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(54) **Method and apparatus for simultaneously actuating navigational lanterns.**

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US-A- 3 781 853
US-A- 4 132 983

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Description

Navigational lighting systems in many locations are not easily accessible, must operate with high reliability in order to provide safety, and be autonomously powered. The electrical power, which is generally batteries, and the lamps are conserved by operating only at night, and are turned off in the daytime by light sensors.

In order to avoid possible ambiguity to mariners, it is desirable to have all lanterns marking a channel, hazard, or structure to light or flash at the same time at dusk, and to extinguish simultaneously at dawn. This is difficult to accomplish by independent light sensing devices connected to each of the lanterns because (1) abvailable light sensors are difficult to calibrate, compensate, and do not track each other well, (2) in extreme northern and southern latitudes, the transition from night to day may be quite slow, thereby causing lanterns only slightly out of calibration to light and extinguish far apart from each other in time, and (3) shading of the light sensor by other structurs causes orientation sensitivity and sensitivity to the sun angle.

Prior art document US-A 4 132 983 discloses a warning light system constructed of an array of flashable, warning lights. The warning lights are self-contained, battery powered warning lights that may be arranged in an array and controlled to flash simultaneously. Each warning light includes individual transceiving means for transmitting a coded, radio frequency signal to each other light of an array and a receiving radio frequency signal from each other light of the array to cause each lamp of each light to flash on and off in synchronism. Each light has a built- in transceiving antenna arranged within the light lens assembly and completely housed therein.

In prior art document US-A 3 781 853, a navigational light system is disclosed in which all of the lanterns flash in unison and are actuated by a synchronizing signal initiated by the first lantern to be actuated. That system synchronized all of the navigational lights and insured that in the event one of the lanterns failed, the remainder of the lanterns would operate.

However, the present systems utilize a single light mesuring threshold point at the output of the light sensors to define the boundary between day and night. If the output of the sensor is above the threshold (day condition), flashing of the lantern is inhibited, and if below the threshold (night conditions), flashing is enabled. All of the lanterns send synchronizing pulses at the beginning of each flash code sequence to all of the lanterns to actuate all of the lanterns that are not inhibited.

It is an object of the present invention to provide an improved system and method for synchronizing a plurality of navigational lanterns by compensating for the fact that the independent light sensors connected to each of the lanterns respond differently to the light levels as well as allow the system to operate even in the event of a light level sensor failure.

The present invention provides a system and a method as defined in claims 1 and 7 to solve this object.

The navigational lanterns are each equipped with an idependent light level sensing means and each sensing means measures the thresholds between day, twilight and night. When a sensor is measuring day, its connected lantern is disabled from flashing and the connected lantern is disabled from providing a synronising signal to the other lanterns. When a sensor measures twilight, the connected lantern is enabled, so as to flash if a synchronization signal is received from other lanterns, but is disabled from providing a synchronizing signal to other lanterns. And if a sensor measures night, the connected lantern is enabled and provides a synchronizing signal to operate itself and the other lanterns.

In a first embodiment of the present invention the navigational lantern system has a plurality of navigational lanterns in which each lantern includes means for providing a synchronizing signal to actuate a lantern and each lantern includes a synchronizing terminal and the input and output from each lantern is connected to the synchronizing terminal of the other lanterns in the system and in which each lantern has an improved light level sensing means. Each light level sensing means senses the thresholds of day, twilight and night. Means are connected to each sensing means, when the sensing means senses day, for disabling the connected lantern and disabling the means for providing a synchronizing signal from the connected lantern. Means are also connected to the sensing means, when the sensing means senses twilight, enabling the connected lantern to receive a synchronizing signal, but disabling the means for providing a synchronizing signal from the connected lantern. And means are connected to each sensing means, when the sensing means senses night, enabling the connected lantern for lighting and enables the means for providing a synchronizing signal from the connected lantern to the other lanterns.

In a second embodiment of the present invention the sensing means includes a photo-detector having a resistance which varies inversely proportional to the light intensity. Means are connected to the photodetector transmitting electric current thereto and means are connected to the photodetector for measuring three different levels of light illuminating the photodetector.

The method of synchronizing a plurality of navigational lanterns at dawn and dusk includes sensing at each of the lanterns the levels of day, twilight and night, when each of the lanterns senses day, disabling the day sensing lantern, and when each of the lanterns senses twilight, enabling the lantern to flash but only if the lantern receives a synchronization signal from another lantern. And each of the lanterns when it senses night, enables and flashes the lantern and also sends the synchronization signal to the other lanterns to flash.

