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(54) Intruder alarm system

(57) The alarm system has a proximity detector 1, such as a microwave or ultrasound device, located in the region to be protected, which produces an output in accordance with the proximity of an intruder. When an intruder is detected, a siren 4 is activated to produce an alarm sound that can be heard by the intruder. The alarm sound increases in volume if the intruder approaches closer to the detector 1 and decreases if the intruder retreats. If the intruder comes within a close distance R_2 of the detector 1, the alarm sound remains at high volume regardless of any subsequent retreat. Instead of, or in addition to varying the volume, the pitch of the alarm sound can be varied as the intruder approaches or retreats. A visual alarm, such as a light 40 may be used which flashes at a frequency that varies as the intruder approaches or retreats.

Fig.1.

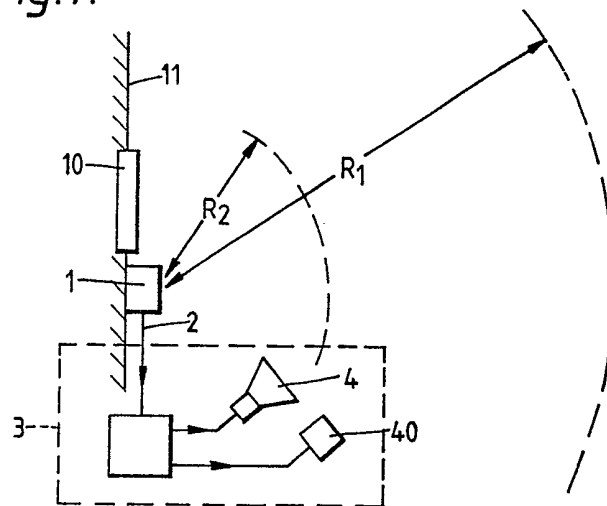


Fig. 1.

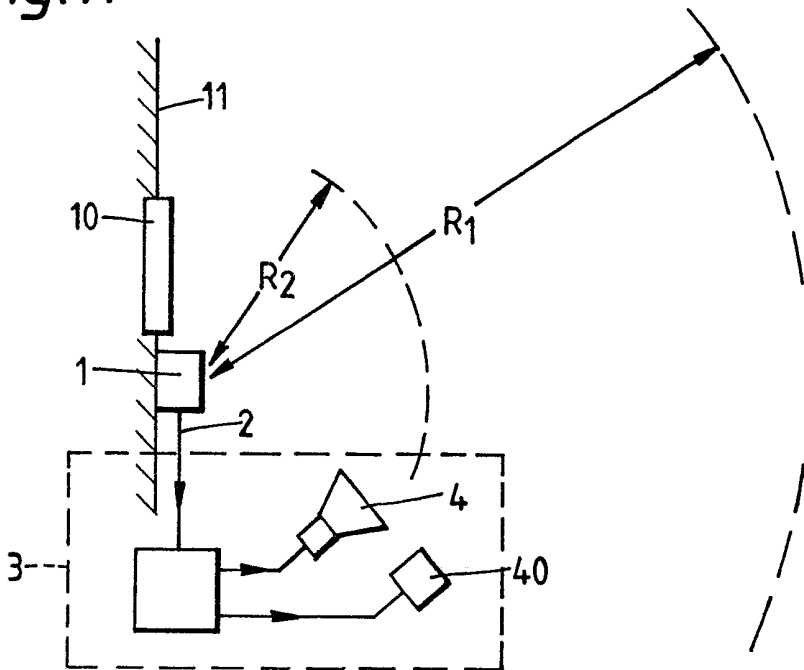
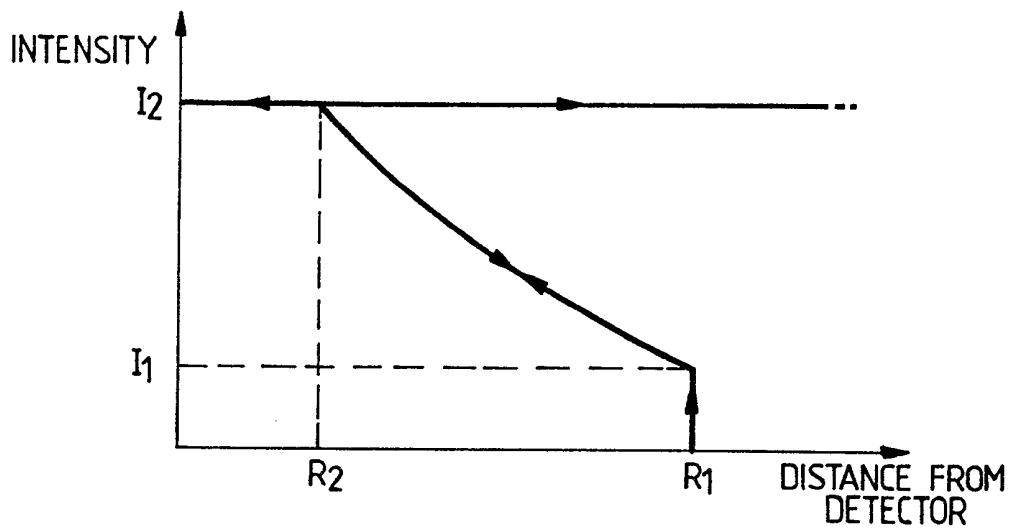


Fig. 2.



