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[54] **INTRUDER DETECTION SYSTEM UTILIZING ARTIFICIAL AMBIENT LIGHT**

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[51] **Int. Cl.** **G08b 13/18**

[58] **Field of Search** ..... 340/258 B, 258 D, 228 S; 250/221

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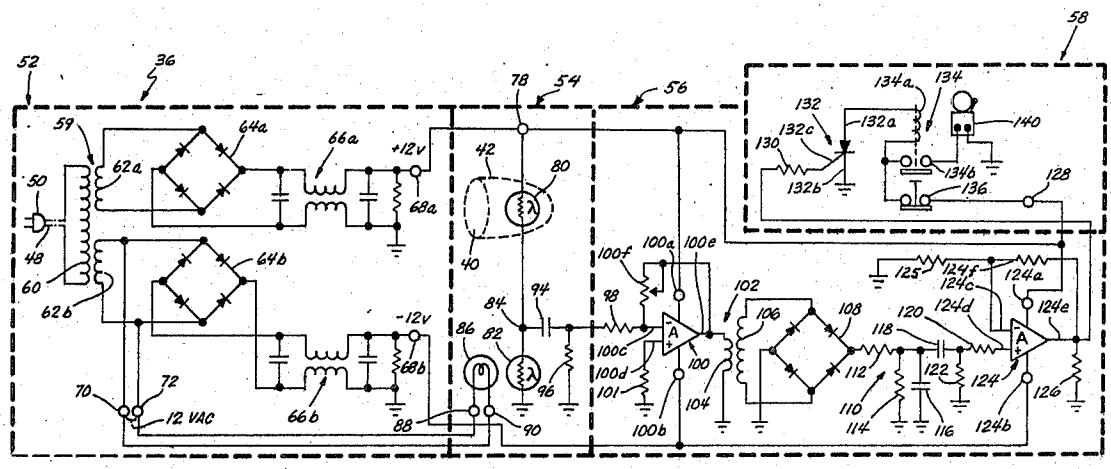
Primary Examiner—David L. Trafton

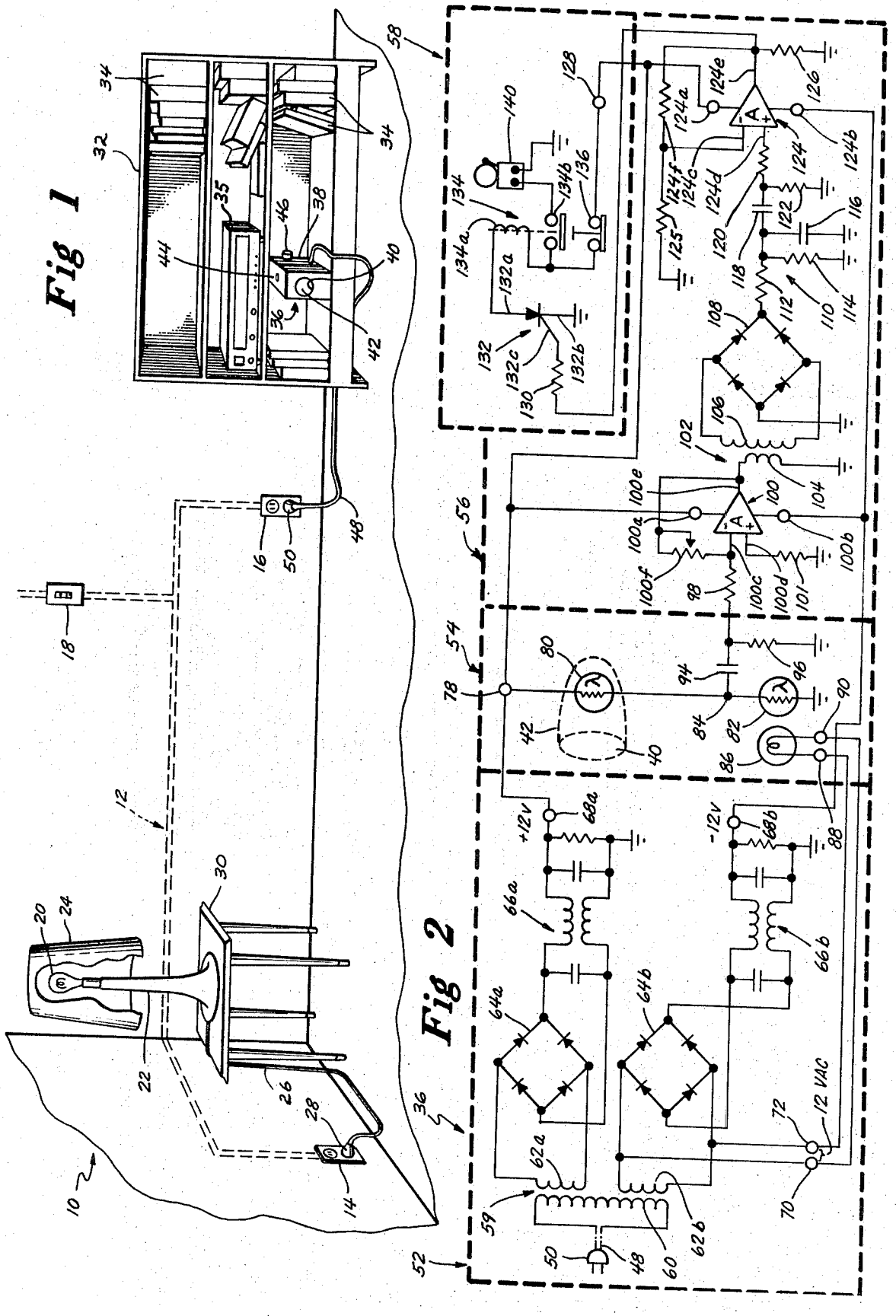
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[57] **ABSTRACT**