Other and further objects, features and advantages will be apparent from the following description of the presently preferred embodiment of the invention, given for the purpose of disclosure and taken in conjunction with the accompanying drawings, in which:

Figure 1 is a truth table indicating the response of a sensor to various levels of surrounding illumination,

Figure 2 is a chart illustrating the operation of a plurality of lanterns utilizing light level sensors which respond differently to the light level,

Figure 3 is a graph illustrating the response of a plurality of lanterns having independent light sensors with varying responses in which one of the light sensors has failed in a mode indicating a day condition,

Figure 4 is a graph illustrating the response of a plurality of navigational lanterns having independent light sensors with varying responses in which one of the light sensors has failed in a mode continuously indicating a night condition,

Figure 5 is an electrical schematic diagram illustrating one type of structure for implementing the present invention, and

Figure 6 is an electrical schematic diagram illustrating another structure for implementing the present invention.

Referring now to document US-A 3 781 853 which is incorporated herein by reference, a portion of a navigational light system is shown in which all of the lanterns are connected together to a synchronizing terminal to aid the lanterns to flash in unison. Each lantern is independent and is equipped with an independent light-sensing means such as the daylight control. In that system, a single threshold point at the output of the light sensor defines the boundary between night and day. In that system, if the output of the light level sensing means is above the threshold (day condition) then flashing of the lanterns is inhibited. If the output is below the threshold (night condition) flashing is enabled and also the connected lantern sends a synchronizing pulse to flash the other lanterns if their light level sensors are sensing night. As has been indicated above, it is difficult to calibrate all of the independent light sensors to simultaneously detect the threshold between day and night. Therefore, it is difficult to obtain the simultaneous operation of all of the lanterns in the system to light at the same time at dusk and to extinguish simultaneously at dawn.

In the present method and system, two thresholds are established, defining each of the sensors' output into three regions referred to a night, twilight and day. Each lantern flashes at night when its sensor detects night and is extinguished during the day if its light sensor senses daylight. However, when a sensor's output falls between the two thresholds (twilight), a lantern will be enabled so that it will flash only if a synchronizing pulse is received. A lantern measuring the twilight condition will not send synchronizing pulses to the other lanterns. The spacing between the two thresholds is selected to establish the desired width of the twilight region and is preferably set slightly wider than the spread of the individual sensor outputs of the individual lanterns caused by the factors which create a difference in response between the individual light sensors. As previously indicated, the difference is caused by (1) the individual light sensors are difficult to calibrate, compensate and do not track each other well, (2) in extreme northern and southern latitudes, the transition from night to day may be quite slow causing the sensor's response to be apart from each other in time, and (3) shading of one or more sensors by other structures causes changes in the sensor output due to orientation sensitivity and sensitivity to sun angles.

In order to accomplish the method and function of the present invention, as best seen in Figure 1, a truth table, generally indicated by the reference numeral 10 indicates the output or response of each individual light level sensor to the measured condition of day 12, twilight 14, and night 16. That is, the output or response to the light level sensor when it measures day is the response 18 which indicates that the connected lantern never flashes or sends a synchronizing signal. In response to a measurement of the twilight 14, the output of the measuring light level sensor is 20 which indicates that the lantern is enabled to flash but only when a synchronizing signal is received from other lanterns and the lantern is inhibited from sending a synchronizing signal to the other lanterns. And as indicated in response block 22, when the light level sensor senses night 16, the connected lantern will be enabled, will flash, and will send a synchronizing signal to the other lanterns so that they will simultaneously flash if they are not inhibited.

Referring now to Fig. 2, a plurality of lanterns, such as four for illustration only, are connected in a navigational system and are designated as lantern 1, lantern 2, lantern 3 and lantern 4. Each of the lanterns has an independent light level sensor suitable for measuring light intensities corresponding to day 24, twilight 26 and night 28. A twilight 26 output can be either dawn or dusk. For purposes of illustration, the individual light level sensors output for each of the individual lanterns is indicated by an arrow. Thus, the sensor of lantern 1 has an output 30 indicating that the sensor of lantern 1 is measuring a twilight light intensity. The sensor of lantern 2 as indicated by arrow 32 is measuring a night light level. The sensor of lantern 3 as indicated by the arrow 34 is measuring twilight and the sensor of lantern 4 as indicated by the arrow 36 is measuring a twilight light level. Under the conditions indicated in Figure 2, assuming the light is going from dusk to night and referring to the truth table in Figure 1, the sensor levels 30, 34 and 36 are all in the twilight zone whereby the sensors of lanterns 1, 3 and 4 are enabled to flash, but only if a synchronizing signal is received from another lantern and lanterns 1, 2 and 4 will not send synchronizing signals. However, since the sensor of lantern 2 has a level 32 in the night zone, lantern 2 will flash, and will send synchronizing signals to lanterns 1, 3 and 4. Therefore, all of the lanterns will flash in synchronism because of the sensor level 32 of lantern 2. As night continues to fall, the sensors of lanterns 1, 3 and 4 will eventually measure a night level 28 and therefore all of the lanterns will send a synchronizing signal and the first synchronizing signal will cause all of the lanterns to flash in unison.

