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(54) **A street lighting system**

Strassenbeleuchtungssystem

Système d'éclairage solaire de rues

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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] US 5479159 (Kelly et al) discloses an apparatus and system for street light monitoring. Data on the street lights operation is sent to a monitoring station and from there the data may be retrieved by an interrogating station. The data may be transmitted along the power cables or by other means.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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

[0013] 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.

[0014] The ability to accept text messages will greatly increase the functionality of the system.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] Ideally, the data transmitted is stored for future analysis.

[0021] The lamp data may include data on the location of the lamp.

[0022] 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

[0023] 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.

[0024] 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.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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.

Claims

1. A public street 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, and in which 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);
   a transmitter (13) in the controller (10) to send data to the communications device (20); **characterised in that**
   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).

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

3. A system (1) as claimed in claim 1 or 2, in which at least some of the lamp assemblies (5) comprise a transmitter (30) for the transmittal of data to associated receivers (31).

4. A system (1) as claimed in claim 3, in which the transmitter (30) delivers the data by one or more of ISM Band Radio Telemetry, broadband infrared mesh transmission, and fixed line.

5. 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).

6. A system (1) as claimed in any of claims 1 to 4, in which each monitoring station (3) is connected to the controller (10) by a separate data transmission line or by wireless transmission.

7. A method of operating a public street 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, each lamp assembly further comprising a GPS transmitter (25) for a global positioning system to locate the position of the lamps assembly for the central controller, 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 including data on the location of the lamp; and
   transmitting the lamp data to the communications device.

8. A method as claimed in claim 7, in which the data transmitted is stored for future analysis.

9. A method as claimed in any of claims 7 or 8, in which the controller transmits data to one or more monitoring stations for broadcasting to other receivers.

10. A method as claimed in claim 9, 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.

Patentansprüche

1. Öffentliches Straßenbeleuchtungssystem (1), das eine zentrale Steuerung (10) zum Bedienen und Überwachen mehrerer Lampenbaugruppen (5) umfasst, wobei jede Lampenbaugruppe (5) eine Lampe (2) und eine Überwachungsstation (3) umfasst, die jeweils Lampensteuerungs- und Datenerfassungsmodule umfassen, und wobei das System (1) ferner Folgendes umfasst:

   Befehlsmittel (12) in der Steuerung (10) zum Empfangen und Verarbeiten von Anweisungen im Textformat von einem Kommunikationsgerät (20);
   einen Sender (13) in der Steuerung (10) zum Senden von Daten zu dem Kommunikationsgerät; **dadurch gekennzeichnet, dass**
   die Lampenbaugruppe (5) einen GPS-Sender (25) für ein globales Positionierungssystem umfasst, um die Position der Lampenbaugruppe für die zentrale Steuerung (10) zu finden.

2. System (1) nach Anspruch 1, bei dem ein GPRS-Kommunikationsprotokoll zum Herstellen von "Always-on"-(immer aktiv)-Datenverbindungen für ein Mobiltelefon verwendet wird, wenn ein solches als Kommunikationsgerät (20) verwendet wird.

3. System (1) nach Anspruch 1 oder 2, bei dem wenigstens einige der Lampenbaugruppen (5) einen Sender (30) zum Senden von Daten zu assoziierten Empfängern (31) umfassen.

4. System (1) nach Anspruch 3, bei dem der Sender (30) die Daten durch ISM-Band-Radiotelemetrie, Breitband-Infrarot-Mesh-Transmission und/oder über Festnetz sendet.

5. System (1) nach einem der vorherigen Ansprüche, bei dem jede Überwachungsstation (3) durch eine kombinierte Strom- und Datenübertragungsleitung (6) mit der Steuerung (10) verbunden ist.

6. System (1) nach einem der Ansprüche 1 bis 4, bei dem jede Überwachungsstation (3) durch eine separate Datenübertragungsleitung oder per drahtloser Übertragung mit der Steuerung (10) verbunden ist.