The detection system includes a pair of photocells connected in series to form a voltage divider. One photocell is responsive to ambient light (supplied by either an incandescent or fluorescent lamp) and the other to reference light (supplied by a small auxiliary incandescent lamp). Inasmuch as the system is responsive to artificial ambient light, which contains an alternating component by reason of being supplied by the usual 60 hertz power source, any spurious changes in the supply voltage are nullified by the voltage divider since my detection system is also connected to the same source as that supplying the artificial ambient light. The signal forwarded from the voltage divider comprising the two photocells is filtered, amplified, rectified, and the resulting output signal employed to actuate a suitable alarm, this being when an intruder has caused a change in the amount of artificial light impinging upon the photocell responsive to ambient light. The system is insensitive to changes in ambient light derived from sources other than the alternating current power supply, such as changes in daylight or headlights on passing automobiles.

9 Claims, 2 Drawing Figures




Fig 1
Fig 2
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82
84
86
88
90
92
94
96
98
100a
100b
100c
100d
100e
100f
101
102
104
106
108
110
112
114
116
118
120
122
124
124a
124b
124c
124d
124e
124f
125
126
128
130
132
132a
132b
132c
134
134a
136
140
+12v
-12v
12 VAC

INTRUDER DETECTION SYSTEM UTILIZING ARTIFICIAL AMBIENT LIGHT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to intruder detection systems, and pertains more particularly to one responsive only to ambient light derived from an incandescent or fluorescent lamp supplied from an alternating current power source.

2. Description of the Prior Art

Numerous attempts have been made in the past to devise satisfactory intruder detection systems. The more basic type involves an interruption of a light beam so that it no longer reaches the photocell that normally picks up this light. The shortcomings of such a system have been recognized and, at least, one attempt to intensity-modulate the transmitted light has been made. Phase relationships have also been resorted to but these require more elaborate equipment and are not completely reliable, especially in view of extraneous noise conditions that may at times arise.

While some of the prior art systems have met with a reasonable degree of success, especially those of a rather sophisticated character, there still exist deficiencies in the systems with which I am acquainted that render such systems objectionable, due to their cost, the ability to detect them when in operation and/or the inability to provide a reliable alarm, such as when there has been a sudden change in light conditions not attributable to an intruder.

SUMMARY OF THE INVENTION

Accordingly, a general object of my invention is to provide an intruder detection system that will be responsive only to artificial ambient light changes, more specifically changes occurring in the level of light provided by either an incandescent or fluorescent lamp when changed by the presence of an unauthorized person.

