(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 465 463 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.10.2004 Bulletin 2004/41

(51) Int Cl.[7]: **H05B 37/03**

(21) Application number: **04394017.0**

(22) Date of filing: **01.04.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **01.04.2003 IE 20030240**

(71) Applicant: **Noontek Limited**
Country Mayo (IE)

(72) Inventors:
- **Noone, Sean**
  Belmullet County Mayo (IE)
- **Quinlan, Michael**
  County Limerick (IE)

(74) Representative: **O'Connor, Donal Henry**
c/o Cruickshank & Co.,
1 Holles Street
Dublin 2 (IE)

(54) A street lighting system

(57) A public lighting system (1) is provided which has a central controller (10) capable of accepting and delivering text messages to operate the lighting system (1). In the embodiment illustrated, each lamp assembly (5) comprises a lamp (2) and a monitoring station (3) which incorporates a GPS transmitter (25). Further, some of the lamp assemblies (5) include a further transmitter (30) for the delivery of messages for display on signage (34-37) or for delivery of messages to and from motorcars (35).

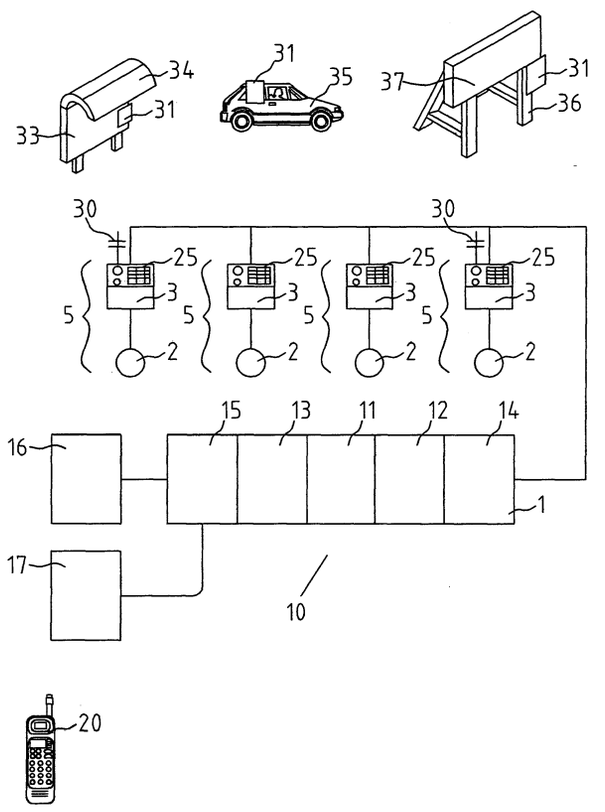

Fig. 3

EP 1 465 463 A1

Description

Introduction

[0001] The present invention relates to a public lighting system comprising a central controller for operating and monitoring a plurality of lamp assemblies, each lamp assembly comprising a lamp and a monitoring station, each comprising lamp control and data acquisition modules. It also relates to a method of operating such a public lighting system..

[0002] There are certain problems with public lighting networks in that currently, the testing of public lighting networks is carried out, either visually, in other words, to see is the actual particular lamp or lamps operating correctly, and or alternatively, by cycling the power to the lamps. Needless to say, visual inspection can only be done at night and cycling the power to cause the lamps to temporarily light is both time consuming and difficult as it requires access to inspection covers, photoelectric cells where such are fitted, and so on. The more sophisticated the lamp control system is, the more difficult it is to carry out routine monitoring and control. When, for example, repairs have been made or lamps replaced, it is necessary for some inspector or supervisor to check that the work has been done correctly. Again, this can be time consuming and difficult to do, often requiring the input of many personnel.

[0003] Generaily, as stated above, such a public lighting network comprises a lighting control system of the type comprising a central controller for operating and monitoring the lamps including the provision of lamp and system operating data and comprising at least one monitoring station in communication with one or more of the lamps. With such a sophisticated system, it is possible to carry out many tests and other monitoring operations both before and after maintenance, however, such tasks very often require the presence of somebody at the lamp in question. Many of the tasks cannot be carried out totally remotely but do require that there be some human intervention.

