

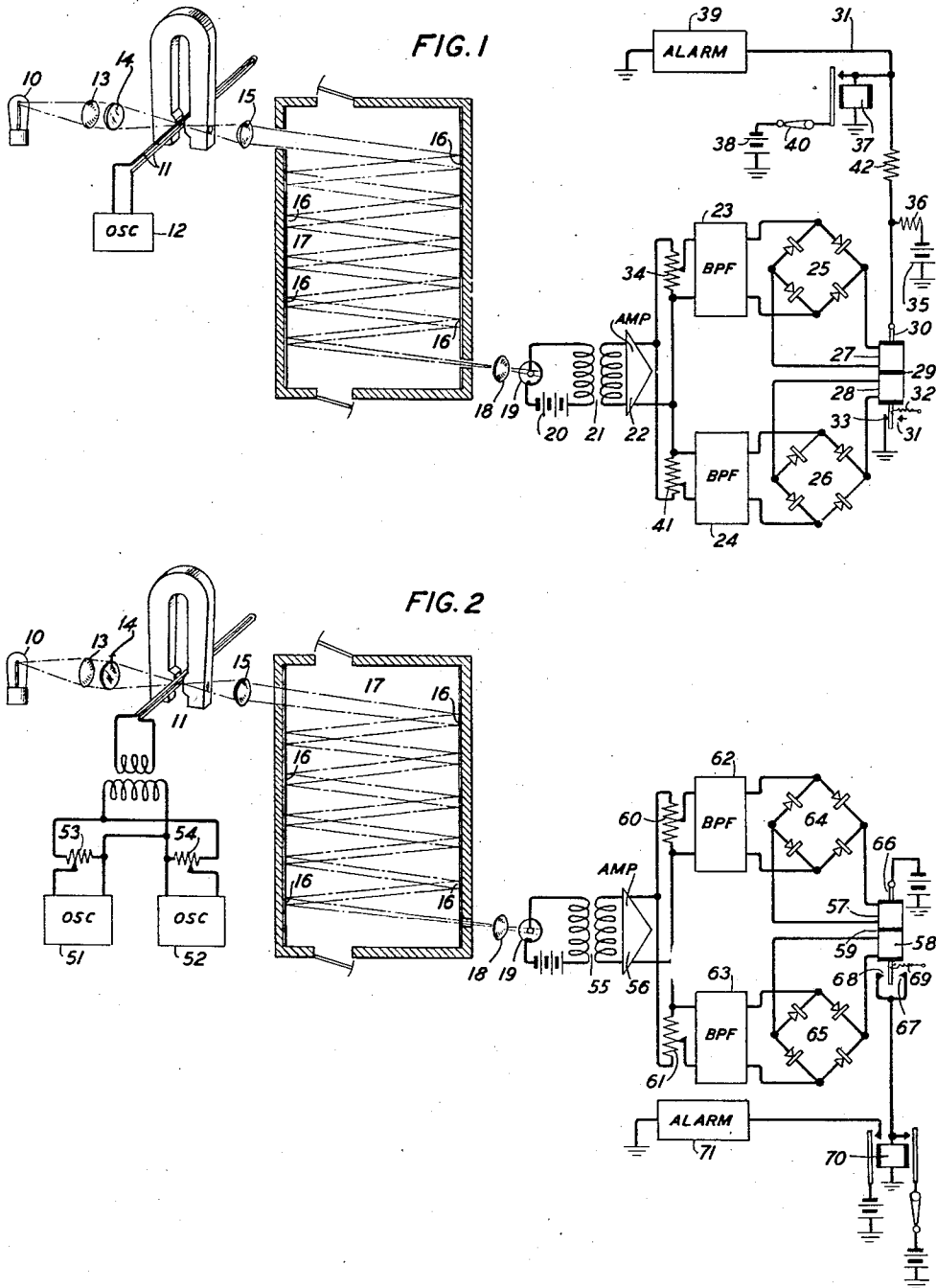
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ALARM SYSTEM

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ALARM SYSTEM

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This invention relates to signaling systems and particularly to burglar alarm systems.

The object of the invention is a system capable of protecting a large area and in which the danger of an intruder defeating the system is reduced to a minimum.