Another object is to provide a detection system that is self-contained, there being no external transmitters as such. Also, the invention has for an aim the elimination of not only any beam-type transmitter but also the avoidance of the coding that has heretofore been employed in order to make such a transmitter more foolproof.

Another object is to provide a system that is not dependent upon absolute values of light intensities, the system responding to rapid changes in light intensity and being insensitive to gradual changes such as those occurring from a change in the sun's position, specifically the rising of the sun in the morning.

Also, the invention has for an object the provision of a simple system requiring no complex or time-consuming adjustments in readying it for operation. More specifically, the invention has for an aim the provision of only a single external control in the form of an adjustment knob that can be easily manipulated in order to select an optimum detection range for the prevailing light conditions.

A further object is to provide a system of the foregoing character that does not depend on wall-reflected light, thereby enabling the system to respond more readily to the passage of a person in the more immediate vicinity of my system, thereby rendering the system

independent of light reflected from walls that would be beyond a normal detection range.

Yet another object is to provide a compact system that can be contained in a very small casing, thereby contributing to its being unobstrusive. Coupled with lack of any visible transmitter or light beam, my system is indeed quite difficult to detect and circumvent.

An object is to provide a system that is quite inexpensive as well as simple, thus encouraging its purchase and use.

Still another object of the invention is to provide a detection system that will be virtually immune to changes in line voltages. Prior art devices have been made to turn off for a period of time following a voltage fluctuation, but my system remains active and fully capable of detection throughout the fluctuation period.

Another important object of the invention is to provide a system that will detect both positive and negative light intensity excursions as far as the norm is concerned, the simple expedient of wearing dark clothes not enabling the system to be foiled.

Briefly, my intruder detection system comprises a pair of photocells connected in series to provide a voltage divider. By having one photocell function as a primary sensor, being located at the focus of a parabolic reflector, it senses all ambient light in a room including that from an incandescent or fluorescent lamp, whereas the second photocell serves as a reference device, nullifying any spurious or sudden changes in voltage that might occur. The lamp for the reference photocell not only supplies light to this reference device but additionally serves as an on-off visual indicator to the user. When there is a change of light impinging on the primary sensor, there is a change in the voltage at the junction between the two photoelectric sensors.

A capacitor connected to the junction between the two photocells blocks the direct current component of the signal but permits the alternating current or fluctuating component containing the 120 hertz signal to be passed, this being derived from the alternating component contained in the artificial ambient light, more specifically that from an incandescent lamp or a pair of fluorescent lamps energized from a conventional 60 cycle power source. It will be appreciated that fluorescent lamps are normally connected for out-of-phase operation which produces the same 120 hertz frequency experienced with a single incandescent lamp. After appropriate amplification, an alternating or fluctuating signal of proper magnitude is provided as a result of the passage of the previously mentioned 120 hertz signal through the capacitor. Any direct current voltage provided by the primary sensor from steady state light conditions, of course, is filtered out or blocked by reason of the capacitor's capability to pass only the 120 hertz signal. While a changing voltage signal is derived from the system due to the movement of an unauthorized person, it is derived only from the alternating current component of the ambient light source. Therefore, the change is indicative of the change in that light striking the primary sensor, which change is caused by the movement of an intruder in the room where my system is being used. The changing signal, if it reaches the magnitude for which my system has been adjusted, triggers a silicon controlled switch so that a relay is picked up which sounds an alarm, such as a bell or buzzer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a fragmentary perspective view of an artificially lighted room having my intruder detection system set up for operation therein, and

FIG. 2 is a schematic diagram depicting the various electrical components utilized in the circuit constituting my system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, a fragmentary portion of a typical room 10 has been pictured containing the usual concealed wall wiring denoted generally by the reference numeral 12. Two electrical outlets 14, 16 have been shown. Additionally, a toggle-type wall switch 18 has been illustrated, it serving to turn on a conventional overhead lamp (not shown), either of the incandescent or fluorescent variety. The artificial ambient light in the illustrated situation is provided by a conventional incandescent bulb or lamp 20 mounted on a lamp base 22, a portion of the lamp shade 24 having been broken away to reveal this lamp 22. The usual flexible cord 26 in this instance has its pronged plug 28 connected to the wall outlet 14. As will be better understood as the description progresses, the lamp 20 provides the artificial ambient light in this particular instance, although it might very well in practice be derived from an overhead lamp (not shown) controlled by the wall switch 18. The lamp base 22 rests on a table 30. Another item of furniture in the room 10 is a bookcase 32 containing books 34 and, for example, a stereo set 35; the use to which the bookcase 32 is put will be described presently.