On the other hand, assuming that the navigational light system of Figure 2 is moving from a night condition to a day condition, all of the lanterns 1, 2, 3 and 4 would flash in synchronism until the last sensor, the sensor of lantern 2, moves out of the night 28 condition into the twilight 26 condition at which time all of the lanterns would be extinguished as no synchronization pulses would be generated.

It is desirable that the width of the measured twilight region 26 be set slightly wider than the spread of the individual sensor outputs 30, 32, 34 and 36 so that one sensor output will not be measuring night while another is measuring day. If the width of the region 26 is wider than the individual sensor outputs, then the system will always operate in unison.

It is also important that the system be constructed and operated so that a failure in one or more of the level light sensors does not unduly affect the operation of the system.

Referring now to Figure 3, the operation of which is similar to that in Figure 2 with the exception that lantern 4 has a sensor which has failed and has a level 36a giving an erroneous "day" indication at all times. Again, the operation of the system in Figure 3 is the same as the operation of the system in Figure 2 with the exception that lantern 4 remains off at all times. Again, the system will flash and light lanterns 1, 2 and 3 when the light level sensor of lantern 2 detects a level 32 in the night zone 28. And on changing from night to day when the last sensor here, the sensor of lantern 2 moves out of the night zone 28 all of the lanterns 1, 2 and 3 will extinguish as there will be no synchronization pulses from any of the sensors.

Referring now to Figure 4, a system is shown in which the sensor of lantern No. 4 has failed and has an output reading of 36b at all times to give an erroneous "night" reading. A failure of this type causes all of the lanterns 1, 2 and 3 to begin flashing as soon as its independent sensor output crosses from the day zone 24 to the twilight zone 26. Thus, under the sensor levels indicated in Figure 4, lanterns 1 and 2 would be flashing due to the synchronous signals sent out by the sensor of lantern 4 but since the sensor of lantern 3 has a level 34 still in the daylight zone 24, then lantern 3 would not be simultaneously flashing with the other lanterns. Similarly, assuming that night is turning into day, the lanterns 1, 2 and 3 would continue to flash until their sensors sense the daylight zone 24 in which case they would be extinguished. Therefore a failure of the type shown in Figure 4 will cause the simultaneously on/off feature not to function, but it will not be any more disadvantageous than the present-day systems.

There are various possible implementations of the method and operation previously described.

Referring now to Figure 5, one type of structure is best seen having a flasher 40 such as one sold under the trademark SYNCHROSTAT by Tideland Signal Corporation for flashing a conventional navigational light 42. The flasher 40 includes and enable input port 44 for allowing operation of the flasher 40 or inhibiting the operation of the flasher 40. The flasher 40 also includes a synchronous input port 45 which is connected to a system synchronous line or terminal 46 to the remainder of the lanterns in the system for receiving an actuating pulse from other lanterns or from the flasher 40. That is the flasher 40 also includes a synchronous output 48 which is connected to the input of an NAND gate 50 for providing a synchronous signal which is transmitted both to the synchronous terminal 46 and to the input port 45 of the flasher 40.

A light level sensing means is generally indicated by the reference numeral 52 and includes a photodetector 54 which is a variable resistance device in which the resistance is inversely proportional to the incident light intensity. An electrical current source 56 supplies current through the photodetector to cause a voltage to appear at node 60 according to the IR drop across the current source 56. Resistors R1, R2 and R3 form a voltage divider establishing fixed voltages at nodes 62, and 63. During the "daylight" hours, the voltage at node 60 is lower than the voltage at nodes 62 and 64. This daylight condition causes the voltage comparators 66 and 68 to produce a logic low voltage at nodes 70 and 72, respectively. The logic low of node 72 is applied to the enable port 44 of the flasher 40 causing the flasher 40 to remain inactive.

As day changes toward night, the resistance of the photodetector 5 increases and the voltage at node 60 eventually exceeds the voltage at node 64 which causes the comparator 68 to change state thereby driving node 72 to HIGH. This is the twilight condition. A logic HIGH at the enable port 44 of the flasher 40 will cause the flasher 40 to initiate a flash code sequence upon receipt of a synchronization pulse on the synchronous port 45. Therefore, if another lantern in the system provides a synchronization signal to terminal 46, the lantern in the twilight condition will flash. However, any synchronous output from the port 48 is not gated through NAND gate 50 to the terminal 46.

When the night condition is measured by the photodetector 54, its resistance is high enough to drive the voltage at node 60 above that at node 62. This causes voltage comparetor 66 to change state, thereby driving node 70 to HIGH. This, in turn, gates a sync out signal from port 48 through the NAND gate 50 to the sync terminal 46 for transmission to the other lanterns.

