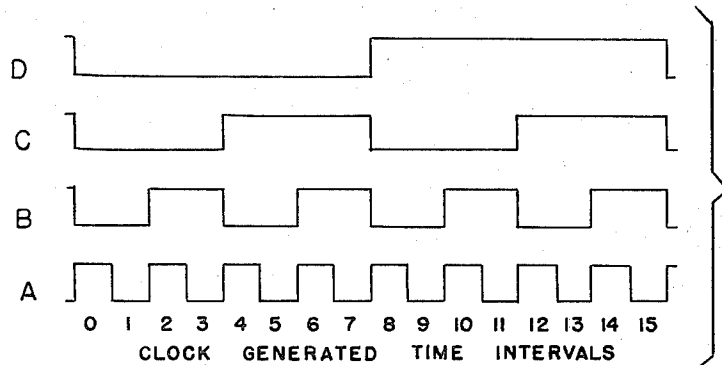


FIG. 5

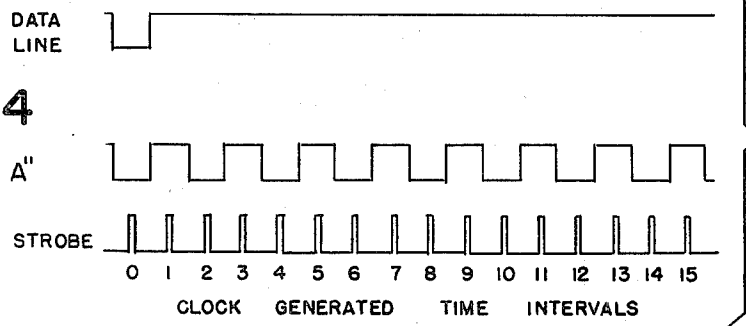


FIG. 4

FIG. 3A

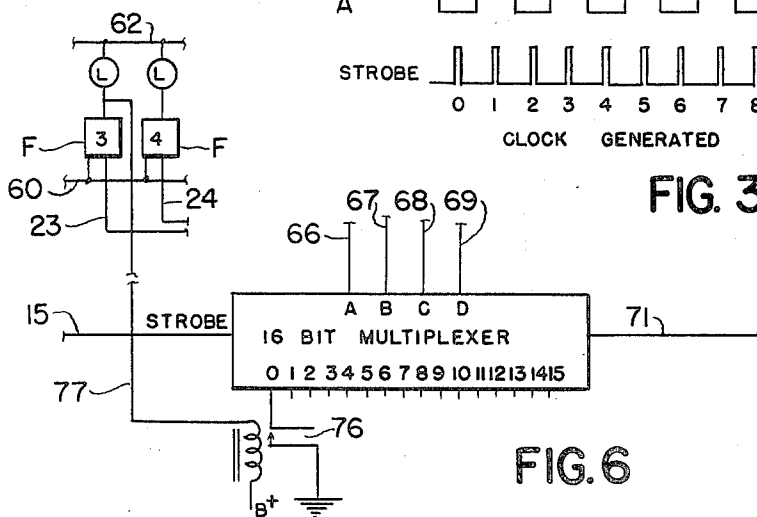
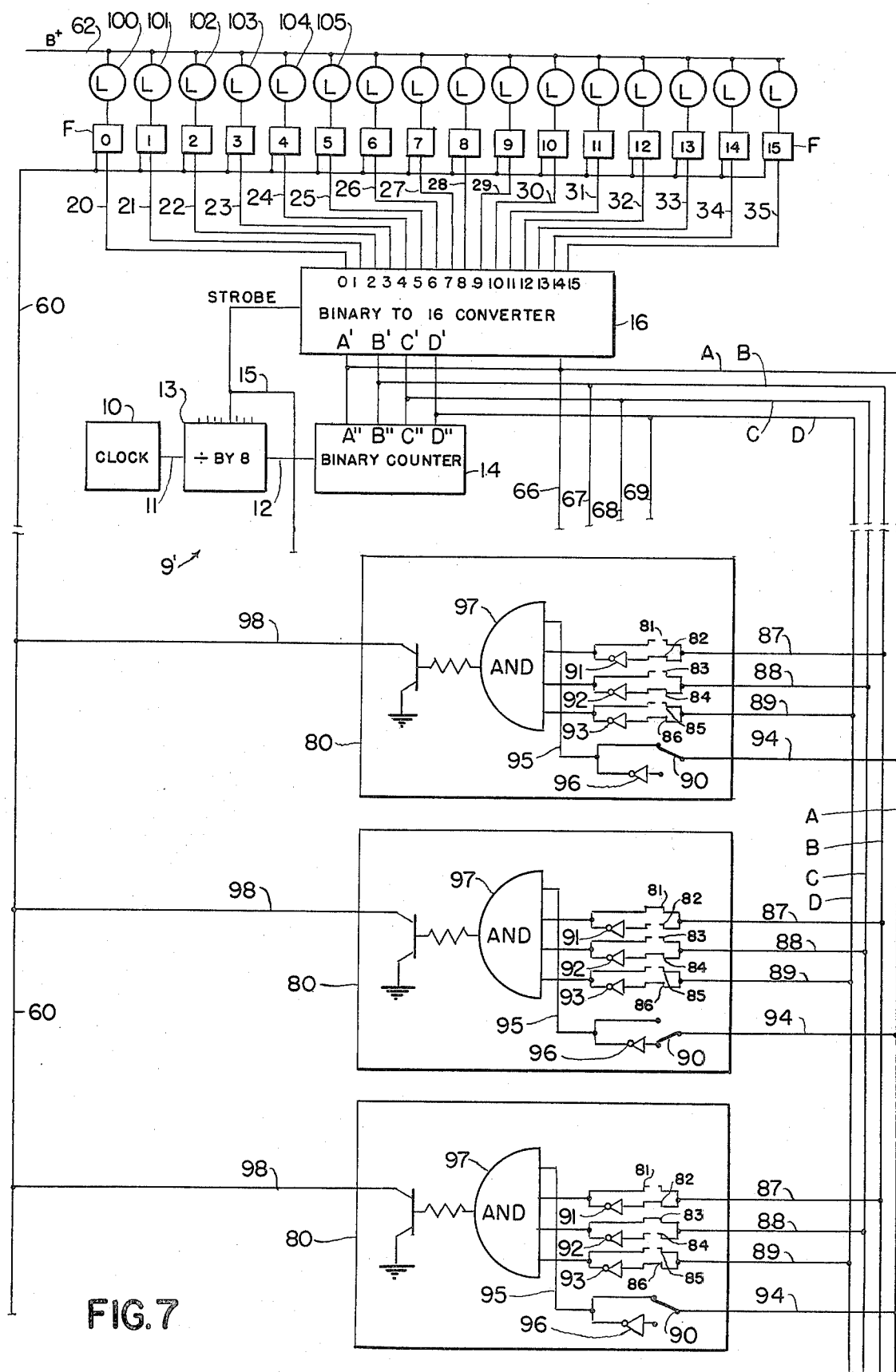


FIG. 6



REMOTE SENSING AND CONTROL SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention:

In modern high rise buildings there is a great need to collect information at remote sensing units at a control center from which remotely controlled units may be activated. The information may be collected from smoke detectors, heat sensitive switches, security devices, switches activated by the opening of doors, and the like. In response to this information, remote units such as alarms, stair well pressurizing blowers, and the like must be activated. In hospitals, remote patient call buttons are monitored. In factories and stores security requires the central monitoring of security devices on doors, windows, and the like.

2. Description of the Prior Art

Heretofore each remote sensing and control unit had its own set of wires run directly to a central monitoring and control center. This invention allows the parallel connection of all remote units with relatively few wires to a monitoring and control center.