Describing now my intruder detection system, denoted generally by the reference numeral 36, it will be observed from FIG. 1 that the entire system is contained in a casing 38 having an opening 40 in the front wall thereof. A parabolic reflector 42 can be viewed through the opening 40. As will be better understood hereinafter, the reflector 42 simply concentrates the ambient light so that it is focused on a photosensor yet to be referred to. In the top wall of the casing 38 is a lens 44 that passes light to indicate when the system 36 is operational. A knob 46 appears at one side of the casing 38, it being used to adjust the threshold level at which my system 36 is triggered into action. Extending from the casing 38 is an electrical cord 48 having a pronged plug 50 thereon.

Turning now to a description of FIG. 2, it will be noted from this figure that my intruder detection system 36 comprises four separate modules: (1) a power supply 52; (2) a sensor-filter 54; (3) an amplifier-detector 56, and (4) a thresholder or output circuit 58.

The power supply 52 includes the previously mentioned electrical cord 48 and its plug 50. Additionally, there is a step-down transformer 59 composed of a primary winding 60 and two secondary windings 62*a*, 62*b*. The secondary winding 62*a* connects to a first bridge rectifier 64*a*, whereas the secondary winding 62*b* connects to a similar bridge rectifier 64*b*. The rectified voltage in each instance is supplied to a filter, the filter associated with the rectifier 64*a* being labeled 66*a* and the filter associated with the rectifier 64*b* being labeled 66*b*. Both filters 66*a*, 66*b* provide a low ripple DC voltage. There is an output terminal 68*a* for the filter 66*a*, the other side simply being grounded. With respect to ground, the terminal 68*a* is normally at +12 volts. Similarly, the filter 66*b* has an output terminal 68*b* associated therewith, the other side of this filter likewise being grounded. The terminal 68*b* is normally at −12 volts. Still further, there are two additional output terminals 70, 72 which supply an alternating 12 volts. Inasmuch as a conventional household power supply is to be utilized when practicing the invention, 117 volts AC is made use of for the operation of my intruder detection system 36, the transformer 59 simply stepping down or lowering the household voltage to the usable 12 volts AC that my system 36 is designed to operate on.

Passing now to a description of the sensor-filter 54, it will first be discerned that it includes an input terminal 78. Two photo-sensing devices in the form of photocells 80, 82 are connected in series to form a voltage divider having a junction at 84. In other words, the photocell 80 is in one leg of the divider and the photocell 82 in the other leg thereof. As will presently be made manifest, the junction 84 between the two photocells 80, 82 provides a voltage signal that will be forwarded for further processing the rest of my system 36.

At this particular stage, though, it is important to understand that the photocell 80 is a primary sensor and that it is located at the focal point of the previously mentioned parabolic reflector 42, the parabolic reflector 42 being superimposed upon FIG. 2 in phantom outline. The photocell 82 functions as a reference device and is situated within the casing 38, being proximally located with respect to an auxiliary lamp 86. The lamp 86 is connected to a pair of terminals 88, 90 which are in turn connected to the previously mentioned terminals 70, 72 of the power supply module 52 so as to be energized at 12 volts. Not only does the auxiliary lamp 86 provide a reference level of light intensity, which is concomitantly influenced by any voltage excursions experienced by the household power supplied to the room 10, but it serves as a convenient on-off visual indicator to the user of my system. In this latter regard, a portion of the light emitted by the lamp 86 passes through the previously mentioned lens 44 shown in FIG. 1.

A filter, more specifically, a capacitor 94 is connected at one side to the junction 84 between the voltage divider provided by the photocells 80 and 82; this capacitor 94 blocks the passage of direct current. Additionally, it will be discerned that a resistor 96 extends from the other side of the capacitor 94 to ground. The R-C time constant provided by the resistor 96 and capacitor 94 is fairly low, thereby rendering the system insensitive to real slow signal changes. It is, of course, the 120 hertz component of the signal picked up by the photocell 80 that is significant and is passed on to the amplifier-detector 56 via the capacitor 94. Direct current components are not wanted and would be grossly misleading if forwarded; the capacitor 94 assures they are not.