Another implementation of the invention is best seen in Figure 6 having a photodetector 54a connected to a current source 56a to provide a voltage output at node 60a which is proportional to the light intensity encountered by the photodetector 54a. The voltage at node 60a is transmitted through an analog to digital converter 80 to provide a digital signal which is transmitted over a computer address/data buss 82 to a microprocessor 84 which is connected to a memory 86. The microprocessor 84 compares the digital representation of the allumination level measured by the photodetector 54a relative to the daylight, twilight and night thresholds stored in the memory 86. The truth table shown in Figure 2 is implemented in the microprocessor 84 and memory 86 to inhibit the switch 88 in the event of a daylight signal, to enable the switch 88 in the event of a twilight signal and to send out a synchronous pulse signal from the output 90 to the synchronizing terminal 46a and to receive pulses on the input port 92.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as other inherent therein.

Claims

1. A navigational lantern system having a plurality of navigational lanterns (42, 42a), each lantern including means (44) for sending and receiving a synchronizing signal to and from other lanterns, characterized in that a light level sensing means (54, 54a) sensing the thresholds of day, twilight, and night, is connected to each lantern (42, 42a), wherein each of said light level sensing means comprises a device (52, 88) connected to each sensing means, and each device:
- when the connected sensing means (54, 54a) senses day, disables the connected lantern (42, 42a) and its means for sending a synchronizing signal,
- when the connected sensing means (54, 54a) senses twilight, enables the connected lantern (42, 42a) to receive a synchronizing signal, but disables the connected lantern's means (44) from sending a synchronizing signal, and
- when the connected sensing means (54, 54a) senses night, enables the connected lantern (42, 42a) and enables the connected lantern's means (44) for sending a synchronizing signal.

2. The system according to claim 1, characterized in that said device is formed by switch means (88).

3. The system according to claim 1 or 2, characterized in that the sensing means (54, 54a) includes:
a photodetector (54, 54a) having a resistance which varies inversely proportional to the light intensity, and
means (52) connected to the photodetector (54, 54a) for measuring the three different levels of light illumination on the photodetector (54, 54a).

4. The system according to anyone of claims 1 to 3, characterized in that the width of the twilight measurement is wide enough to preclude one sensor output measuring night while another sensor output is measuring day.

5. The system according to claim 1 or 4 characterized in that each lantern (42, 42a) includes a synchronizing terminal for actuating the lantern, and that the input and output from each lantern is connected to the synchronizing terminal of the other lanterns.

6. The system according to claim 5, characterized in that the width of the twilight measurement is greater than the spread of the outputs of the individual light level sensing means (54, 54a).

7. A method of synchronizing a plurality of navigational lanterns (42, 42a) at dawn and dusk comprising steps of:
- sensing at each of the lanterns (42, 42a) the levels of day, twilight, and night, and
- disabling, when a lantern (42, 42a) senses day,
characterized by the further comprising steps of:
- enabling, when a lantern (42, 42a) senses twilight, the lantern (42, 42a) to flash but only if the lantern (42, 42a) receives a synchronization signal from another lantern, and
- enabling and flashing, when the lantern (42, 42a) senses night, the lantern and sending a synchronization signal to the other lanterns to flash.

8. The method of claim 7, characterized in that sensing the levels of day and night is performed such that while one lantern (42, 42a) senses day, another lantern will not measure night.

Revendications

1. Un système de feux de signalisation pour la navigation, comportant une pluralité de feux de signalisation (42, 42a) pour la navigation, chaque feu de signalisation comportant des moyens (44) pour émettre et recevoir un signal de synchronisation de et à partir d'autres feux de signalisation, caractérisé en ce que des moyens (54, 54a) de détection de niveau de lumière, détectant les seuils de jour, de crépuscule et de nuit, sont reliés à chaque feu de signalisation (42, 42a), chacun desdits moyens de détection de niveau de lumière comportant un dispositif (52, 88) relié à chacun des moyens de détection, et chaque dispositif:
- met hors circuit le feu de signalisation relié (42, 42a) et ses moyens pour émettre un signal de synchronisation, lorsque les moyens de détection reliés (54, 54a) détectent le jour,
- met en circuit le feu de signalisation relié (42, 42a) pour recevoir un signal de synchronisation, mais met hors circuit les moyens (44) du feu de signalisation reliés pour empêcher que celui-ci émette un signal de synchronisation, lorsque les moyens de détection reliés (54, 54a) détectent le crépuscule, et
- met en circuit le feu de signalisation relié (42, 42a) et met en circuit les moyens (44) du feu de signalisation relié pour l'émission d'un signal de synchronisation lorsque les moyens de détection reliés (54, 54a) détectent la nuit.

2. Le système selon la revendication 1, caractérisé en ce que ledit dispositif est formé par des moyens de commutation (88).