SUMMARY OF THE INVENTION

A monitoring and control center for a plurality of remote units has a binary counter into which regular clock pulses are fed to generate square wave signals of progressively doubled wave length, each wave signal being sent through a separate wave signal carrying wire. A plurality of remote units are connected in parallel to the center by the signal wave carrying wires, a monitoring wire, and a control wire. The number of remote units monitored and controlled may be as many as 2^n where n is the number of wave signal carrying wires.

The remote units are each keyed as to their identity and thus their location by selectively breaking one of a pair of jumpers, one of each pair being in series with an inverter, each pair of jumpers being connected to a signal wire so that one or more wave signals at each remote unit may be selectively inverted. These selectively inverted signals at each unit are fed to an AND gate which emits a signal in a given time slot for each unit. A monitoring signal is only sent from a given unit to the center if a switch at the remote unit is operated. Smoke detectors, door switches, and the like operate the switches at each remote unit. The coding of identification of the units limits their monitoring signal output to a given time interval because the inversion of one or more combinations of progressively doubled wave length signals determines the time interval when all the wave signals will be high and it is only when all the inputs to a given AND gate are high that it will cause a monitoring signal to be emitted.

At the center, a binary to sixteen converter is connected to the wave signal carrying wires and has its outputs each connected to the gate of a flip flop associated with a lamp for each remote unit. The monitoring wire is connected to all the data inputs of the flip flops and the output of each flip flop activates a lamp. Therefore when a monitoring signal is sent from a given remote unit in its coded time slot, the monitoring signal reaches all the flip flops, but only one flip flop receives a gating signal from the binary to sixteen converter during that time slot to light its associated indicator lamp. Thus the closing of a sensing switch on a given remote

unit will be indicated at center by the lighting of a given lamp.

If a multiplexer at center is also connected to the signal wave carrying wires, switches to its inputs corresponding to each remote unit can be closed to send a control signal to all the remote units through the control wire. However, the multiplexer will only send a control signal in the time slot of a given unit whose multiplexer input switch is closed at center. In a unit a signal from its AND gate and a control signal can be used to activate a relay to sound an alarm, close a door, or carry out any other remote control.

At central, the output from any flip flop can activate one or more switches of the multiplexer. This enables a remote unit to sense a condition and then control one or more other remote units.

Additionally, a single pole double throw switch at a remote unit can be used to connect a signal wave carrying wire directly or through an inverter to the AND gate of the remote unit. The double throw switch is moved by the sensing means at the remote unit. The rest of the signal wave carrying wires are used to selectively code a unit as has been described. While this embodiment of the invention requires an extra wave signal carrying wire and two indicator lamps at center for each remote unit, one lamp may be used to indicate that a given remote unit is connected to central and the other lamp will indicate that the unit has been activated by a sensing device.

Thus it may be seen that the remote monitoring and control system of this invention is easy to install as the center is connected with relatively few wires in parallel to a large number of remote units. Since the remote units are all identical, they are inexpensive to fabricate and may be coded on installation. The center is simple although it handles a large number of remote units and may be modified, even after installation, to enable one remote unit to control other remote units by its activation. The center may also display information indicating that units, although not activated, have failed to function.

The remote units may be activated by smoke detectors, heat sensors, door position switches, and any other devices. In a like manner, there is no limit to the control functions they may carry out if provided with control relays. The system of this invention has almost unlimited uses. It has been tested in building security applications.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a monitoring and control center connected to two remote units, one unit being a remote sensing unit and the other being a remote sensing and control unit;

FIG. 2 is an enlarged diagram of an AND gate with pairs of jumpers connected thereto as in a remote unit, one jumper of each pair being broken to code the unit;

FIG. 3 is a time interval graph of signal waves carried by the wires A, B, C, and D of FIG. 1;