[0004] A further problem when people have to access specific lamps for inspection is that only limited tests can be carried out so that only scant data on lamp performance is provided. Generally, any control system will consist of a network which embodies a lamp equipped with means of monitoring power usage, lamp voltage, ballast temperature, general lamp and ballast status, and any other data that is important to system operation, for example, the number of hours the lamp was lit at full intensity where lamp dimming is part of the control operation or indeed any other data. An example of such a system is sold under the Trade Name SELC 2000 Ballast (manufactured by SELC Ireland Limited, County Mayo, Ireland) which combines ballast and monitoring functions.

[0005] Generally, a monitoring station is connected to one or more lamps to provide the necessary functionality. individual monitoring devices can be connected to each lamp and in turn, the monitoring devices may be connected to further monitoring devices and finally to a base station.

[0006] For example, it is known to use SMS messages to control equipment, such as, for example, switchgear, as described in PCT Patent Specification No. WO 02/054749 (Westphal Mussgnug & Partner). In this specification, there is described a control and/or monitoring device comprising switchgear having a plurality of input terminals and/or output terminals which can be interrogated or controlled according to control commands supplied to the switchgear. Said switchgear is coupled to an SMS receiver device, for example, a mobile phone and then the switchgear is provided with a decoding device for converting a received SMS into a control command by means of predefined switch functions. Similarly, monitoring tasks can be carried out. While this has been applied to, for example, switchgear, heretofore it has not been applied to what are, in some ways, the more important element of control, namely that of a public lighting system.

[0007] There are specific problems inherent in the operation of public lighting systems. If one considers a lamp and its associated ballast and lamp control and data acquisition modules as a unit, they are relatively inexpensive, however, there is a large number of them. Further, in any particular area, there is a large number of such lamps and each one has to be individually tracked and tested on a regular basis. It is very important when reports of any malfunctioning of a particular lamp is received, that the actual lamp causing the difficulty can be identified and located. A further problem also arises in that with such lamps, the ancillary control equipment and indeed the whole lamp unit itself, is often replaced, from time to time, by personnel and thus, unless a very accurate record is kept of the particular lamp unit at a particular location, the management of such lamps very quickly becomes difficult in the sense that nobody is aware as to what particular equipment or unit is at any particular location. It is almost certainly correct to suggest that with the constant replacement of units and other equipment in public lighting systems, the tracing of the location of any particular item of equipment becomes almost impossible. This is irrespective of the system installed to provide traceability. The problem is that any such system depends on human interaction and, almost certainly, maintenance personnel are not likely to keep sufficiently accurate records to ensure that those controlling the system will know when and where particular items of equipment are located. If overall control of the system is to be maintained, it is vital to know exactly what equipment is in any particular location. Further, when equipment is not working, for example, if equipment has been tested and it is found not to be operative, it is vital to be able to direct maintenance personnel to the correct location to deal with the specific item of equipment that is not operating correctly.

[0008] Thus, while there are many sophisticated control and monitoring systems available, none of these are that user friendly in the sense that they can be used easily by maintenance and other personnel who may wish to, for example, discover how a particular lamp is operating before and after maintenance, or may wish to, in some way, check the operation of one or more lamps about which certain complaints have been made by the general public. Such personnel may be security or other staff as well as the operators of the lighting system.

[0009] Further, it will be appreciated that in many instances, authorities may wish to switch on or off the public lighting system for some specific reason. One can envisage, for example, the police authorities might wish to have the power to switch on and off various portions of a lighting system.

[0010] Further, while lighting systems are used extensively and they, in effect, are on almost all major motorways and all urban roads, the lighting system is generally used simply for lighting and nothing else. The present invention is directed towards providing some other uses for the lighting system which would further increase the versatility of the system.

[0011] The present invention is directed towards overcoming the problems inherent in the present systems and in particular to the control of such systems.

Statements of Invention

[0012] According to the invention, there is provided a public lighting system comprising a central controller for operating and monitoring a plurality of lamp assemblies, each lamp assembly comprising a lamp and a monitoring station, each comprising lamp control and data acquisition modules, characterised in that the system further comprises:

command means in the controller to receive and process instructions in text format from a communications device; and

a transmitter in the controller to send data to the communications device.