7. Verfahren zum Betreiben eines öffentlichen Straßenbeleuchtungssystems des Typs, der eine zentrale Steuerung zum Bedienen und Überwachen mehrerer Lampenbaugruppen umfasst, wobei jede Lampenbaugruppe eine Lampe und eine Überwachungsstation mit Lampensteuerungs- und Datenerfassungsmodulen umfasst, wobei jede Lampenbaugruppe ferner einen GPS-Sender (25) für ein globales Positionierungssystem umfasst, um die Position der Lampenbaugruppe für die zentrale Steuerung zu finden, wobei das Verfahren Folgendes beinhaltet:

   Senden eines Befehlssignals in Form einer Textnachricht von einem Kommunikationsgerät zu der Steuerung;
   Veranlassen des Aktivierens von einer oder mehreren Lampen;
   Durchführen der Überwachung des Betrtiebs und/oder des Zustands jeder Lampe oder einer Mehrzahl von Lampen;
   Aufzeichnen von Lampendaten einschließlich Daten über den Standort der Lampe; und
   Senden der Lampendaten zu dem Kommunikationsgerät.

8. Verfahren nach Anspruch 7, wobei die gesendeten Daten für eine spätere Analyse gespeichert werden.

9. Verfahren nach Anspruch 7 oder 8, wobei die Steuerung Daten zu einer oder mehreren Überwachungsstationen zum Broadcasten zu anderen Empfängern sendet.

10. Verfahren nach Anspruch 9, bei dem die Daten eines oder mehrere der Folgenden beinhalten:

Werbemediendaten;
Nachrichten für die Öffentlichkeit;
Internet-Breitbandinformationen;
GPS-Daten für Fahrzeuge; und
Verkehrsdaten.

Revendications

1. Réseau d'éclairage de rues (1) comprenant une unité de commande centrale (10) pour actionner et surveiller une pluralité d'ensembles de lampes (5), chaque ensemble de lampe (5) comprenant une lampe (2) et une station de surveillance (3), chacun comprenant des modules de commande de lampe et d'acquisition de données, et le réseau (1) comprenant en outre :

un moyen de commande (12) dans l'unité de commande (10) pour recevoir et traiter des instructions en format de texte depuis un dispositif de communications (20) ;
un émetteur (13) dans l'unité de commande (10) pour envoyer des données au dispositif de communications (20) ; **caractérisé en ce que**
l'ensemble de lampe (5) comprend un émetteur GPS (25) d'un réseau de positionnement global pour localiser la position de l'ensemble de lampe à l'intention de l'unité de commande centrale (10).

2. Réseau (1) selon la revendication 1, dans lequel le protocole de communications GPRS est utilisé pour fournir des connexions de données toujours actives pour un téléphone portable quand il est utilisé comme dispositif de communications (20).

3. Réseau (1) selon la revendication 1 ou 2, dans lequel au moins certains des ensembles de lampe (5) comprennent un émetteur (30) pour la transmission de données à des récepteurs associés (31).

4. Réseau (1) selon la revendication 3, dans lequel l'émetteur (30) délivre les données par une ou plusieurs des techniques de Télémétrie Radio en Bande ISM, transmission maillée infrarouge à large bande et ligne fixe.

5. Réseau (1) selon l'une quelconque des revendications précédentes, dans lequel chaque station de surveillance (3) est connectée à l'unité de commande (10) par un fil de transmission combinée de puissance et de données (6).

6. Réseau (1) selon l'une quelconque des revendications 1 à 4, dans lequel chaque station de surveillance (3) est connectée à l'unité de commande (10) par un fil de transmission de données séparé ou par transmission sans fil.

7. Procédé d'exploitation d'un réseau d'éclairage de rues du type comprenant une unité de commande centrale pour actionner et surveiller une pluralité d'ensembles de lampes, chaque ensemble de lampe comprenant une lampe et une station de surveillance comprenant des modules de commande de lampe et d'acquisition de données, chaque ensemble de lampe comprenant en outre un émetteur GPS (25) d'un réseau de positionnement global pour localiser la position de l'ensemble de lampe à l'intention de l'unité de commande centrale, le procédé comprenant :

l'envoi à l'unité de commande d'un signal de commande sous forme de message de texte depuis un dispositif de communications;
l'activation d'une ou de plusieurs lampes ;
l'exécution de la surveillance du fonctionnement et/ou de l'état de chaque lampe ou d'une pluralité de lampes ;
l'enregistrement de données de lampe dont des données sur la position de la lampe ; et
la transmission des données de lampe au dispositif de communications.