FIG. 3A is a time interval graph of signal waves carried by a data line, the wire A, and the strobe line;

FIG. 4 is a column showing the status of outputs of the binary counter of FIG. 1 during a number of clock pulses;

FIG. 5 is a time interval graph of signal waves in a remote unit coded to invert the signal waves from wires B, C, and D, the waves being shown prior to their entering the AND gate of that unit;

FIG. 6 is a block diagram of elements broken away from FIG. 1 and modified so that a remote sensing unit may activate another remote sensing and control unit; and

FIG. 7 is a block diagram of a monitoring center and remote sensing units, the center having two indicating lamps for each remote unit, one lamp indicating that a unit is connected and functioning and the other lamp indicating that the unit has been activated.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A monitoring and control center is generally designated by the reference numeral 9 and comprises the elements shown in the upper half of FIG. 1. Within center 9 clock 10 passes pulses at a given frequency through the divide by eight element 13 to binary counter 14 by means of the leads 11 and 12. Lead 15 from one of the central outputs of element 13 strobes binary to sixteen converter 16 and multiplexer 65 if it is used. The outputs A'', B'', C'', and D'' of binary counter 14 are connected to the signal wires A, B, C, and D, respectively, as well as to the inputs A', B', C' and D' of the binary to sixteen converter 16. The numbered outputs 0-15 of the binary to sixteen converter 16 are connected, respectively, to the flip flops F 0-15 by the leads 20-35.

A remote sensing unit 40 has pairs of jumpers 41-48 connected to signal wires A, B, C, and D by leads 36-39. One jumper 42, 44, 46, and 48 of each pair is connected in series with an inverter 50, 51, 52 and 53. Output from the pairs of jumpers are connected to the multiple inputs of AND gate 54. FIG. 2 shows an enlarged view of the pairs of jumpers 41-48 connected to the AND gate 54 of a remote unit 40.

Referring now to FIGS. 3 and 4, output A'' of binary counter 14, which is connected to signal carrying wire A, is pulled low and then goes high changing its condition to count successive pulses from divide by eight element 13. Output B'' connected to signal wire B is pulled low for two pulses and then goes high for two pulses; output C'' connected to signal wire C is pulled low for four pulses and then goes high for four pulses; and output D'' connected to signal wire D is pulled low for eight pulses and then goes high for eight pulses. These outputs of binary counter 14 generate the square waves shown in FIG. 3 and sent through the wave carrying wires A, B, C and D.

The state of the binary counter outputs is also shown in FIG. 4, 0 representing a low state and 1 a high state. These states, as in any binary counter, correspond to the columns of binary numbers shown in FIG. 4 after their decimal equivalents. As has been stated, these states of the outputs A'', B'', C'' and D'' corresponding to binary numbers generate the square waves shown in FIG. 3, each wave signal being twice the wave length of an adjacent wave signal.

FIG. 3A shows the sort duration strobe pulses in line 15 that trigger the binary to sixteen converter 16 and multiplexer 65 in a central portion of the square waves generated by the binary counter 14. The data line signal is shown as if a remote unit 40 was coded to send a signal in the 0 time slot as will be hereinafter explained.

Remote unit 40, as shown in FIG. 1 and elements of which are shown in FIG. 2 is specifically coded by breaking the jumpers 41, 43, 45, and 47 so that the signal waves in the wires A, B, C, and D are inverted to enter the AND gate 54. As shown in FIG. 3, the only

time interval when all signal waves are low is during the first time interval designated 0. Thus in this time interval and only in this time interval, since unit 40 is coded to invert all signal waves, AND gate 54 of remote unit 40 passes a signal through lead 55 to AND gate 56. If switch 57 is closed by a remote sensing element, the thus grounded lead 58 connected to gate 56 will cause it to send a monitoring signal through lead 59 connected to the monitoring wire 60.