[0013] The ability to accept text messages will greatly increase the functionality of the system.

[0014] In one embodiment of the invention, the lamp assembly comprises a transmitter for a global positioning system to locate the position of the lamp assembly for the central controller. The advantage of this is that by incorporating a GPS transmitter in the the lamp assembly, the effect is that any specific item of equipment can be rapidly located. Indeed, by carrying out a polling of a number of lamps, the central controller can have an exact record of the particular lamp assemblies at each location. This will have considerable advantages such as, for example, when a particular lamp is indicated to have been operating incorrectly, without sending somebody out to investigate the position, those operating the central controller can identify a number of lamps by location and then test the lamps and can then accurately determine which lamp requires maintenance. There is no dependence on the accuracy of third party reports. Thus, the maintenance personnel can be quickly sent to the particular location. Subsequently, the necessary tests can be carried out.

[0015] In another embodiment, the communications protocol used is GPRS, which protocol allows always-on data connections over a mobile phone network. The advantage of this is that there is no need to perform any dial up operation, once a person operating a mobile phone has the correct code to input into the mobile phone. Then, immediately, the person carrying out the work will be connected directly into the system.

[0016] In another embodiment of the invention, at least some of the lamp assemblies comprise a data transmitter for the transmittal of data to associated receivers. The advantage of this is that now the public lighting system can be used, for example, to display traffic messages or other information. For example, if a receiver and an associated signboard or the like is mounted on a bus shelter, it will be possible for the bus company to download accurately the expected time of arrival of a particular bus at a particular shelter. Similarly, advertising and the like can be downloaded as required. With this latter embodiment, the data transmitter may deliver the data by one or more of ISM Band Radio Telemetry, broadband infrared mesh transmission, and fixed line.

[0017] Preferably, each monitoring station is connected to the controller by a combined power and data transmission wire or alternatively may be by a separate data transmission line or by wireless transmission.

[0018] Further, there is provided a method of operating a public lighting system of the type comprising a central controller for operating and monitoring a plurality of lamp assemblies, each lamp assembly comprising a lamp and a monitoring station comprising lamp control and data acquisition modules, the method comprising:

sending a command signal in the form of a text message from a communication device to the controller;

causing one or more lamps to be activated;

carrying out monitoring of the operation and/or condition of each lamp or a plurality of lamps;

recording lamp data; and

transmitting the lamp data to the communications device.

[0019] Ideally, the data transmitted is stored for future analysis.

[0020] The lamp data may include data on the location

of the lamp.

[0021] In another embodiment of the invention, the controller transmits data to one or more monitoring stations for broadcasting to other receivers. Such data may comprise one or more of:

advertising media data;

messages for the public;

internet broadband information;

GPS data to vehicles; and

traffic data.

Detailed Description of the Invention

[0022] The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 illustrates a control system according to the invention,

Fig. 2 illustrates another control system according to the invention, and

Fig. 3 illustrates a still further control system according to the invention.

[0023] Referring to the drawings and initially to Fig. 1, there is provided a public lighting system, indicated generally by the reference numeral 1, comprising a plurality of lamps 2 each connected to lamp control and data acquisition modules, namely, monitoring stations 3, together forming lamp assemblies 5. All the monitoring stations 3 are connected by a wire 6 which in this embodiment is a combined wire for power and data transmission to a central controller, indicated generally by the reference numeral 10. The controller 10 comprises a control system 11 for operating and monitoring each lamp assembly 5, as well as a command means 12 to receive and process instructions received in text format. It further comprises a transmitter 13 for downloading data externally to communications devices. It thus comprises an interface 14 for reception of the wire 6 and a modem 15 for connection to a landline network 16 and a mobile phone network 17. There is illustrated a mobile phone 20 operating as a communications device. The mobile phone 20 is equipped with SMS. Each monitoring station 3 has means for monitoring power usage, lamp voltage, ballast temperature, general lamps or ballast status and any other data that is important to the system operator. Such a system could, for example, be a ballast, previously mentioned as being sold under the Trade Name SELC 2000 Ballast which combines the ballast and monitoring functions.