SPECIFICATION

Intruder alarm systems and methods of deterring intruders

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This invention relates to intruder alarm systems and to methods of deterring intruders.

Intruder alarm systems include some form of means for detecting the presence of an intruder and means for generating an alarm in response to the detected presence of the intruder.

The means for detecting the intruder may be, for example, a switch that is activated when a door or window is opened or broken, a pressure-responsive pad, a light beam that is interrupted by the presence of an intruder, or an ultra-sound or microwave device that responds to energy reflected by the intruder. Alternatively, the infra-red radiation radiated by an intruder may be detected. All these previous devices are arranged to be triggered as soon as the intruder's presence is detected and to produce a constant alarm signal for alerting a guard or neighbours of the presence of the intruder. In some alarm systems the alarm signal is only produced remotely, such as at a police station so as not to alert the intruder.

The problem with such intruder alarm systems is that they only generally respond after the intrusion has occurred which may still leave the intruder time to remove valuables before the arrival of the police. Once the system has been triggered, the intruder has little to lose by quickly taking any items of value that are immediately to hand. Also, the damage of forced entry will not have been prevented and its attendant psychological trauma to the victim. Intruder alarm systems, furthermore, are often prone to false alarms and, once triggered remain on until switched off by a key holder. This causes disturbance to neighbours; repeated false alarms may deter anyone hearing the alarm from summoning the police. Also, local noise regulations may be breached by such alarms.

It is an object of the present invention to provide an intruder alarm system that can be used to alleviate the above-mentioned problems and can deter intrusion.

According to one aspect of the present invention there is provided an intruder alarm system including proximity detector means arranged to detect the proximity of an intruder and to produce an output signal that varies in accordance with change in proximity, and means for producing an alarm signal that can be perceived by said intruder, wherein over at least a predetermined range of distances of the intruder from the proximity detector means, the alarm signal increases in intensity as the intruder comes closer to the detector means and reduces in intensity as the intruder retreats away from the detector.

The alarm system may be arranged such that, if the intruder approaches closer than the closest distance in said predetermined range, the alarm signal remains at a high intensity regardless of any subsequent movement of the intruder to distances further from the detector means.

The alarm signal producing means may be arranged to generate an audible signal which increases in amplitude and, or alternatively, pitch as the intruder

comes closer. The alarm signal producing means may include means for generating a visible alarm signal which may be a flashing light, the frequency of flashing of the light increasing as the intruder comes closer and reducing as the intruder retreats.

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The proximity detector means may include means for directing ultrasound energy towards the intruder and means for responding to the intruder's effect on said ultrasound energy. The proximity detector means may include means for directing microwave energy towards the intruder and means for responding to the intruder's effect on said microwave energy.

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According to another aspect of the present invention there is provided a method of deterring an intruder including the steps of detecting the proximity of the intruder, producing an alarm signal that can be perceived by the intruder, increasing the intensity of the alarm signal as the intruder approaches a protected region over at least a predetermined range of distances, and reducing the intensity of the alarm signal as the intruder retreats away from the protected region.

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The intensity of the alarm signal may be maintained high if the intruder approaches closer than a predetermined distance, regardless of any subsequent movement of the intruder to greater distances.

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An intruder alarm system and its method of operation, in accordance with the present invention, will now be described, by way of example, with reference to the accompanying drawing, in which:

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Figure 1 shows the alarm system schematically; and

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Figure 2 illustrates the performance of the alarm system.

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The intruder alarm system comprises a proximity detector 1 that supplies output signals via a line 2 to an alarm signal generating unit 3, which may be mounted in the same casing as the proximity detector.

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The proximity detector 1 is mounted close to the region to be protected, such as the window 10 of a building 11, and is arranged to respond to the presence of an intruder close to this region. The proximity detector 1 is preferably a microwave or ultrasound device of the kind that generates a beam of energy and responds to energy reflected by objects within the beam. Alternatively, the detector 1 may be a passive device that detects infra-red energy radiated by an intruder. Several types of detector could be used together. The detector 1 provides an output on line 2 as soon as an intruder approaches within a distance R_1 of the detector. This output is received by the alarm signal generating unit 3 which produces an audible output from a siren 4 at a relatively low level I_1 , as shown in *Figure 2*. The siren 4 is mounted so that it can be heard by the intruder.