8. Procédé selon la revendication 7, dans lequel les données transmises sont mémorisées en vue de leur analyse ultérieure.

9. Procédé selon l'une quelconque des revendications 7 ou 8, dans lequel l'unité de commande transmet des données à une ou plusieurs stations de surveillance pour leur diffusion à d'autres récepteurs.

10. Procédé selon la revendication 9, dans lequel les données comprennent un ou plusieurs de

données de média publicitaires ;
messages au public ;
informations Internet à large bande;
données GPS à l'intention des véhicules ; et
données de trafic.

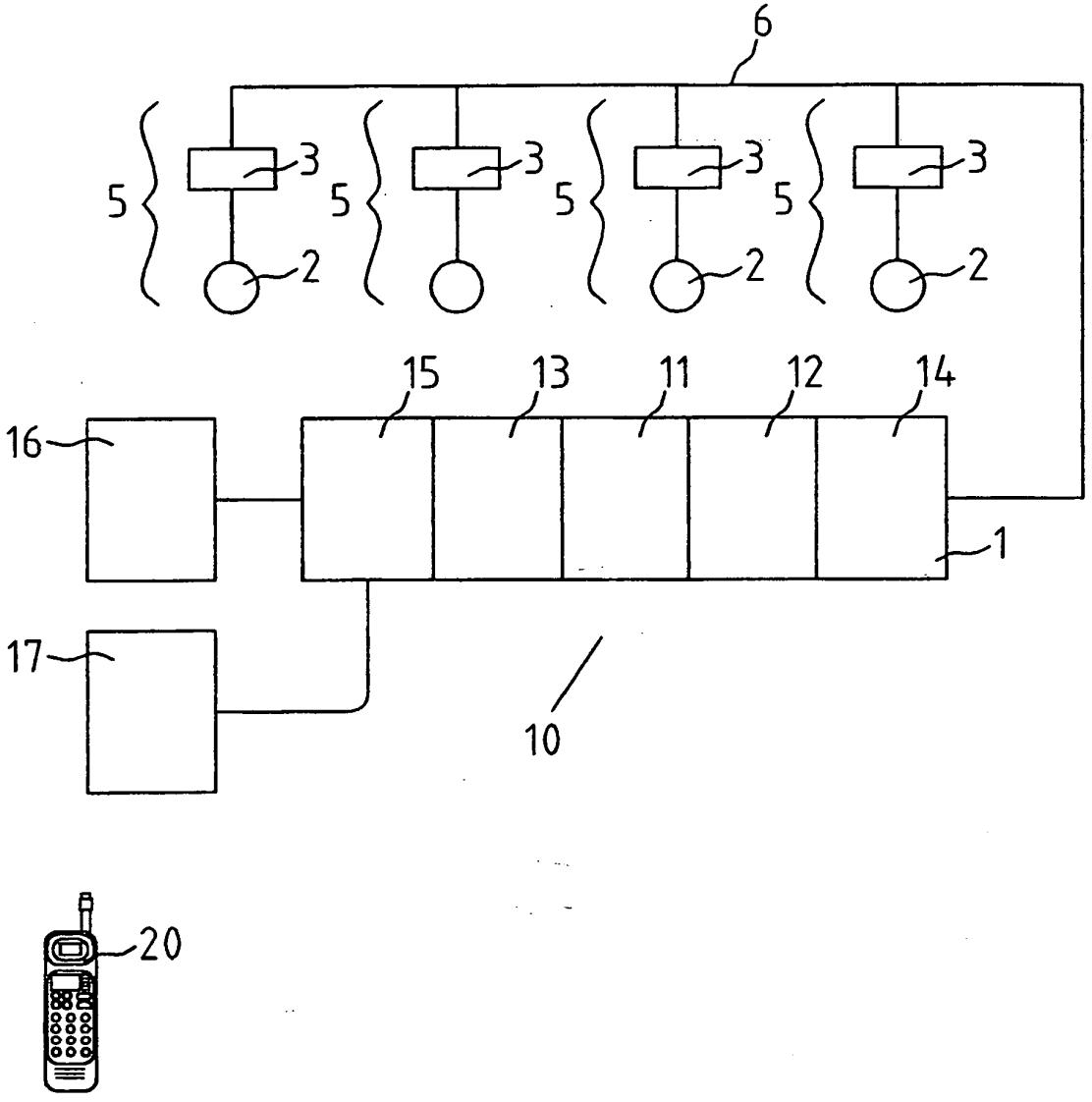

Fig. 1

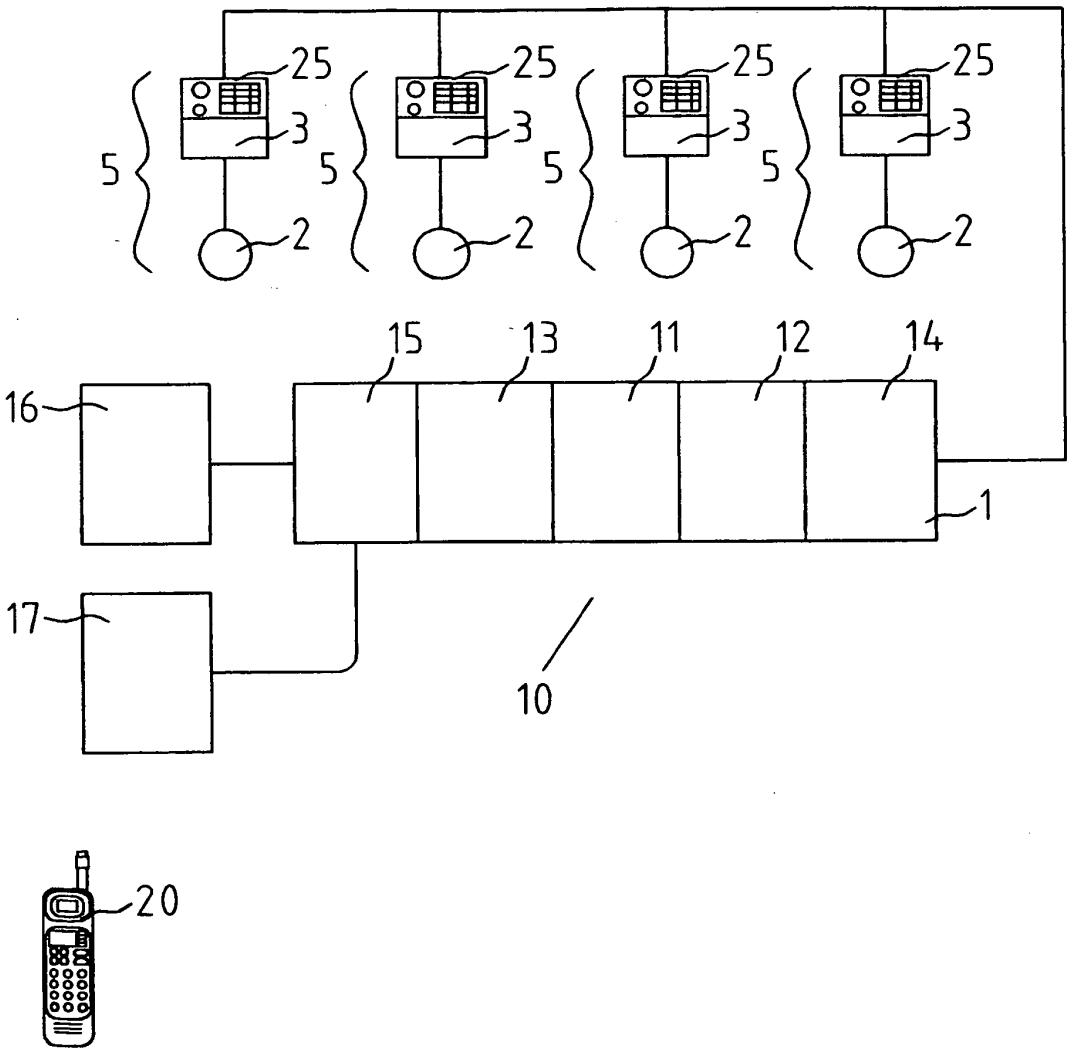

Fig. 2

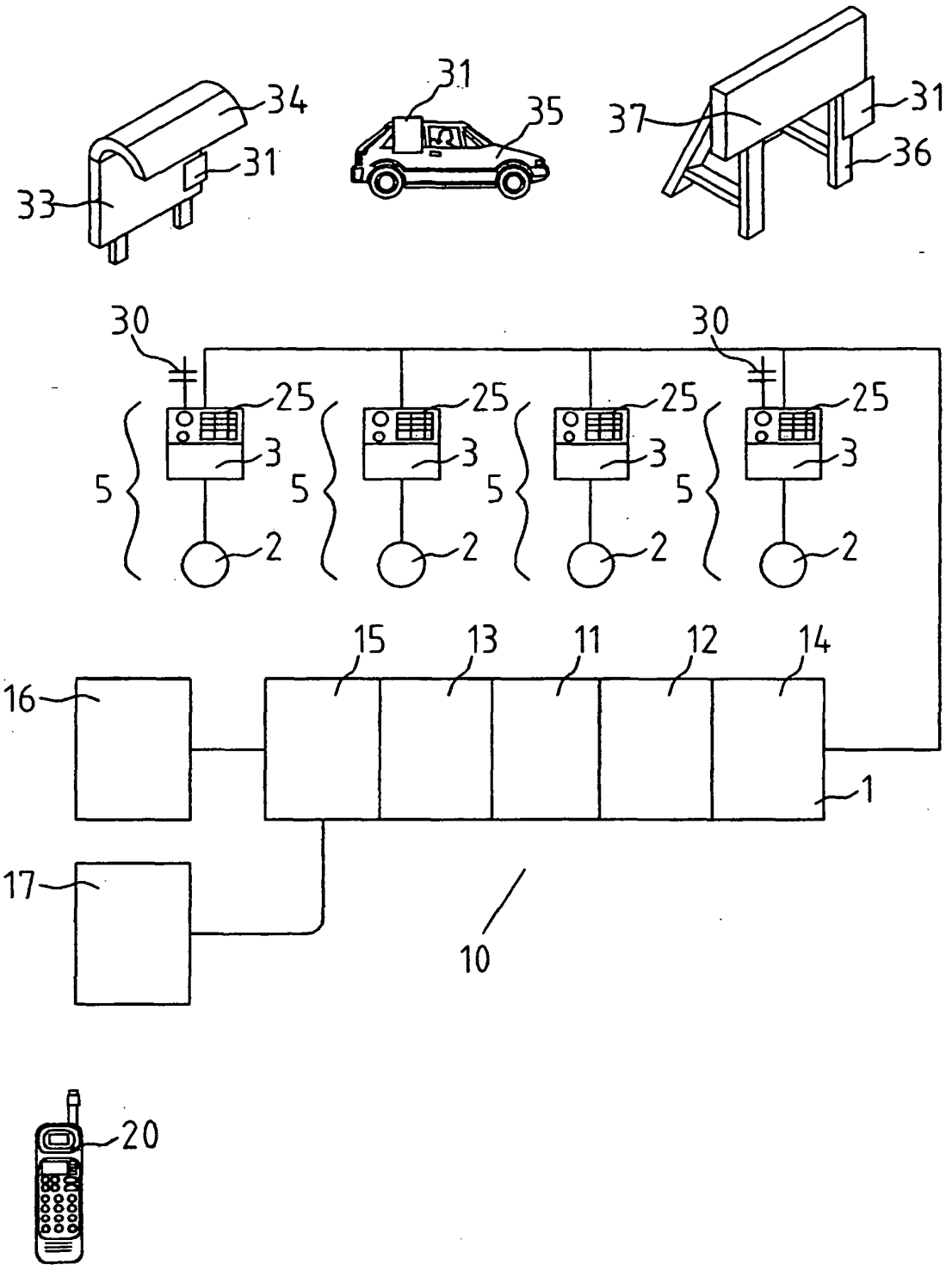
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Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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