[0024] Essentially, the controller 10 is the base station and the system interface 7 may, for example, be Lonworks modem, DALI interface or SCADA interface or similar, to allow it to communicate with the wire 6.

[0025] In operation, maintenance personnel have access to each monitoring station 3 by entering passwords into a mobile phone, followed by commands in standard text format. The information is relayed via the public network to the base station, namely, the controller 10. Then, the various security checks, as desired, including password verification, are performed before interrogating the monitoring station 3 or issuing commands to it. Then, the monitoring station 3 will cause a specific lamp 2 to operate or will carry out various checks on the lamp operation, as desired, which information is then relayed to the controller 10 for onward transmission to the mobile phone 20.

[0026] Referring to Fig. 2, there is illustrated a modified diagrammatic view of a control system according to the invention, again indicated generally by the reference numeral 1 and all parts similar to those described, with reference to the previous drawings, are identified by the same reference numerals. In this embodiment, there is provided an additional global positioning GPS transmitter 25m in each monitoring station 3.

[0027] Fig. 3 shows a further modification of a control system forming part of a lighting system according to the invention. In this embodiment, again parts similar to those described with reference to the previous drawings, are Identified by the same reference numerals. In this embodiment, at least one and probably a considerable number of the lamp assemblies 5 are provided with a data transmitter 30 for transmission of data. The data is transmitted from the data transmitters 30 to receivers 31 which are illustrated mounted, for example, in a bus shelter 33 having a sign 34 thereon for the transmittal of messages to the general public. There is also illustrated a motorcar 35 having a further transmitter 31 which would allow GPS and traffic information to be transmitted to passing vehicles. Further, there is illustrated a signboard 36 having a display sign 37 and again it is shown mounted a receiver 31. With this latter embodiment, various messages can be provided.

[0028] With this embodiment, as suggested, various messages could be delivered such as, for example:

Internet Broadband Information for distribution through the streetlight network system to the citizens;

Advertising Media Data and Information through the streetlight network to the citizen on the city streets; and

Sending messages to other street furniture, e.g. bus shelters, advertising signs, and so on.

[0029] It will be appreciated that when the data is transmitted to passing vehicles, where the vehicle does not have GPS, the motorist can be updated with relevant GPS information and relevant motoring data. Similarly, it is envisaged that such vehicles could be provided with transmitters to allow the reception of data for onward transmission to authorities. It is envisaged that this information could be used to control the speed of vehicles and data to operate the vehicles correctly.

Further, with this system, it is envisaged, as with the previous system, that communication protocols, such as GPRS, may be used to provide always-on data connections over a mobile phone network. The advantage of this is that it prevents the need for continual dial-up. Further, the global positioning transmitter will ensure that the position of each lamp assembly can be accurately pin-pointed at any time.

[0030] It will be appreciated that typical commands could include:-

provide lamp data such as operational status, power, lamp voltage, ballast temperature, burning hours, ballast serial number, software version, status of access panels, and any other data that is required;

switch the lamp on;

switch the lamp off;

dim the lamp;

test the photoelectric cell, and so on.

[0031] It should be noted that the transmission medium could be either through powerline cable through the air by utilising radio, radio using the ISM Band Radio Telemetry or using Broadband Infra Red Mesh Transmission from the streetlight.

It will be appreciated that the system can be used by maintenance personnel to test lamps during daylight hours and without the need to have a manned base station or control station. The maintenance personnel can operate totally independently of anybody else.

[0032] Further; when maintenance personnel have carried out a repair, they can quickly determine whether a repair has been successful or not. This will also allow those in charge of maintenance personnel to check whether work has been carried out satisfactorily.

[0033] Further, it will be appreciated that people other than those actively involved in the maintenance and control of the public lighting system may also be provided with access to it. For example, police or other authorities could, as well as checking the operation of a system, also use the system to allow variation of lighting levels to match local conditions, without the need for specified centralised control by the lighting system authorities. The lighting system authorities can give whatever powers they so desire to other personnel.

[0034] It will be appreciated that the use of a combined wire for power and data transmission is not essential. The data may be transmitted by separate wire or wireless transmissions.

[0035] One of the great advantages of the present invention is that it is not necessary to provide special equipment to access the system, just standard low cost mobile phone may be used.