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If the intruder approaches closer to the detector 1, its output varies causing the unit 3 to increase the volume of siren 4, in the manner shown in *Figure 2*. In this respect, the proximity detector 1 may produce a pulsed output and respond to the time of travel of the pulse after reflection from the intruder so as to derive an indication of his proximity. Alternatively, the detector may respond to the amplitude of reflec-

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ted signals which increase as the intruder approaches closer.

The intensity I of the output of the siren 4 increases as the intruder approaches close to a distance R_2 from the detector 1. Similarly, if the intruder retreats away from the detector 1 the siren 4 will become quieter until it becomes silent when the intruder is outside the distance R_1 . If the intruder should approach closer than the distance R_2 , the siren 4 will remain on at its maximum intensity, regardless of any subsequent retreat by the intruder.

Many modifications are possible to the intruder alarm discussed above.

Instead of using a detector of the kind described, the alarm could include a plurality of discrete detectors responsive to the presence of an intruder in adjacent regions. In one example, the detectors could take the form of a row of pressure-sensitive pads along a corridor in front of a door to be protected, alternatively, light beams could be arranged to be broken one after the other as the intruder approaches.

In general, the invention relies on an alarm signal that varies in intensity in accordance with change in proximity. In this respect, a change in "intensity" is intended to cover changes in any property of an alarm signal that alter how apparent it is to the intruder. For example, where an audible alarm signal is used, its intensity can be increased by increasing either its volume or its pitch (or both) so that it becomes more and more audible. Instead of, or in addition to, an audible signal, a visible signal may be produced by a lamp 40. The intensity of the lamp 40 may be varied by varying either its luminosity, its colour or by flashing at different frequencies.

The advantage of the present invention relies on the fact that the intruder will rapidly become aware that, if he approaches closer, the alarm signal is going to increase in intensity, thereby increasing his chances of being apprehended, whereas if he retreats he can silence the alarm. This encourages the intruder to withdraw and reduces the risk of damage caused by forced entry.

False alarms are also reduced by this invention since they will generally only be transient and of low intensity.

CLAIMS

1. An intruder alarm system including proximity detector means arranged to detect the proximity of an intruder and to produce an output signal that varies in accordance with change in proximity, and means for producing an alarm signal that can be perceived by the intruder, wherein over at least a predetermined range of distances of the intruder from the proximity detector means, the alarm signal increase in intensity as the intruder comes closer to the detector means and reduces in intensity as the intruder retreats away from the detector.

2. An intruder alarm system according to Claim 1, wherein the system is arranged such that, if the intruder approaches closer than the closest distance in said predetermined range, the alarm signal remains at high intensity regardless of any subsequent

movement of the intruder to distances further from the detector means.

3. An intruder alarm system according to Claim 1 or 2, wherein the alarm signal producing means is arranged to generate an audible signal.

4. An intruder alarm system according to Claim 3, wherein the alarm system is arranged to increase the amplitude of the audible signal as the intruder comes closer.

5. An intruder alarm system according to Claim 3 or 4, wherein the alarm system is arranged to increase the pitch of the audible signal as the intruder comes closer.

6. An intruder alarm system according to any one of the preceding claims, wherein the alarm signal producing means includes means for generating a visible alarm signal.

7. An intruder alarm system according to Claim 6, wherein the means for generating a visible alarm signal is a flashing light, and wherein the frequency of flashing of the light increases as the intruder comes closer and reduces as the intruder retreats.

8. An intruder alarm system according to any one of the preceding claims, wherein the proximity detector means includes means for directing ultrasound energy towards the intruder and means for responding to the intruder's effect on said ultrasound energy.

9. An intruder alarm system according to any one of the preceding claims, wherein the proximity detector means includes means for directing microwave energy towards the intruder and means for responding to the intruder's effect on said microwave energy.

10. A method of deterring an intruder including the steps of detecting the proximity of the intruder, producing an alarm signal that can be perceived by the intruder, increasing the intensity of the alarm signal as the intruder approaches a protected region over at least a predetermined range of distances, and reducing the intensity of the alarm signal as the intruder retreats away from the protected region.

11. A method according to Claim 10, wherein the intensity of the alarm signal is maintained high if the intruder approaches closer than a predetermined distance, regardless of any subsequent movement of the intruder to greater distances.

12. An intruder alarm system substantially as hereinbefore described with reference to the accompanying drawings.

13. A method of deterring intruders substantially as hereinbefore described with reference to the accompanying drawings.

14. Any novel feature or combination of features as hereinbefore described.