In an alarm system, according to the invention, the area to be protected is traversed by a modulated beam of energy, preferably a light beam from which the visible rays have been removed by suitable filters. The alarm mechanism is controlled by a relay normally tending to operate the alarm, but held unoperated by opposing windings associated with selective filters connected to a translating device intercepting the beam. At least one of the windings is normally energized by energy derived from the beam and any interruption or substantial variation in the modulations of the beam permits the relay to operate and sound the alarm.

In one embodiment of the invention, the beam is modulated at a single frequency and the filter associated with the winding which holds the relay unoperated is designed to pass only currents of this frequency. A second filter which excludes only currents of this frequency is connected to the other winding of the relay. Upon interruption of the beam the relay operates under the control of its own biasing means and if another source of modulated light is substituted in an attempt to hold the relay while the protected area is invaded, any components of frequencies other than the proper modulating frequency will be passed by the second filter and will aid the biasing means to operate the relay.

In an alternate construction the beam is modulated at two frequencies and at different amplitudes, the filters are tuned to the two frequencies, respectively, and the gains of the associated currents are adjusted so that the opposing windings and the biasing means hold the relay unoperated. An interruption of the beam permits the biasing means to assume control as in the previous case and a substituted beam will be ineffective unless modulated at the same two frequencies and relative amplitudes as the normal beam.

In the drawing:

Fig. 1 shows an alarm system in which the protective beam is modulated at a single frequency; and

Fig. 2 shows a modified system using two modulating frequencies of predetermined amplitudes.

In Fig. 1, a beam of light from the source 10 is modulated by a light valve 11 which is driven by an oscillator 12 generating any suitable frequency F_1 such, for example, as 500 cycles. The light valve may be of the type commonly used in film recording and the oscillator may be of the vacuum tube or other known type and is preferably of adjustable frequency, but not subject to appreciable variation for any given adjustment.

The modulated beam passed by the light valve is focussed by a lens 13 on a suitable light filter 14 which removes all visible light rays and passes a beam of infra-red or other invisible energy through the lens 15 to a series of mirrors 16 disposed about the area 17 to be protected, in such a way that no access to that area may be obtained without intercepting the beam. The use of an invisible beam makes it much easier to conceal the system and in most cases an intruder will sound the alarm before even discovering the location of the protective apparatus. By modulating the beam it is made effective over much greater distances than a steady beam so that a larger number of reflecting mirrors may be used and a greater area may be protected by a single system.

After traversing the area the beam is intercepted by the lens 18 which focusses it on the photoelectric cell 19 or other suitable translating device responsive to the particular beam used.

The device 19 passes a current varying in accordance with the modulation of the received beam from the battery 20 through the transformer 21 in the input of the amplifier 22. Connected to the output of the amplifier is a filter 23 comprising a circuit tuned to pass only the frequency F_1 at which the protective beam is modulated and a filter 24 comprising a network which rejects frequency F_1 and passes all other frequencies. These filters are preferably adjustable so that the modulating frequency F_1 may be changed from time to time to avoid the possibility of unauthorized persons learning which particular frequency is being used.

The outputs of the filters are rectified by suitable rectifiers 25 and 26 which are associated with the windings 27 and 28, respectively, of the relay 29. The relay windings oppose each other and the armature 30 is biased toward the contact 31 by the spring 32, but it is normally held on contact 33 by the energy derived from the protective beam. Under normal conditions no current flows in the winding 28 and the currents in winding 27 are adjusted by the potentiometer 34 to a value sufficient to overcome the tension of the biasing spring.

A small current normally flows from the grounded battery 35 through the resistor 36 to ground through contact 33 on the relay 29. Un-

der this condition both sides of the winding of relay 37 are grounded and the relay remains unoperated. When the protective beam is intercepted by an intruder or fails for any other reason, to actuate the device 19, the winding 27 of the relay is deenergized and the biasing spring 32 opens contact 33 on the relay 29. Whenever contact 33 is broken current flows through resistance 42 and the winding of relay 37, this relay operates and is locked up by current from the grounded battery 38 which also sounds the alarm 39 until relay 37 is released by the switch 40. Since the alarm is sounded immediately upon the breaking of contact 33 this system is very sensitive and will function on very brief interruptions of the protective beam.