[0036] In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

[0037] The invention is not limited to the embodiment hereinbefore described, but may be varied in both construction and detail.

Claims

1. A public lighting system (1) comprising a central controller (10) for operating and monitoring a plurality of lamp assemblies (5), each lamp assembly (5) comprising a lamp (2) and a monitoring station (3), each comprising lamp control and data acquisition modules, **characterised in that** the system (1) further comprises:

   command means (12) in the controller (10) to receive and process instructions in text format from a communications device (20); and

   a transmitter (13) in the controller (10) to send data to the communications device (20).

2. A system (1) as claimed in claim 1, in which the lamp assembly (5) comprises a GPS transmitter (25) for a global positioning system to locate the position of the lamp assembly for the central controller (10).

3. A system (1) as claimed in claim 2, in which GPRS communications protocol is used to provide always-on-data connections for a mobile phone when used as the communications device (20).

4. A system (1) as claimed in any preceding claim, in which at least some of the lamp assemblies (5) comprise a transmitter (30) for the transmittal of data to associated receivers (31).

5. A system (1) as claimed in claim 4, in which the transmitter (30) delivers the data by one or more of ISM Band Radio Telemetry, broadband infrared mesh transmission, and fixed line.

6. A system (1) as claimed in any preceding claim, in

which each monitoring station (3) is connected to the controller (10) by a combined power and data transmission wire (6).

7. A system (1) as claimed in any of claims 1 to 6, in which each monitoring station (3) is connected to the controller (10) by a separate data transmission line or by wireless transmission.

8. A method of operating a public lighting system of the type comprising a central controller for operating and_monitoring a plurality of lamp assemblies, each lamp assembly comprising a lamp and a monitoring station comprising lamp control and data acquisition modules, the method comprising:

sending a command signal in the form of a text message from a communication device to the controller;

causing one or more lamps to be activated;

carrying out monitoring of the operation and/or condition of each lamp or a plurality of lamps;

recording lamp data; and

transmitting the lamp data to the communications device.

9. A method as claimed in claim 8, in which the data transmitted is stored for future analysis.

10. A method as claimed in claim 8 or 9, in which the lamp data includes data on the location of the lamp.

11. A method as claimed in any of claims 8 to 10, in which the controller transmits data to one or more monitoring stations for broadcasting to other receivers.

12. A method as claimed in claim 11, in which the data comprises one or more of:

advertising media data;

messages for the public;

internet broadband information;

GPS data to vehicles; and

traffic data.