Referring further to FIG. 1, wire 60 is connected to all the flip flops F, but it is only during time interval 0 that the binary to sixteen converter 16 sends a signal through its 0 output to trigger the 0 flip flop F and light lamp 61 which is connected to a potential by lead 62. If switch 57 of remote unit 40 is not closed, no monitoring signal will be sent through monitoring wire 60 during time interval 0 to light lamp 61.

During the second time interval, which is designated 1 in FIG. 3, the binary counter output A'' goes high. A remote unit, not shown, could be coded for time interval 1 by breaking its jumpers 41, 43, 45 and 48. As shown in FIG. 1, remote unit 40', except for some added control elements, is identical with remote unit 40. Remote unit 40' is specifically coded by breaking its jumpers 42, 44, 46 and 47 so that the wave signal in wire A is inverted and the wave signals in wires B, C and D are not inverted to enter AND gate 54'. The signal waves entering AND gate 54' are shown in FIG. 5. In this altered situation, it may be seen that the all signals high time interval is now shifted into the time interval designated 14. For this reason it is only during time interval 14 that remote unit 40' will send a monitoring signal through lead 59' to monitor wire 60 if its switch 57' is closed. Since it is only during time interval 14 that the binary to sixteen converter 16 will send a signal to flip flop F 14 through lead 34, the closing of switch 57' of remote unit 40' can only light indicator lamp 64. As shown, after one hundred twenty eight pulses from clock 10 and sixteen pulses from element 13, the outputs of binary counter 14 will all go low again to monitor unit 40 a second time and continually at intervals as the clock pulses are generated.

Referring further to FIG. 1, with four signal wave carrying wires A, B, C, and D, the status of sixteen remote units 40 or 40' can be monitored, each unit being coded by breaking different combinations of its jumpers 41-48 to have each unit send its monitoring signal in its own one of the sixteen available time slots. If the binary counter 14 and the binary to sixteen converter 16 are cascaded or otherwise provided with increased capacity, the number of remote units 40 or 40' which may be monitored, each with its own indicator lamp L at the center 9, is equal to 2^n , where n is the number of signal carrying wires provided. For each additional signal carrying wire, another pair of jumpers and an inverter must be provided in all the remote units.

In one test installation clock 10 provided 8,000 pulses per second. Eight wave carrying signal wires were provided to allow for a maximum of two hundred and fifty six remote units which were all selectively coded by breaking one jumper of each of eight pairs of jumpers in each unit. Since there were 256 time slots, one for each remote unit, each unit was monitored with the 8,000 pulses per second of the clock every quarter of a second. Additional signal wires and many more remote units can be used. If required, clock pulses can be provided at higher rates so units will be monitored at closer intervals of time. The divide by eight element 13

strobes binary to sixteen converter 16 near the center of each signal wave to prevent the possibility of false signals at the start or end of a pulse. Well known solid state and integrated circuit elements are used as is well known in the art.

Referring further to FIG. 1, if it is desired to control a device connected through the relay 75 of a remote unit 40', a multiplexer 65 is provided at center 9. Inputs A₁, B₁, C₁, and D₁ of multiplexer 65 are connected to signal wires A, B, C, and D by the leads 66-69, respectively. When a given grounded switch 70 connected to one of the multiplexer 65 inputs 0-15 is closed, multiplexer 65 will send a control signal through control wire 71 which would be connected to all the remote monitoring and control units 40'. The control signal will be sent in the time interval determined by which of the switches 70 is closed. As shown, closing switch 70 to ground multiplexer 65 input 1 causes multiplexer 65 to send a signal through control wire 71 and lead 72 to AND gate 73 in time interval 1. As unit 40' is coded to time interval 1 as has been described, simultaneous signals reach gate 73 through leads 72 and 74. This activates relay 75 to remotely control any desired device connected through relay 75.

