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(54) Video surveillance system.

(57) A security system for use in identification and surveillance, particularly at night in dark conditions, wherein a plurality of infra-red emitting devices are adapted to be mounted so as to illuminate an area to be subject to surveillance by one or more cameras or viewing devices of a type sensitive to infra-red light.

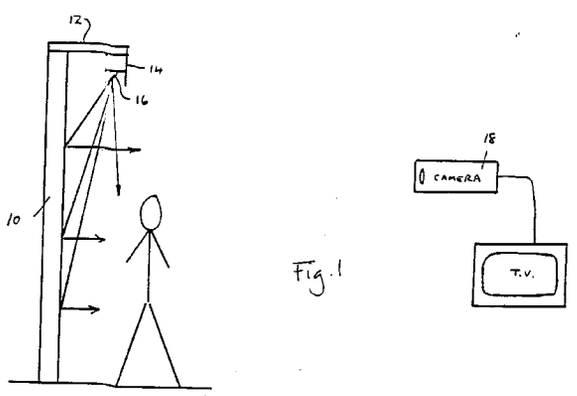

Fig.1

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The present invention is concerned with security systems for use in both commercial and domestic situations.

Security systems increasingly make use of cameras and special viewing devices, such as night vision goggles (NVG), to provide remote viewing of perimeter fencing, entrance gates, and the like.

It is an object of the present invention to provide such a security system which is capable of improved performance compared to conventional systems of this type.

In accordance with one aspect of the present invention, there is provided a security system comprising one or more cameras or viewing devices of a type sensitive to infra-red (IR) light, and a plurality of infra-red emitting devices adapted to be mounted so as to illuminate with IR an area to be subject to surveillance by the camera(s) or viewing device(s).

Preferably, the infra-red emitting devices are infra-red emitting diodes (IRLEDs).

In one embodiment, a plurality of IRLEDs are mounted in a length of conduit and fitted along the top, or upper region, of a fence or wall in such a way that the IR light shines generally downwards so as to be at least partially reflected forward towards the camera(s) or viewing device(s) from the fence or wall.

Advantageously, the IRLEDs are mounted in a sealed conduit using a waterproof seal, such as one of those described in European Application No. 91304471.5 (Publ. No. 0474330) to which reference is hereby directed for structure details.

Preferably, the power distribution to the IRLEDs is carried out at low voltages via a battery (usually 12 or 18 volts d.c.) or low voltage a.c., such as 24v a.c. By using a low voltage a.c. supply, contactless power pickup to the conduit can be obtained by the use of a transformer coupling to the main power supply.

The invention also provides a housing containing a plurality of infra-red emitting devices which, when the housing is disposed at a region to be surveilled, are adapted to illuminate the region with IR light.

Advantageously, the housing can be in the form of a rigid, semi-rigid or flexible conduit or tube in which the infra-red emitting devices are mounted.

For outside use, the infra-red emitting devices are preferably mounted in the conduit or tube in a waterproof manner.

One particular area in which, for security reasons, there is often a requirement to photograph or view persons in a covert manner is in connection with automatic telling machines, such as cash dispensing machines. The increasing amount of fraud at cash dispensing machines has led security experts to consider means to photograph each person who makes a transaction at a machine.

In accordance with one embodiment of the present invention this problem is solved by incorporating infra-red emitting devices (e.g. IRLEDs) in the surround or within the control/display panel of a cash dispenser in such a way as to be covert. Thus, the position and number of such infra-red emitting devices is arranged to be hidden to the cash dispenser user.

The camera which is used to photograph users of the cash machine illuminated by the IR light can be incorporated within the housing of the cash dispenser itself or at another location in the vicinity of that housing. In the event that the camera is located within the housing it is preferably adapted to take pictures of the transactor through the wall of the housing.