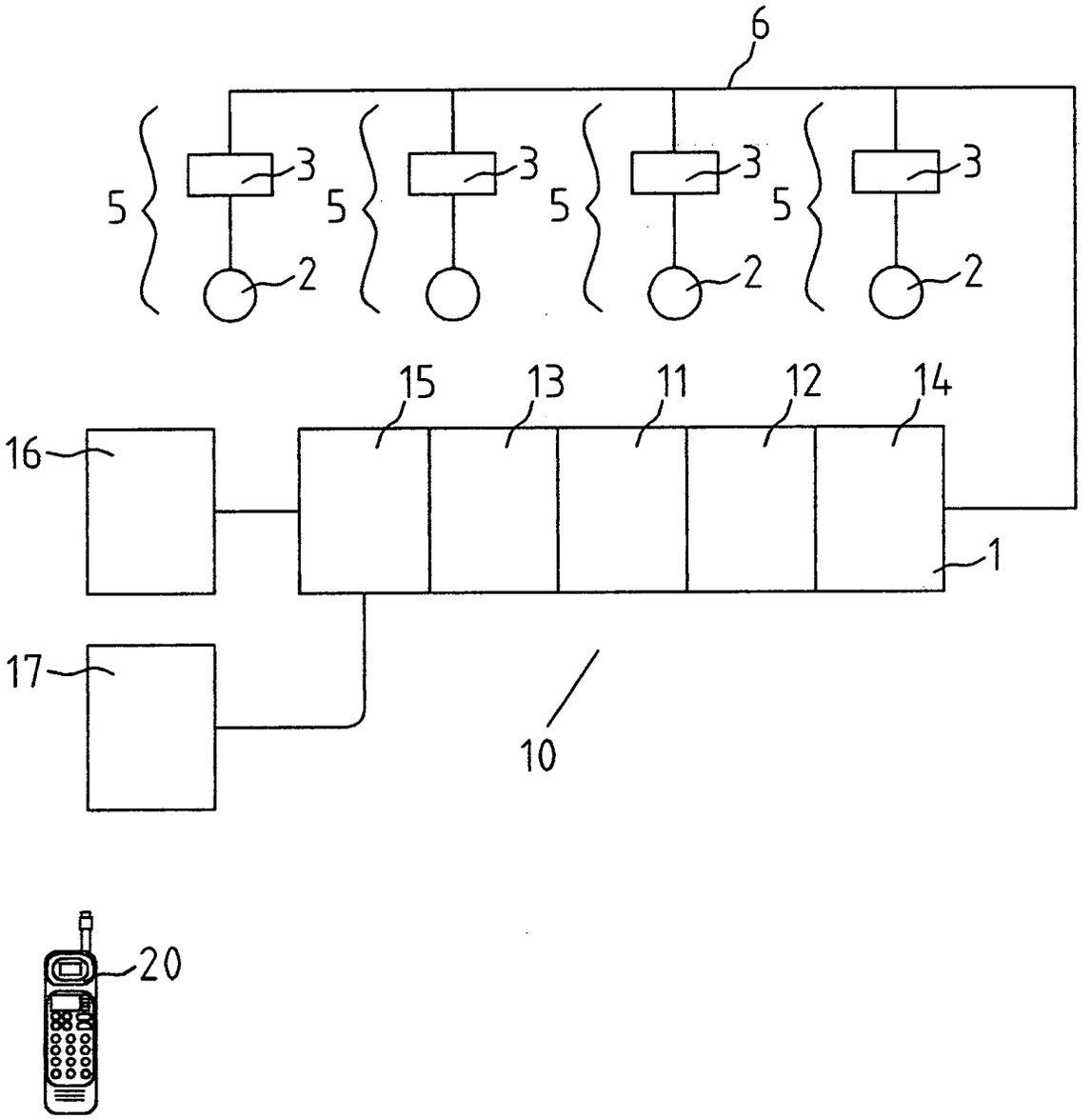

Fig. 1

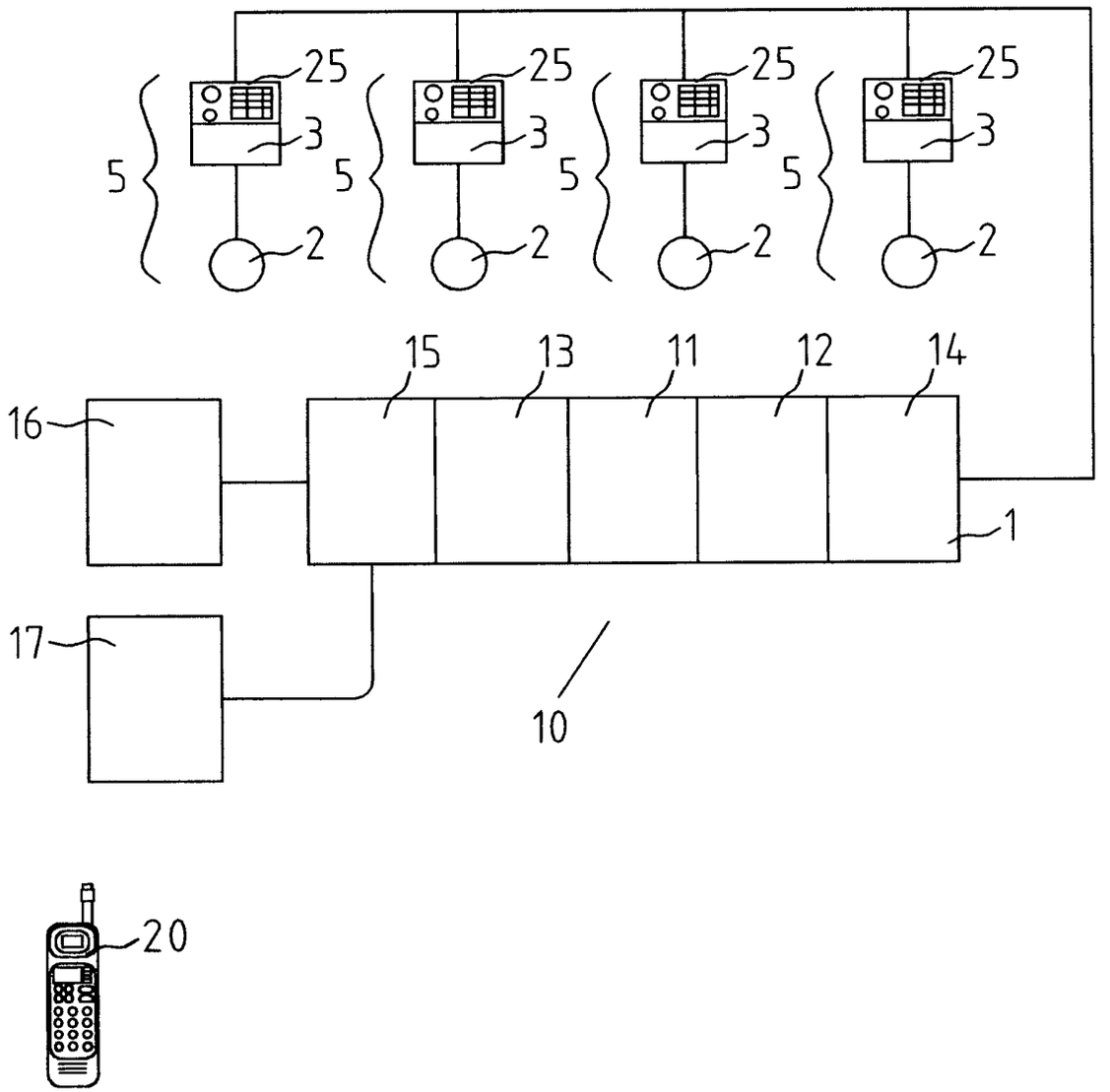

Fig. 2