Referring now to FIGS. 1 and 6, the multiplexer 65 of FIG. 1 is replaced in FIG. 6 by a substantially identical multiplexer 65' having a relay activated grounded switch 76 connected to one of its inputs, the input 0 as shown. A connection 77 from the output of flip flop F 3 causes its activation to close the relay operated grounding switch 76. Thus it may be seen that the activation of any remote unit 40 or 40' can be used to control any other remote unit 40'. If desired, a plurality of connections may be made between one flip flop output and a number of relay activated grounding switches 76. Thus by merely making a number of connections at the center 9, the activation of some remote units may control others automatically. The relay activated grounding switch 76 may be any solid state equivalent thereof.

Referring now to FIG. 7, a monitoring center 9' which could also be a monitoring and control center 9 if desired, has sixteen indicator lamps L, a clock 10, a binary counter 14, a binary to sixteen converter 16, and four wave carrying signal wires A, B, C, and D. Center 9' is substantially identical to center 9 of FIG. 1 except that pairs of lamps L monitor the state of each remote unit 80. Thus the center 9' can only monitor eight remote units 80 with four wave carrying wires.

The units 80 are identical, each having three pairs of jumpers 81, 82, 83, 84, 85 and 86 connected to the signal wires B, C, and D by the leads 87, 88 and 89, respectively. Inverters 91, 92, and 93 are connected in series with the jumpers 82, 84 and 86. A single pole, double throw switch 90 is thrown at each remote unit 80 by a sensing element. The switches 90 in the units 80 are connected to wire A by leads 94. In one position switch 90 directs signals to lead 95 and in the other position it directs signals through an inverter 96 to lead 95. When all signals are high entering the AND gate 97 of each unit 80, gate 97 sends a signal through a lead 98 to monitoring wire 60.

The uppermost unit 80 is shown coded by breaking jumpers 81, 83, and 85 which codes this unit 80 to the time intervals 0 or 1; the center unit 80 is shown coded by breaking jumpers 82, 83 and 85 which codes this unit 80 to the time intervals 2 or 3; and the lowermost unit 80 is shown coded by breaking jumpers 81, 84, and 85 which codes this unit 80 to the time intervals 4 or 5.

Additional units 80 would be coded to following pairs of time intervals.

The switch 90 of the uppermost unit 80 has not been moved to invert signal waves in wire A so that this unit 80 now lights lamp 101 in time interval 1. Lamp 101 being lit indicates at center 9' that proper connections are made to this unit 80 and that it is coded and functioning. If this switch 90 was moved by a sensing element to invert the signal waves in wire A by passing them through inverter 96, lamp 100 would light as flip flop F O was activated in time interval 0. Thus lamp 100 lights to show that a sensing element has thrown switch 90 of the uppermost unit 80.

The switch 90 of the center unit 80 is shown moved by a sensing element to invert the signal in wire A and cause lamp 102 to light of the second pair of lamps 102 and 103. The switch 90 of the lowermost unit 80 is shown not moved by a sensing element so that the signal in wire A is not inverted. This unit 80 lights lamp 105 of the next pair of lamps 104 and 105. With the addition of the elements shown in unit 40' in FIG. 1, lead 74, gate 73, and relay 75, the units 80 could be made as monitoring and control units. In this embodiment of the invention, one signal wire is used to indicate the positions of the switches 90 and only the remaining signal wires provide signals which are used in the units 80 to code them for their identification.

While this invention has been shown and described in the best forms known, this is purely exemplary and many modifications and substitutions may be made. For example, the breaking of one of each of the pairs of jumpers in the remote units is shown as a means to code the remote units. However, any equivalent means may be used which selectively inverts the wave signals entering the AND gates of the units. Other than lamps, many different indicating devices may be used in the center. Equivalents which perform the same function may be substituted for all the elements of the center and the remote units. While a binary counter is shown generating square wave signals in response to clock pulses, square waves need not be used. Further, the square signal waves have been shown as having progressively doubled wave lengths; however, with suitably manipulated coding of the remote units and the sacrifice of some potentially usable time intervals, signal wave lengths may be progressively increased by factors other than two. Elements of the several embodiments of this invention can be combined in a given system.