3. Le système selon la revendication 1 ou 2, caractérisé en ce que les moyens de détection (54, 54a) comportent:
un photodétecteur (54, 54a) présentant une résistance qui varie de façon inversement proportionnelle avec l'intensité de la lumière, et des moyens (52) reliés au photodétecteur (54, 54a) pour mesurer les trois niveaux différents d'éclairement par la lumière sur le photodétecteur (54, 54a).

4. Le système selon l'une quelconque des revendications 1 à 3, caractérisé en ce que la largeur de la mesure de crépuscule est suffisamment importante pour empêcher qu'une sortie de détecteur mesure la nuit tandis qu'une autre sortie de détecteur mesure le jour.

5. Le système selon la revendication 1 ou 4, caractérisé en ce que chaque feu de signalisation (42, 42a) comporte une borne de synchronisation pour actionner le feu de signalisation, et en ce que l'entrée et la sortie de chaque feu de signalisation sont reliées à la borne de synchronisation des autres feux de signalisation.

6. Le système selon la revendication 5, caractérisé en ce que la largeur de la mesure du crépuscule est supérieure à la largeur des sorties des moyens individuels de détection de niveau de lumière (54, 54a).

7. Un procédé pour synchroniser une pluralité de feux de signalisation (42, 42a) pour la navigation, à l'aube et au crépuscule, comportant les phases consistant à:

– détecter à chacun des feux de signalisation (42, 42a) les niveaux de jour, de crépuscule et de nuit, et

– mettre hors circuit un feu de signalisation (42, 42a) lorsqu'il détecte le jour,

caractérisé par les phases supplémentaires consistant à:

– lorsqu'un feu de signalisation (42, 42a) détecte le crépuscule, mettre en circuit le feu de signalisation (42, 42a) pour qu'il éclaire seulement si le feu de signalisation (42, 42a) reçoit un signal de synchronisation provenant d'un autre feu de signalisation, et

– lorsque le feu (42, 42a) détecte la nuit, mettre en circuit et faire éclairer le feu de signalisation et envoyer un signal de synchronisation vers les autres feux de signalisation pour qu'ils éclairent.

8. Le procédé selon la revendication 7, caractérisé en ce que la détection des niveaux de jour et de nuit est exécutée de telle manière que, lorsqu'un feu de signalisation (42, 42a) détecte le jour, un autre feu de signalisation ne mesure pas la nuit.

Patentansprüche

1. Navigationslampensystem mit mehreren Navigationslampen (42, 42a), von denen jede eine Einrichtung (44) zum Senden und Empfangen eines Synchronisiersignales zu und von anderen Lampen hat, dadurch gekennzeichnet, daß eine Lichtpegelsensoreinrichtung (54, 54a), die die Pegel von Tages-, Zwie- und Nachtlicht erfaßt, mit jeder Lampe (42, 42a) verbunden ist, wobei jede Lichtpegelsensoreinrichtung eine Vorrichtung (52, 88) aufweist, die mit jeder Sensoreinrichtung verbunden ist, und jede Vorrichtung:

– wenn die verbundene Sensoreinrichtung (54, 54a) Tageslicht erfaßt, die verbundene Lampe (42, 42a) und deren Einrichtung zum Senden eines Synchronisiersignales abschaltet,

– wenn die verbundene Sensoreinrichtung (54, 54a) Zwielicht erfaßt, die verbundene Lampe (42, 42a) einschaltet, um ein Synchronisiersignal zum empfangen, jedoch die Einrichtung der verbundenen Lampe vom Senden eines Synchronisiersignales abschaltet, und

– wenn die verbundene Sensoreinrichtung (54, 54a) Nachtlicht erfaßt, die verbundene Lampe (42, 42a) einschaltet und die Einrichtung der verbundenen Lampe zum Senden eines Synchronisiersignales einschaltet.

2. System nach Anspruch 1, dadurch gekennzeichnet, daß die Vorrichtung durch eine Schaltereinrichtung (88) gebildet ist.

3. System nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Sensoreinrichtung (54, 54a) aufweist:

einen Photodetektor (54, 54a) mit einem Widerstandswert, der sich umgekehrt proportional zur Lichtstärke ändert, und

eine Einrichtung (52), die mit dem Photodetektor (54, 54a) verbunden ist, um die drei verschiedenen Pegel der Lichtbeleuchtung auf dem Photodetektor (54, 54a) zu messen.

4. System nach einem der Ansprüche 1 bis 3 dadurch gekennzeichnet, daß die Weite der Zwielichtmessung weit genug ist, um ein Ausgangssignal eines Nachtlicht messenden Sensors auszuschließen, während ein anderes Sensor-Ausgangssignal Tageslicht mißt.