With this system it is very difficult to "hold up" the alarm by means of a second light source while the intruder is entering the protected area. A steady light source such as a flashlight will obviously be ineffective since a steady current in the primary of transformer 21 produces no current in the input of amplifier 22. If the intruder uses some means for producing a modulated beam it is very unlikely that he will in the first instance choose the correct modulating frequency F_1 and currents of any other frequencies will be passed by the filter 24 to the winding 28 of the relay 29 thereby sounding the alarm. By adjusting the potentiometer 41 to give a high effective gain in the circuit supplying the winding 28 the alarm is sounded even when the correct modulating frequency is used if there is any considerable harmonic content in the modulated beam. It will also be understood that the frequency of the oscillator 12 and the constants of the filters may be changed at intervals to make it still more difficult for unauthorized persons to defeat the system.

The system of Fig. 2 is in many respects similar to the one described above and similar apparatus has been designated as in the system of Fig. 1. In Fig. 2, however, the light valve is vibrated at two frequencies F_1 and F_2 simultaneously by the oscillators 51 and 52. By means of the potentiometers 53 and 54 the two component frequencies may be adjusted to any desired relative amplitude.

The output circuit of the light sensitive device 19 includes the transformer 55 which is connected to the opposed windings 57 and 58 of the relay 59 through the amplifier 56, potentiometers 60 and 61, filters 62 and 63 and rectifiers 64 and 65, respectively. The filter 62 is tuned to pass only frequency F_1 and the filter 63 passes only frequency F_2 . The potentiometers 60 and 61 are adjusted so that the armature 66 of the relay 59 is normally held midway between the contacts 67 and 68, the effect of the current in winding 58 being sufficient to balance the current in winding 57 and the pull of the biasing spring 69.

Upon interruption of the beam the spring 69 closes the relay on contact 67 to complete the circuit of relay 70 which in operating locks up and operates the alarm 71. Similarly, any substituted steady beam or any beam modulated at

a single frequency will unbalance the relay 59 and operate the alarm and from the foregoing description it will be apparent that no substituted beam will be effective to prevent the relay 59 from closing one or other of its contacts unless it is modulated at the same two frequencies and at the same relative amplitudes as the normal beam.

While the invention has been described with reference to particular embodiments for purposes of illustration, it will be obvious that various modifications may be made within the scope of the following claims.

What is claimed is:

1. In an alarm system, a source of light projecting a beam, means for modulating the beam at a predetermined frequency, means for filtering out the visible rays of the beam, a receiving circuit including a device responsive to the beam, an alarm, operating means for the alarm, a relay normally tending to operate to cause said operating means to operate the alarm, means in the receiving circuit conductive only to currents of the modulating frequency for disabling the relay, and means responsive to currents of other frequencies in the receiving circuit for operating the relay.

2. In an alarm system, a source of light projecting a beam, means for modulating the beam at two predetermined frequencies, means for filtering out the visible rays of the beam, an alarm, a relay normally tending to operate the alarm and having opposing windings, a receiving device responsive to the beam, two output circuits for the device connected to the respective relay windings and being conductive only to currents of the respective modulating frequencies, and means for adjusting the current in one of the circuits to balance the relay in its unoperated position.

3. In an alarm system, a beam of wave energy traversing an area to be protected, means for modulating the beam at two frequencies and at different amplitudes, a translating device intercepting the beam and generating electric currents corresponding to the beam modulations, an alarm, operating means therefor, and means energized by the difference in the output of the translating device at said two frequencies normally disabling the alarm operating means.

4. In an alarm system, means for projecting across an area to be protected, a beam of energy of varying intensity, a translating device intercepting the beam and generating currents representing the beam variations, an alarm, a relay, means for biasing the relay so that it normally tends to operate the alarm, and two output circuits for the translating device connected to the relay, the first circuit having frequency selective means for passing only currents of a frequency representing normal variations in the beam and being connected to oppose the relay biasing means and the second circuit having frequency selective means offering high impedance to the currents passed by the first circuit and being connected to assist the relay biasing means.

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