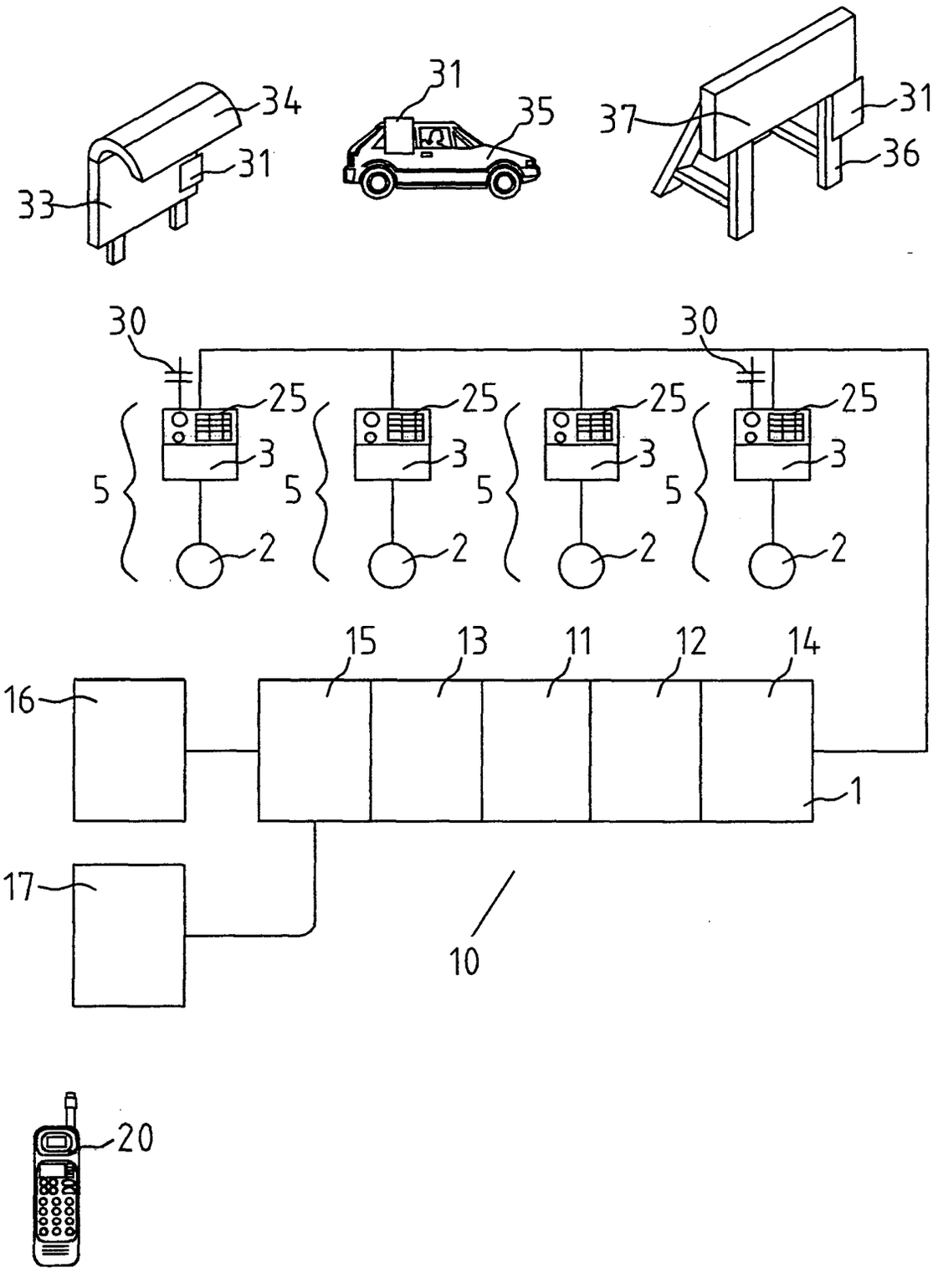
34
31
33
31
35
37
31
36
30
30
25
25
25
25
3
3
3
3
5
5
5
5
2
2
2
2
15
13
11
12
14
16
1
17
10
20