At this time, a description will be given of the amplifier-detector 56. It will be observed that it includes a coupling resistor 98, this resistor being connected to the previously mentioned capacitor and resistor 94, 96. An operational amplifier indicated generally by the reference numeral 100 has a pair of power inputs 100*a*, 100*b*, a pair of signal inputs 100*c*, 100*d*, an output 100*e* and an adjustable feedback resistor 100*f* in the form of a potentiometer controlled or set through the agency of

the knob **46** shown in FIG. **1.** While operational amplifiers are now quite common, it might be mentioned that the power inputs **100***a* and **100***b* receive power from the power supply **52,** there being conductors extending from the terminals **68***a*, **68***b*. More specifically, a +12 volts is applied to the power input **100***a* and a −12 volts to the power input **100***b*. The resistor **98** is actually connected, as is evident from FIG. **2,** to the signal input **100***c*, which is the inverting input, the other signal input **100***d* being connected to ground through a resistor **101.** To provide impedance matching, the value of the resistor **101** should approximate the sum of that for the resistors **96** and **98.** It can be mentioned in passing that the ratio of the resistance of resistor **100***f* to that of resistor **98** determines the gain of the operational amplifier **100.** More will be said hereinafter concerning the gain.

The output signal from the output **100***e* of the operational amplifier **100** is delivered to an isolating transformer **102** having a primary winding **104** to which the output **100***e* is connected and a secondary winding **106.** The isolating transformer **102** also functions to step up the signal voltage at this stage, the secondary winding **106** having more turns thereon than the primary winding **104.**

The stepped up voltage from the transformer **102** is fed to a bridge rectifier **108** which converts the alternating current voltage from the secondary winding **106** to an equivalent direct current voltage, doing so in conjunction with an attached filter **110** composed of a first resistor **112,** a second resistor **114** connected to ground, and a capacitor **116** paralleling the resistor **114.**

Owing to the rectifying action supplied by the bridge rectifier **108** and the filtering action supplied by the filter **110,** a voltage signal reflecting any change in the intensity of the alternating light striking the photocell **80** is provided. The filter **110** merely smoothes out this voltage, minimizing the ripples therein, and furnishes the direct current voltage that is proportional to the AC component of the light impinging on the sensor **80** as just mentioned.

Connected to the filter **110** is a capacitor **118** which couples the resulting signal from the filter **110** to a resistor **120,** there also being a resistor **122** leading to ground; as with the resistor **96** and capacitor **94,** the resistor **122** and capacitor **118** provide a low R-C time constant so that any slow changes are not reflected in the final output. The resistor **120** is connected to a second operational amplifier **124** which has a pair of power inputs **124***a*, **124***b*, the input **124***a* being connected to the +12 volt terminal **68***a* of the power supply **52** and the input **124***b* to the −12 volt terminal **68***b*. More specifically, the resistor **120** is connected to the non-inverting input **124***d* of the amplifier **124,** the other input **124***c* being connected to ground. The output of the amplifier **124** has been labeled **124***e*. There is a feedback resistor **124***f;* the ratio of the value of resistor **124***f* to that of the resistor **125** determines the gain of the amplifier **124,** the gain being fixed in this instance in contra-distinction to the earler-mentioned gain of the amplifier **100.** There is also a resistor **125** leading to ground which, together with the resistors **124***f* and **120** provide a desired impedance match for the amplifier **124.**

The output signal from the amplifier **124** is fed to a resistor **126** leading to ground.

It will be seen that the thresholder or output circuit **58** includes a terminal **128** connected to the +12 volt terminal **68***a*. The output **124***e*, however, is electrically attached to a resistor **130** that is in turn connected to a silicon controlled switch **132,** more specifically a silicon controlled rectifier, having an anode **132***a*, cathode **132***b* and a gate **132***c*, the resistor **130** actually being connected to the gate **132***c* so as to apply a triggering voltage to this gate and thereby cause the switch **132** to become "closed" and thereby allow current to flow through its anode **132***a* and cathode **132***b* to ground.