The latter wall is preferably provided with a plurality of windows and means to operate the security camera to record an image through a selected window. Means may be provided to move the camera to a selected window or means can be provided to select images received through one or more of the windows for onward processing. The windows are preferably pinhole lenses.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 illustrates highly diagrammatically one embodiment of a security system in accordance with the present invention;

Fig. 2 illustrates how shielding of a direct coupling of the infra-red light from the IRLEDs to the camera can be obtained;

Fig. 3 is a diagrammatic perspective view of an automatic teller machine incorporating an embodiment of the present invention; and

Fig. 4 is a diagram of a panel fitted to the front of the machine of Fig. 3.

Fig. 1 shows a perimeter wall or fencing 10 having mounted along its upper edge, on a flanged bracket 12, a strip 14 of infra-red LEDs (IRLEDs) 16. The IRLEDs 16 can be mounted discretely in a rigid or flexible housing or, preferably are predisposed in a flexible conduit which can be laid onto the bracket 12, with or without an additional housing, so that the plurality of IRLEDs contained within the conduit illuminate the region to one side (right-hand side in Fig. 1) of the wall/fencing 10. As shown in Fig. 1 part of the IR light is reflected from the wall/fencing and redirected towards the camera(s) 18 located to one side of the surveillance area. By virtue of this arrangement, an intruder walking in front of the fence/wall 10 at night is brightly silhouetted against the background IR illumination when viewed with the camera.

For outside use, the IRLEDs should preferably be mounted in the conduit in a sealed manner, using a waterproof seal, such as that described in our above mentioned European Application No. 91304471.5 (0474330).

It is also preferred for the power distribution to the IRLEDs to be at low voltage for safety reasons, with waterproof connections between lengths of conduit, if there is more that one such length. One suitable low

voltage can be 28 v a.c. In the case of the use of such a low voltage a.c. supply, it is then possible to drive the IRLEDs by way of a miniature transformer coupling from a single wire loop of a main, higher voltage supply. An advantageous feature of the latter arrangement is that this provides a contactless power pick-up for the IRLEDs which is inherently corrosion proof and reliable. Particularly in the case of very long perimeter fencing where many sections of IRLEDs are required, this provides a particularly attractive feature to prevent connector problems which could compromise the integrity of the security system.

Some fencing/wall materials, such as wood, do reflect infra-red efficiently so that, for example, a standard wooden lap fence provides a suitable back reflector for the infra-red light from the IRLEDs. However, many other fencing/wall materials, such as brick or concrete, do not reflect infra-red as efficiently. In these cases, special IR reflective paint can be used on the wall/fence surface to reflect the IR forward.

Because the camera(s) 18 have automatic light level adjustment, it is important to prevent the IRLEDs shining directly at the camera(s). This can be prevented by the use of a suitable shield around at least part of the IRLEDs, such as that shown in Fig. 2 where a skirt 20 depends from the conduit/housing so as to provide a barrier preventing direct communication between the IRLEDs and the camera(s).

It is emphasised that the invention is not limited to the particular disposition of the IRLEDs shown in Fig. 1 nor to the particular method of mounting the IRLEDs shown in this drawing.

In the illustrated embodiment, the housing is described as being in the form of a flexible conduit in which the IRLEDs are mounted. In other embodiments the housing can be in the form of a rigid, or semi-rigid elongate tube into the wall of which the plurality of infra-red emitting diodes are incorporated or mounted.

In the latter case, the intention is that, in use, the tube will be mounted in the ground in the manner of an upright post so as to illuminate with IR an area or region around the post. The illuminated area can then be surveilled using an infra-red sensitive camera or cameras as described hereinbefore.

The cross-sectional profile of the tube is not limited to any particular shape but is preferably circular so that the IR light is emitted uniformly around the post.

In one embodiment, the pipe is about 4 inches (10 cms) in diameter and of the order of 2-3 feet (60-90 cms) long, with approximately 3-6 LEDs arranged around the circumference every few centimetres or so along the length. The top of the pipe is closed by a cover which can, if required, project laterally somewhat beyond the pipe wall in the manner of a "hat".

Power for the IRLEDs can be supplied either via a low voltage supply from a mains transformer or using internal batteries.