What is claimed is:

1. A system for monitoring remote units comprising, in combination,
 - a. a center having signal wires extending therefrom, means generating a wave signal in each of said signal wires, said wave signals being of increasing wave lengths increasing from one of said wires to the next by a whole multiple greater than one, flip flops, an indicator means activated by each flip flop, a monitoring wire connected to each flip flop and extending from said center, and means counting wave signals and having outputs each connected to one of said flip flops, said outputs each sending a signal to a flip flop during a given count which is during a given time interval; and
 - b. a plurality of remote monitoring units, each remote unit having a sensing switch, gate means, inverters connected to said gate means, means connected to each of said signal wires and being selectively preset to route signals from each of said sig-

nal wires directly to said gate means and alternately through one of said inverters to said gate means, said means connected to each of said signal wires routing signals to said gate means to code each remote unit by causing the gate means of each remote unit to emit a signal during a given time interval, and means connected to said monitoring wire responsive to a position of said remote unit sensing switch passing the signal emitted by said gate means through said monitoring wire;

a signal in said monitoring wire and a simultaneous signal from an output of said means counting wave signals activating each of said flip flops to in turn activate one of said indicator means at the center according to a position of each of said remote unit sensing switches.

2. The combination according to claim 1 wherein said means generating a wave signal in each of said signal wires generates wave signals of progressively doubled wave lengths.

3. The combination according to claim 2 wherein said system is a system for monitoring and controlling remote units; wherein in (a) said center has multiplexing means connected to said signal wires and having input switches, and a control wire extending from said multiplexing means, said multiplexing means sending a signal through said control wire in a time interval determined by the closing of a given input switch which represents a given count of wave signals in said signal wires; and wherein in (b) at least some of said remote units each have a relay operated switch, and means responsive to simultaneous signals from said gate means and said control wire activating said relay operated switch, the operation of a given multiplexing means input switch at said center activating the relay operated switch of a given one of said remote units.

4. The combination according to claim 3 wherein in (a) at least one of said multiplexing means input switches is relay activated, and with the addition of a connection between one of said flip flops and said relay activated multiplexing means input switches so that said flip flop activates the relay activated input switch, a position of the sensing switch of one of said remote units thereby controlling the relay operated switch of another of said remote units.

5. The combination according to claim 2 wherein at least one of said remote units has one of said signal wires connected through said sensing switch of said at least one remote unit, said sensing switch of said at least one remote unit being a single pole, double throw switch, said sensing switch being one of said means in said at least one remote unit selectively routing signals from said signal wire directly to said gate means and through one of said inverters to said gate means, said center having two indicator means each indicating a position of said sensing switch of said at least one remote unit.

6. The combination according to claim 5 wherein said at least one remote unit is all said remote units, each remote unit having a sensing switch connected to one of said signal wires, said center having two indicator means for each remote unit, each indicator means indicating a position of one of said sensing switches.

7. The combination according to claim 2 wherein said means generating a wave signal in each of said signal wires is a clock, and a binary counter having outputs, said binary counter being connected to said clock,

said signal wires each being connected to an output of said binary counter.

8. The combination according to claim 7 wherein said means counting wave signals is a binary to sixteen converter having inputs connected to outputs of said binary counter, said converter having counting outputs each connected to one of said flip flops.

9. The combination according to claim 3 wherein said means generating a wave signal in each of said signal wires is a pulse generating clock, and a binary counter having outputs connected to said clock counting pulses therefrom, said signal wires each being connected to an output of said binary counter; and wherein said means counting wave signals is a binary to sixteen converter having inputs connected to outputs of said binary counter, said binary to sixteen converter having outputs each connected to one of said flip flops.