A relay **134** is employed having a coil **134***a* in the anode circuit of the silicon controlled switch **132.** The relay **134** further includes normally open contacts **134***b* that are closed when the coil **134***a* is energized, the energization of the coil **134***a* depending upon the arming or gating of the silicon controlled switch **132.** A manual reset switch **136,** which is normally closed, is connected between the coil **134***a* of the relay **134** and the previously mentioned terminal **128.** The switch **136** is opened in order to cause the switch **132** to become reverse-biased or open.

In circuit with the contacts **134***b* of the relay **134** is an appropriate alarm, such as a bell or buzzer **140.** It will be appreciated, though, that the alarm **140** may constitute various forms, even being located at a remote vantage point, such as at a surveillance station located some distance away and connected by telephone lines.

TABLE OF PRINCIPAL COMPONENTS

Components that have been used in a working embodiment of my invention and which might be helpful to identify are:

Photocells 80, 82	Clairex 903A
Operational amplifiers 100,124	Model 741C
Silicon Controlled Rectifier 132	GE C103A
Capacitor 94,118	5 uf
Capacitor 116	10 uf
Resistor 96	1K
Resistors 101,125	5.6K
Resistors 98,120	4.7K
Resistor 112	100 Ohms
Resistor 114	10K
Resistor 122	560 Ohms
Resistor 126	500 Ohms
Resistors 124f,130	100K
Potentiometer 100f	2M

OPERATION

Having presented the foregoing description, the manner in which my intruder detection system **36** operates should be readily understandable. However, a brief recapitulation will perhaps be helpful in appreciating the full benefits to be derived from a system of this type. Assuming that the casing **38** containing my system **36** has been unobtrusively placed in the room **10,** such as on one of the shelves of the bookcase **32** and further concealed by flanking books **34,** which is to be protected or safeguarded and that the plug **50** has been inserted into the wall outlet **16,** the next step is to turn on the lamp **29,** if it has not already been turned on, (or close the switch **18** in order to energize a ceiling lamp if this is preferred). Although exposed to limited view in FIG. **1,** it will be understood that the casing **38** may be placed in almost any inconspicuous location, even behind an item of furniture, such as a chair, but some-

where where its field of view embraces the area to be protected. The lamp **20** does not have to be in the field of view; all that is required is that the field of view be illuminated by some of the light supplied by the lamp **20.** Thus, only a very small portion of the total light emanating from the lamp **20** need be received, particularly in view of the use of the parabolic reflector **42** which functions to focus any light rays entering the opening **40** onto the primary photocell **80.** With the power being supplied to the system **36** via the cord **48** and plug **50,** a small fraction of the light from the auxiliary lamp **86** is made visible through the lens **44** in order to indicate that the system is operational.

With the preliminary steps just mentioned taken care of, the next step is to adjust the value of the potentiometer or feedback resistor **100***f*, and hence the gain of the operational amplifier **100,** doing so by manipulating the adjusting knob **46** (FIG. **1**) on the side of the cabinet **38** which is connected to the wiper arm (FIG. **2**) of the resistor **100***f*. The proper gain, effected with the knob **46,** is needed in order to assure that an adequate threshold triggering voltage will be supplied to the silicon controlled switch **132,** more specifically to the gate **132***c*. The proper setting can be easily achieved by having someone walk in the vicinity of the casing **38.** One person can take care of the setting if need be by merely making an initial adjustment of the gain via the knob **46** and then walking in the vicinity of the casing **38,** successively repeating this procedure to whatever extent is necessary in order to derive the proper actuation of the alarm **140** for whatever ambient light condition then prevails within the field of view of my system **36.**

With my system conditioned as described above, it is simply left unattended and when an intruder passes in the vicinity of the system **36,** that is, within its field of view, a change in the light striking the primary sensor or photocell **80** is instrumental in changing the resistance of this sensor **80.** It will be appreciated that under these particular circumstances only the resistance of photocell **80** is modified, there being no change with respect to that of the photocell **82.** Consequently, there is a change in voltage at the junction **84** between the two photocells **80, 82** which is manifested in the magnitude of the signal passing through the capacitor **94.** The capacitor **94** passes the **120** hertz but not any direct current, so only the change in light derived from the lamp **20** is forwarded, direct current signals being blocked by the capacitor **94.** Other artificial lighting, such as from an overhead lamp, may be in the room **10,** and the system would react to the composite amount of artificial lightting, but it does so only in response to alternating or fluctuating components derived from the 60 cycle power frequency.