Preferably, the pipe is made of a plastics material.

A particular situation in which, for security reasons, there is often a requirement to photograph or view persons in a covert manner is in connection with money transaction machines, such as automatic teller machines (ATM), otherwise known as cash machines.

Such machines are used by customers of banks, building societies and similar institutions to make transactions with the bank, society or institution, many of which involve the withdrawal of cash. The increasing amount of fraud at cash dispensing machines has led security experts to consider means to photograph each person who makes a transaction at a machine, bearing in mind that, advantageously, this should be covert and equally that the face of the person should be well illuminated to produce a high definition photographic image for identification purposes. ATMs are commonly installed either in well lit lobbies within bank or building society premises or are wall mounted externally on the street. The level of local lighting, particularly for these wall mounted machines, varies widely from almost total darkness at night to areas which are very well lit.

This problem can be solved utilising the present invention by incorporating infra-red emitting devices (e.g. IRLEDs) in the surround or within the control/display panel of a cash dispenser in such a way as to be covert. Thus, the position and number of such infra-red emitting devices is arranged to be hidden to the cash dispenser user.

In one embodiment, for example, a plurality of such infra-red emitting devices are positioned and distributed over a wide area within the cash dispenser surround and/or control panel to make it very difficult for a fraudster to mask them (if the fraudster discovers their location). The latter devices can be covered, for example, by an infra-red transmitting but visibly opaque plastics which hides their precise location.

The infra-red illumination provided by said devices has the advantage that it does not blind the normal person making use of the machine. The camera or cameras which are used to photograph users of the cash machine illuminated by the IR light can be incorporated within the housing of the cash dispenser itself or at another location in the vicinity of that housing. In the event that the camera is located within the housing it is preferably adapted to take pictures of the transactor through the wall of the housing.

The latter wall is preferably provided with a plurality of windows and means to operate the security camera to record an image through a selected window. Means may be provided to move the camera to a selected window or means can be provided to select images received through one or more of the windows

for onward processing. The windows are preferably pinhole lenses.

Referring now to Figs. 3 and 4, there is illustrated one embodiment of an ATM incorporating a security camera arranged as described above. A counter 22 at waist level contains a control panel 23. Close to and above this control panel there is a card receiver slot 24 and a cash dispensing slot or slots 25. Above these there is an upper panel 26 whose front is both lit from behind and printed with the bank or society's logo and name. The lower half of this panel provides conventional illumination to the operating counter.

The panel 26 has installed behind it a "Black-Lite" Unit consisting of a surface filter 29 which blocks natural and artificial light and behind which is a plurality of IR LEDs (infra-red light emitting diodes) 31 and a further array of similar sized apertures 32 through which a camera 27 is enabled to view the customer at the ATM. A typical arrangement of the LEDs 31 and apertures 32 is illustrated in Fig. 4.

The camera is mounted for stepping along a track 28 so that it can be placed behind selected apertures 32 in turn, the stepping being controlled by an operator or automatically at suitable intervals.

The camera 27 can be any suitable type, including those using photographic film and video cameras. Especially suitable is a CCTV camera including a pinhole lens and a solid state recording plate with a suitable electronic scanning mechanism and data processing apparatus to provide a digital signal. Since these detectors are simple and cheap, it may be practical to provide a fixed detector for each window 32 and to select the window providing the image for searching by energizing a selected detector. In this case no physical camera movement is required.

The latter apparatus thus provides a number of camera positional options, its own independent covert illumination system and a selective filter to ensure that the customer is viewed in "Black-Lite" only, regardless of external conditions. This permanent and stable level of covert illumination enables cameras to be preset to a required level of picture quality thus no longer requiring the need to fit expensive automatic iris equipment.

This ATM "Black-Lite" unit is thus totally self-contained and operates to a consistently high standard regardless of the vagaries in artificial or normal light. It is thus not susceptible to random sunlight, car headlights and similar fluctuations in light level.

The surface filter 29 of the panel is designed only to pass IR wavelengths close to those of the LEDs thus providing a simple photographic device for the purpose.