5. System nach Anspruch 1 oder 4, dadurch gekennzeichnet, daß jede Lampe (42, 42a) einen Synchronisieranschluß zum Betätigen der Lampe aufweist, und daß der Eingang und Ausgang von jeder Lampe mit dem Synchronisieranschluß der anderen Lampen verbunden ist.

6. System nach Anspruch 5, dadurch gekennzeichnet, daß die Weite der Zwielichtmessung größer ist als die Streuung der Ausgangssignale der einzelnen Lichtpegelsensoreinrichtungen (54, 54a).

7. Verfahren zum Synchronisieren einer Vielzahl von Navigationslampen (42, 42a) bei Morgendämmerung und Abenddämmerung mit den folgenden Verfahrensschritten:

– Erfassen an jeder der Lampen (42, 42a) der Pegel von Tages-, Zwie- und Nachtlicht und

– Abschalten, wenn eine Lampe (42, 42a) Tageslicht erfaßt,

gekennzeichnet durch die weiteren Verfahrensschritte von:

– wenn eine Lampe (42, 42a) Zwielicht erfaßt, Einschalten der Lampe (42, 42a) zum Aufleuchten, jedoch nur, falls die Lampe (42, 42a) ein Synchronisationssignal von einer anderen Lampe empfängt, und

– wenn die Lampe (42, 42a) Nachtlicht erfaßt, Einschalten und Aufleuchten der Lampe und Senden eines Synchronisationssignales zu den anderen Lampen, um (diese) aufzuleuchten.

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß das Erfassen der Pegel von Tages- und Nachtlicht derart durchgeführt wird, daß, während eine Lampe (42, 42a) Tageslicht erfaßt, eine andere Lampe nicht Nachtlicht mißt.