Thus, when the photocell **80** changes its resistance, there is a variation in the output at the junction **84** of the voltage divider comprised of the two sensors **80, 82.** On the other hand, should both photocells change together there would be no significant change in the output at the junction. In other words, when the alternating light conditions seen by the sensor **80** change, an output is produced, but if a change occurs in the line voltage, both photocells react the same because the lamp **20** will have its light output change in accordance with the changing voltage, and the auxiliary lamp **86,** receiving power from the same supply, will also change and thus there is no output from the voltage divider comprised of the two sensors **80, 82.** This latter feature is important in order to obviate the chance of having false alarms caused by local line voltage disturbances. Such disturbances can be caused by, for example, the automatic starting up of the blower motor on the household furnace.

At any rate, assuming that the change has been sensed only by the photocell **80,** the capacitor **94** passes the resulting 120 hz signal (but not any zero frequency or DC signal), forwarding this fluctuating signal to the amplifier-detector **56.** This signal is delivered to the inverting input **100**c of the operational amplifier **100.** Hence, an output signal at the output **100***e* of this amplifier is forwarded to the transformer **102** and the signal from its secondary winding **106** is impressed on the bridge rectifier **108.** After smoothing out the ripple in the rectified signal from the bridge rectifier **108,** this being done by the filter **110,** the resulting DC voltage is proportional to the AC component of the impinging light. This DC voltage will be constant if there is no change in the level of light striking the photocell **80.** On the other hand, it will be a changing DC voltage if the light striking the photocell **80** is changing (as it will do due to the passage of an intruder). The DC voltage, when changing, is really an AC signal which can be passed by the capacitor **118** to the input **124***d* of the operational amplifier **124.** Stated somewhat differently, it is differentiated by the components **118** and **122,** the R-C time constant being relatively low so as to ignore slow changes, and the resulting voltage applied to the input **124***d*. The output from the amplifier **124** is the signal used to trigger the silicon controlled switch **132,** assuming that it is of sufficient amplitude to do so. It will be recalled that the resistive value of the feedback resistor **100***f* is set or adjusted by way of the knob **46** so as to produce a sufficient voltage in accordance with the passage of a person relative to my intruder detection system **36,** more specifically with respect to the photovell **80** disposed at the focal point of the parabolic reflector **42,** so as to sound the alarm **140.**

Consequently, if the signal delivered to the gate **132***c* is sufficiently large, the switch **132** will become conductive and there will be enough current flowing through the relay coil **134***a* of the relay **134** to pick up or close the normally open contacts **134***b*, closure of these contacts energizing the bell or buzzer **140** which can be used to frighten away the intruder and/or to notify neighbors and the police. As already mentioned, a signal can be forewarded or telemetered to a central station for the purpose of alerting appropriate personnel to the unauthorized intrusion.

It is important to recognize that the entire system **36** lends itself readily to miniaturization. In an actual embodiment of the invention, the dimensions of the casing **38** were 7 inch × 7 inch × 4 inch, thereby helping my system to go unnoticed by unauthorized persons. Of course, the salient advantage stems from the fact that no beam-type transmitted is employed which would be looked for by most intruders. In this latter regard, it will be appreciated that it has become quite customary to leave at least one light on when residents of a household are away. Such precautionary measures have become known to would-be burglars, and they simply resort to various schemes in order to learn of the absence of occupants from a dwelling. Once in a lighted room, containing my system **36,** more specifically within the system's field of view, their presence is quickly detected and the alarm **140** sounded. If per chance the in-

truder does not enter the field of view embraced by my system and decides to turn off the lamp **20**, this has the same result (actually more pronounced) as if he had entered the field of view, for the reference lamp **86** will still be energized with the consequence that a large signal is produced at the junction **84**. Hence, under these conditions the alarm **140** will also be sounded.