The camera output can be compared with a reference value and control the operation of the ATM, so that if the camera fails to take a suitable image, the customer's ATM transaction would be automatically aborted, the card retained and cash dispensation stopped.

The digital signal output from the camera may be processed in the normal way either at the machine or in the bank or, perhaps more advantageously, at some centralised security location. The fitting of these "Black-Lite" units will ensure that every normal ATM transaction is recorded from the moment of card insertion to the removal of cash or statement. The automatic matching of picture image and card information will link the customer to the card for future reference.

In a still further application of the invention, one or more infra-red emitting devices are arranged adjacent to or around a camera and/or night vision device in a door, or adjacent wall structure, to provide covert illumination which enables the viewer to check on the authenticity of the caller using the camera or night vision device.

It will be noted that such infra-red illumination can be used at day or night or even when normal illumination is used, because the camera can be designed to be particularly sensitive to infra-red over visible ambient, either by the use of the appropriate sensitive elements such as CCD (silicon charge coupled devices) or by the use of optical filters to attenuate the visible but not the infra-red or by other means.

Claims

1. An infra-red light source for a security system, said light source comprising a housing containing an array of infra-red emitting devices, which, when the housing is disposed at a region to be surveilled, are adapted to illuminate the region with infra-red light.

2. A security system characterised by one or more cameras or viewing devices of a type sensitive to infra-red (IR) light, and an array of infra-red emitting devices adapted to be mounted so as to illuminate with IR an area to be subject to surveillance by the camera(s) or viewing device(s).

3. A security system as claimed in claim 2, wherein the infra-red emitting devices are infra-red emitting diodes (IRLEDs).

4. A security system as claimed in claim 3, wherein a plurality of IRLEDs are mounted in a common housing so that, when the housing is mounted at a region to be surveilled, the IRLEDs illuminate the region with IR light.

5. A security system as claimed in claim 4, wherein the housing is in the form of a flexible or rigid elongate conduit in which the IRLEDs are mounted.

6. A security system as claimed in claim 5, in which the conduit is adapted to be fitted along the top, or upper region, of a fence or wall in such a way that the IR light shines generally downwards so as to be at least partially reflected forward towards the camera(s) or viewing device(s) by the fence or wall.

7. A security system as claimed in claim 5 or 6, in which the IRLEDs are sealed within the conduit in a waterproof manner.

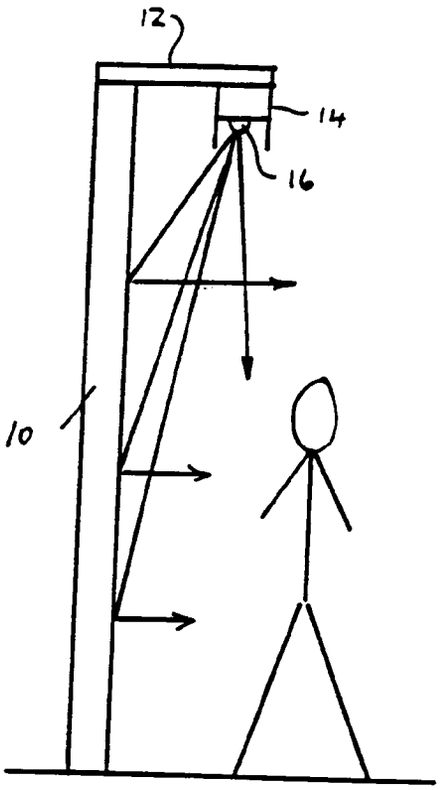
8. A security system as claimed in any of claims 3 to 7, wherein power distribution to the IRLEDs is carried out at low voltage via a contactless coupling arrangement, with a higher voltage power supply.

9. A security system as claimed in claim 4, wherein the housing is in the form of a rigid or semi-rigid elongate tube into the wall of which the plurality of infra-red emitting diodes are incorporated or mounted.