Fig. 1

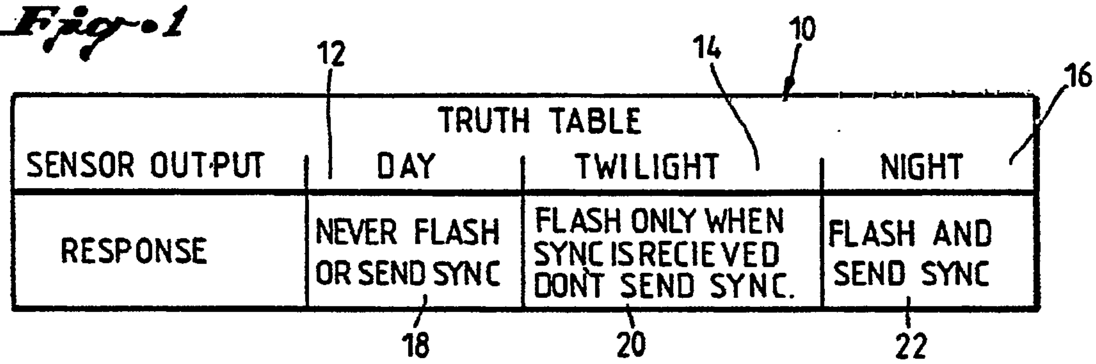


Fig. 2

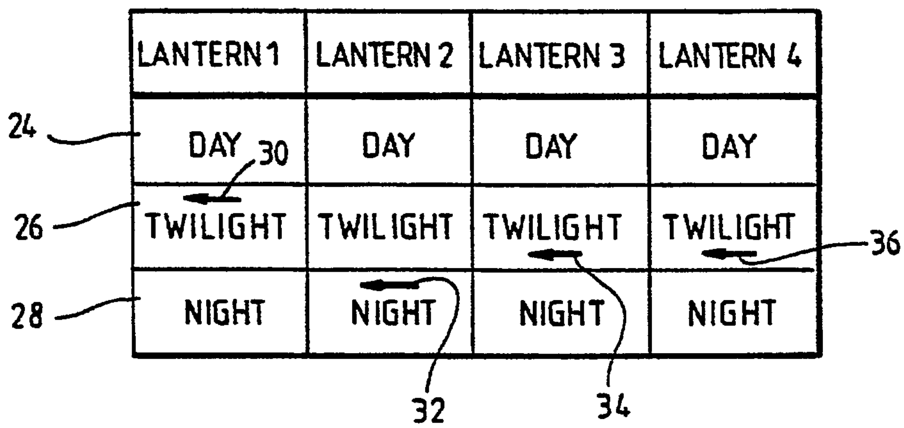


Fig. 3

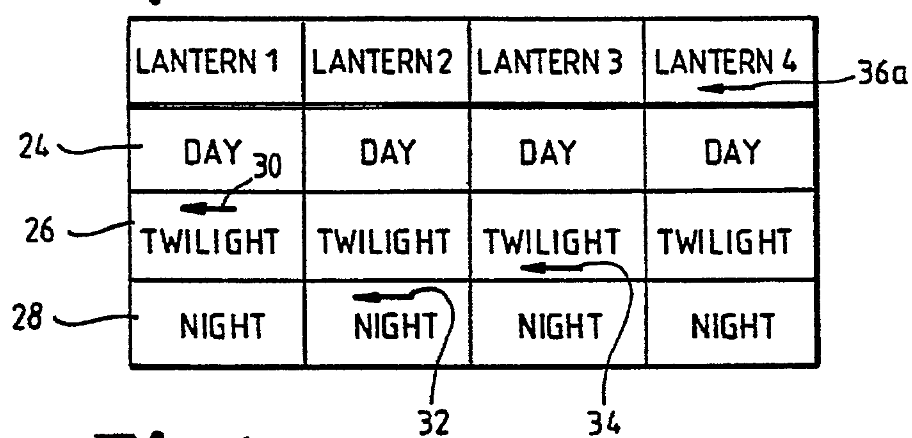


Fig. 4

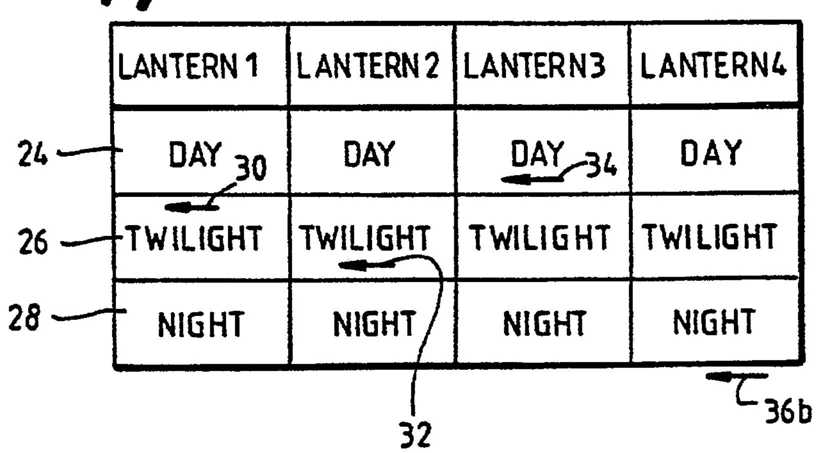
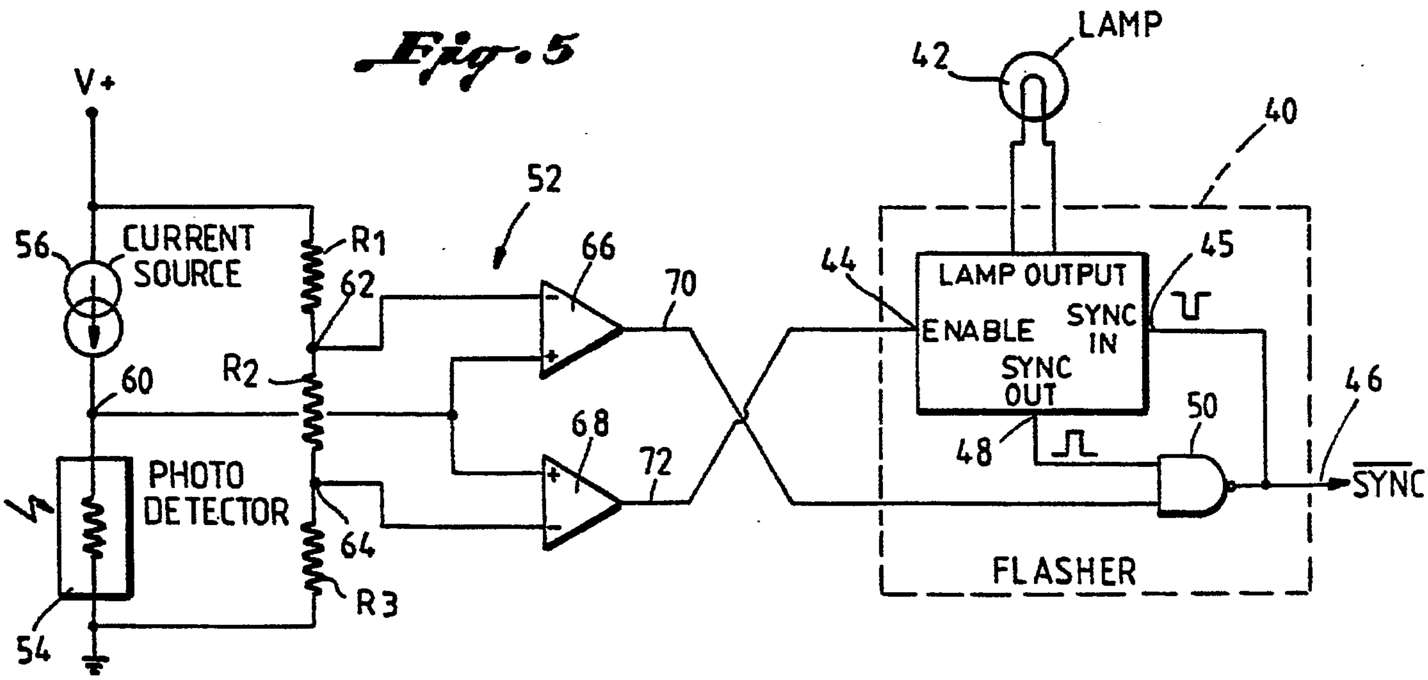