10. The combination according to claim 9 with the addition of a dividing element connected to said clock dividing pulses therefrom, said dividing element strobing said binary to sixteen converter during a central part of each wave signal.

11. The combination according to claim 2 wherein said means connected to each of said signal wires selectively routing signals from each of said signal wires directly to said gate means and alternately through one of said inverters to said gate means is a pair of jumpers connected in parallel between each signal wire and said gate means of each remote unit, one of each of said jumpers of each pair being connected in series with one of said inverters, one of said jumpers of each pair being broken to selectively route wave signals thereby coding each of said remote units.

12. A system having remote units connected in parallel and a center to which said remote units are connected, said system comprising, in combination,

a. a center having signal wires extending therefrom, a clock generating pulses, a binary counter connected to said clock counting pulses therefrom and having outputs, each of said signal wires being connected to an output of said binary counter so that said binary counter transmits square waves through said signal wires of progressively doubled wave length from one wire to the next, an additional wire, and means at said center counting wave signals in said signal wires and being connected to said additional wire; and

b. a plurality of remote units, each of said remote units having gate means, inverters, means connected to each of said signal wires selectively routing wave signals directly to said gate means and alternately through one of said inverters to said gate means, at least some of said means connected to each of said signal wires coding each remote unit by causing the gate means of each unit to emit a signal during a given time interval, and means receiving said signal emitted from said gate means connected to said additional wire;

said means at said center counting wave signals in said signal wires and said means at said remote units receiving signals emitted from said gate means interacting through said additional wire.

13. The combination according to claim 12 wherein said system is a system having said center monitor at least some of said remote units;

wherein in (a) said additional wire is a monitoring wire, and said means at said center counting wave signals in said signal wires is a binary to sixteen

converter having inputs connected to said outputs of said binary counter, said converter having outputs; and, wherein in (b) said means receiving said signal emitted from said gate means transmits the signal through said monitoring wire; and
 with the addition of in (a) flip flops at said center each connected to an output of said binary to sixteen converter and each connected to said monitoring wire, and an indicator means connected to each flip flop activated by each flip flop; and with the addition of in (b) a sensing switch at each remote unit controlling the emission of a signal from said gate means so that each of said flip flops activates an indicator means according to a position of a given remote unit sensing switch.

14. The combination according to claim 13 wherein said sensing switch in at least one of said remote units is one of said means selectively routing signals from said signal wires, said sensing switch at said at least one remote unit being a single pole double throw switch, an indicator at said center indicating each position of the sensing switch of said at least one remote unit.

15. The combination according to claim 13 wherein said system is a system having said center monitor and control said remote units;

with the addition of in (a) a multiplexer having input switches, and a control wire, said multiplexer sending a signal through said control wire on the closing of a given input switch during the time interval of a given count of wave signals by said multiplexer; and with the addition of in (b) relay operated switches in said remote units activated from said center, and means in said remote units responsive

to simultaneous signals from said gate means and from said control wire activating said relay switches on the operation of said multiplexer input switches.

16. The combination according to claim 15 wherein in (a) at least one of said multiplexer input switches is relay activated, and with the addition of a connection between one of said flip flops and said relay activated multiplexer input switch so that said flip flop activates said relay activated multiplexer input switch, a position of the sensing switch of one of said remote units thereby controlling the relay operated switch of another of said remote units.

17. The combination according to claim 12 wherein said system is a system having said center control at least some of said remote units;

wherein in (a) said means at said center counting waves in said signal wires is a multiplexer having input switches, and said additional wire is a control wire, said multiplexer sending a signal through said control wire on the closing of a given input switch during the time interval of a given count of wave signals determined by that input switch; and, with the addition of in (b) a relay operated switch in each remote unit activated from said center; and wherein in (b) said means responsive to a signal emitted from said gate means in said remote units controlled from said center responds only during a simultaneous receipt of signals from said control wire and said gate means to activate relay switches of remote units.

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