10. A security system as claimed in claim 2, wherein a plurality of said infra-red emitting devices are incorporated in the surround or within the control/display panel of a cash dispenser in such a way as to be covert, whereby the position and number of such infra-red emitting devices is hidden to the cash dispenser user.

11. A security system as claimed in claim 10, wherein said plurality of infra-red emitting devices are positioned and distributed over a wide area within the cash dispenser surround and/or control panel and covered by an infra-red transmitting, but visibly opaque material, which hides their precise location to the cash dispenser user.

12. A security system as claimed in claim 2, wherein one or more of said infra-red emitting devices are arranged adjacent to or around the camera or a night vision viewing device in a door, or adjacent wall structure, to provide covert illumination which enables the viewer to check on the authenticity of a caller using the camera or a night vision viewing device.



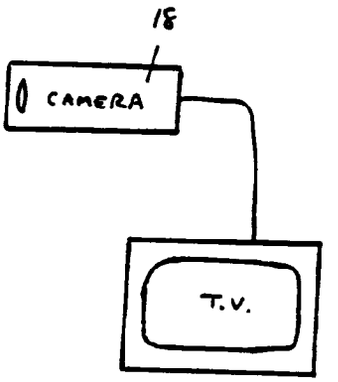


Fig. 1

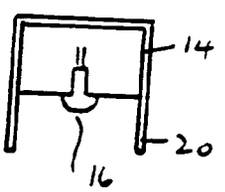


Fig. 2

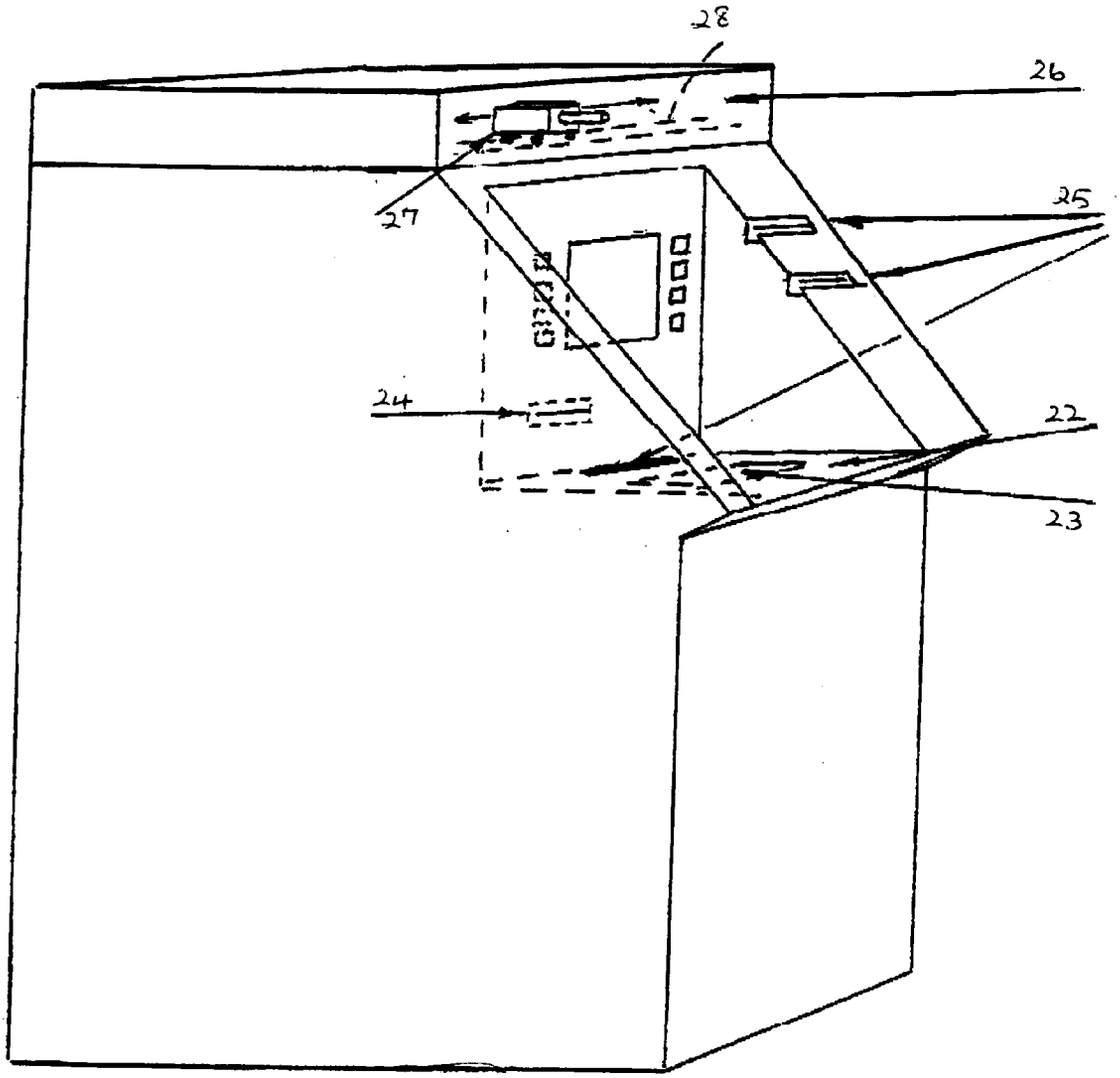


Fig. 3

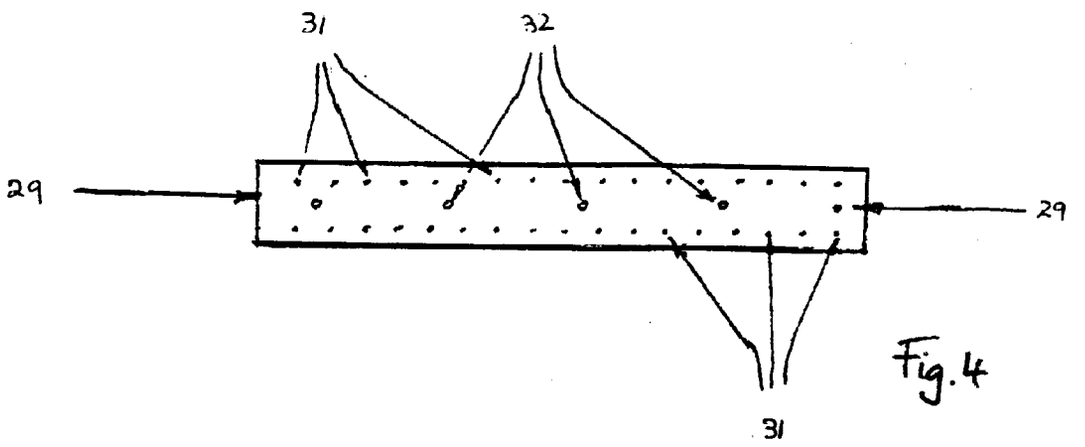


Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 0031

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 8, no. 221 (E-271)(1658) 9 October 1984 & JP-A-59 104 869 (MITSUBISHI DENKI) 16 June 1984 * abstract *	1,2	G08B13/196
D,P, A	EP-A-0 474 330 (OXLEY) * abstract; figure 9 *	3,7	
A	BE-A-754 296 (FINANCIERE DES APPLICATIONS DE L`ECTRICITE) * page 2, line 1 - line 4; figure 1 * * page 4, line 6 - line 14 *	3,7	
A	US-A-4 479 053 (JOHNSTON) * column 3, line 59 - column 4, line 6; figure 2 *	3	
A	DE-U-8 910 680 (SIEMENS) * page 3, line 22 - line 37; figure 2 *	4	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	EP-A-0 126 955 (KRAFTWERK UNION) * abstract; figure 1 *	6	G08B F21V H04N
A	EP-A-0 230 671 (CAMPS ET AL) * abstract; figure 1 *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	24 MARCH 1993	J. Breusing

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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