Fig. 5


V+
56
CURRENT SOURCE
R1
62
R2
60
PHOTO DETECTOR
64
R3
54
52
66
68
70
72
44
LAMP
42
40
LAMP OUTPUT
ENABLE
SYNC IN
SYNC OUT
45
48
50
46
SYNC
FLASHER

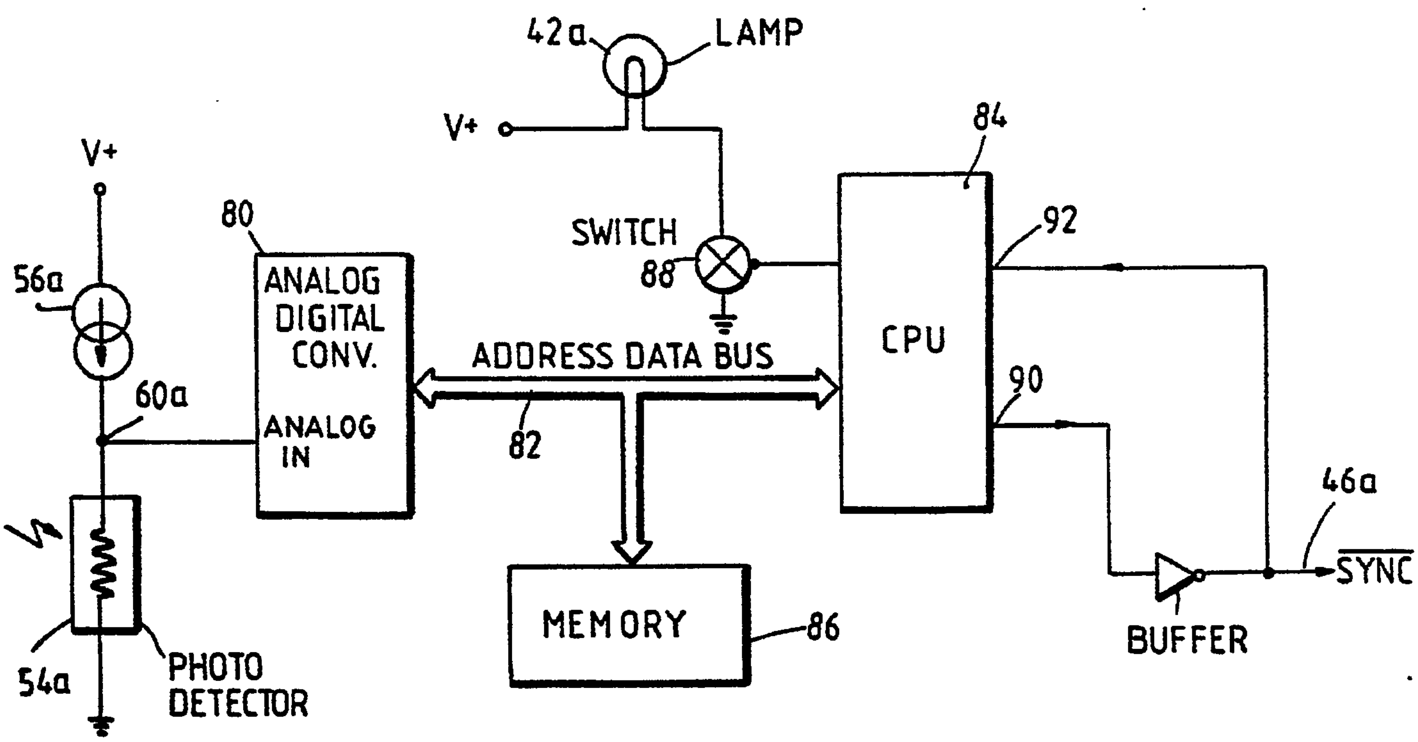

42a
LAMP
V+
V+
56a
60a
54a
PHOTO DETECTOR
80
ANALOG DIGITAL CONV.
ANALOG IN
ADDRESS DATA BUS
82
SWITCH
88
84
CPU
92
90
MEMORY
86
46a
SYNC
BUFFER

Fig. 6