I claim:

1. An intruder system responsive to artificial ambient light derived at least in part from a 60 cycle alternating power supply, the system comprising a photosensor disposed so as to provide an electric signal having a value representative of the amount of ambient light impinging thereon which signal contains a fluctuating component in accordance with the frequency of said power supply, means controlled only by a sufficient change in value of the fluctuating component of said electric signal to provide an output signal, a reference lamp energized from said power supply, a second photosensor disposed so as to receive light only from said reference lamp to provide an electric signal having a value representative of the amount of reference light impinging thereon, said photosensors being connected in series with a junction therebetween, and said controlled means being connected to said junction, whereby the system is sensitive to a change in ambient light derived only from said alternating current power supply when caused by an intruder and is insensitive to changes in ambient light derived from sources other than said power supply.

2. An intruder detection system comprising a photocell, a capacitor having one side connected to said photocell so as to forward an electric signal containing an alternating component variable in accordance with the frequency of artificial light derived from an alternating current power source and to block any signal derived from generally steady-state ambient light, an operational amplifier having a pair of input terminals and a feedback potentiometer to vary the gain of said amplifier, one of which terminals inverts the signal applied thereto, the output side of said capacitor being connected to said inverting terminal, an isolation transformer having its primary winding connected to the output terminal of said operational amplifier and having a secondary winding, a rectifier bridge connected to said secondary winding, a differentiating network connected to said rectifier bridge for passing a signal when the output from said rectifying bridge is changing, a second operational amplifier having a pair of input terminals, one of which is a non-inverting terminal, said non-inverting terminal being connected to said differentiating network, a resistor connected to the output terminal of said second operational amplifier, a threshold device connected to said resistor for providing an output signal when the signal obtained from said resistor is of sufficient magnitude as determined by the feedback potentiometer associated with said first amplifier, and an alarm connected to said threshold device which is energized when said threshold device is triggered into operation.

3. A system in accordance with claim **2** including a second photocell connected in series with said first photocell to provide a junction therebetween, and an auxiliary lamp connected to said alternating power source for supplying reference light to said second photocell, said capacitor being connected to said junction, whereby spurious voltages from said power source are nullified at said junction and are not transmitted through said capacitor.

4. A system in accordance with claim **3** in which said auxiliary lamp also functions as an indicating lamp.

5. A system in accordance with claim **3** including a parabolic reflector, said first photocell being located at the focal point of said reflector and said reflector having an opening via which ambient light enters to strike said first photocell.

6. An intruder system responsive to artificial ambient light at least partially provided by a lamp connected to an alternating power supply, the system comprising a first photosensor disposed so as to provide an electric signal having a value representative of the amount of ambient light impinging thereon which signal contains a fluctuating component in accordance with the frequency of said power supply, a second photosensor disposed so as to provide an electric signal having a value representative of the amount of reference light impinging thereon, said photosensors being connected in series with a junction therebetween, an auxiliary lamp disposed relative to said second photosensor to provide said reference light, said auxiliary lamp also being connected to said alternating current supply, and means connected to said junction controlled only by sufficient change in value of the fluctuating component of the electric signal provided by said first photosensor to provide an output signal, whereby the system is sensitive to a change in ambient light derived from said alternating current power supply when caused by an intruder and is insensitive to changes in ambient light derived from sources other than said power supply.

7. A system in accordance with claim **6** including a casing, said auxiliary lamp being contained in said casing.

8. A system in accordance with claim **7** in which a portion of the light from said auxiliary lamp passes through a lens in said casing so as to indicate when the system is operational.

9. An intruder system responsive to artifical ambient light derived at least in part from a conventional alternating power supply having a 60 hertz frequency, the system comprising a photosensor for receiving at least a portion of said ambient light, means in circuit with said photosensor for passing only a 120 hertz signal derived from said 60 hertz power supply which varies in magnitude depending upon the magnitude of said ambient light portion received by said photosensor, an alarm, means connected to said passing means for activating said alarm when said 120 hertz signal is below a given magnitude, an auxiliary lamp for connection to said power supply so as to furnish a reference level of light intensity, and a second photosensor responsive to only said reference level of light, said passing means being connected to both of said photosensors so that voltage changes in said power supply concomitantly influence both of said photosensors so as not to affect the magnitude of said 120 hertz signal by reason of any such voltage changes.

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