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 39 4017

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.7)
X Y	US 5 479 159 A (KELLY WILLIAM ET AL) 26 December 1995 (1995-12-26) * column 1, line 22 - column 6, line 36; figures 1-5 *	1,6,8,9 2-5,7, 10-12	H05B37/03
Y	WO 02/100040 A (ISOTALO LAURI ; ELISA COMM OYJ (FI)) 12 December 2002 (2002-12-12) * page 5, line 22 - page 7, line 13 *	3	
Y	WO 01/81166 A (ANTICO CHRIS ; GREEN LESLIE (AU)) 1 November 2001 (2001-11-01) * page 2, line 19 - line 31; figure 2 *	2,4,5, 10-12	
Y	US 2002/103621 A1 (WILLIAMS LARRY) 1 August 2002 (2002-08-01) * figures 3-6 *	7	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 June 2004	Henderson, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 39 4017

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-06-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5479159 A	26-12-1995	AT 145112 T	15-11-1996
		CA 2104797 A1	09-09-1992
		DE 69215078 D1	12-12-1996
		DE 69215078 T2	27-03-1997
		DK 574439 T3	14-04-1997
		EP 0574439 A1	22-12-1993
		ES 2096751 T3	16-03-1997
		WO 9216086 A1	17-09-1992
		JP 6508234 T	14-09-1994
WO 02100040 A	12-12-2002	FI 20011212 A	24-02-2003
		WO 02100040 A1	12-12-2002
WO 0181166 A	01-11-2001	WO 0181166 A1	01-11-2001
		AU 5017601 A	07-11-2001
		EP 1280696 A1	05-02-2003
		US 2004100396 A1	27-05-2004
US 2002103621 A1	01-08-2002	US 6359555 B1	19-03-2002
		US 6035266 A	07-03-2000
		US 6119076 A	12-09-2000
		AU 7466498 A	11-11-1998
		WO 9847120 A1	22-10-1998
		US 6384722 B1	07-05-2002
		US 2002002444 A1	03-01-2002
		US 6393382 B1	21-05-2002
		US 6370489 B1	09-04-2002
		US 6393381 B1	21-05-2002
		US 6456960 B1	24-09-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82