(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 September 2001 (20.09.2001)

PCT

(10) International Publication Number
WO 01/69563 A1

(51) International Patent Classification[7]: G08B 21/00, 13/14

(21) International Application Number: PCT/EP00/02215

(22) International Filing Date: 11 March 2000 (11.03.2000)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicants and
(72) Inventors: **GANIERE, Jean** [CH/CH]; Chanta Merloz, CH-1137 Yens (CH). **APPLEBY, Rejean** [CH/CH]; Brunnmattstrasse 33, CH-8103 Unterengstringen (CH).

(74) Agent: **JOHANSSON, Lars**; Patech Sarl, Case postale 25, CH-1138 Villars-sous-Yens (CH).

(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/69563 A1

(54) Title: SYSTEM FOR DETECTING THE PROXIMITY OF AN OBJECT OR A PERSON

(57) Abstract: A system for detection of proximity of an object or a person comprising a base station and at least one mobile unit, said mobile unit being arranged to be fixed on said object or said person or to be integrated in said object the proximity relative to the base station of which object should be detected. The mobile unit comprises a radio frequency transmitter or reflector transmitting or reflecting a signal. The base station comprises a receiver capable of receiving the signal sent out or reflected by the at least one mobile unit and means for detection of the presence of reception, means for detection of absence of reception and means for emitting an acoustical, optical or tactile detection or alarm signal. The system is characterised in that said transmitter forming part of said mobile unit is transmitting intermittently and in that said base station is further provided with means for commutation for activating either the means for the detection of presence of reception or the means for detection of absence of reception.

SYSTEM FOR DETECTING THE PROXIMITY OF AN OBJECT OR A PERSON.

The invention relates to a system for detecting the proximity of an object or a person and includes a base station which could be fixed or mobile and at least one mobile unit related to said object or person.

It is previously known detectors for proximity which react on the proximity of a metallic part. These detectors for proximity generally works according to the principle of a modification of a magnetic field or a modification of the resonance frequency of a resonance circuit. These detectors for proximity allow the location of an object or a person if this object and this person carries a metallic part. The detection could only be made within a limited distance. It is also known to detect the presence of a person by means of a detector sensitive to infrared radiation. The invention refers to a system allowing the detection of the presence of a mobile unit in an area around a base station the extension of which area could be adjusted. Typically the base station is carried by a physical person but could also be fixed. The mobile unit(s) are usually related to objects or physical persons to be surveyed. The base station could activate an alarm depending on the detected presence or non-presence of the mobile unit(s) in the surveyed area.

If the system is set to detection of a non-presence of a mobile unit, i.e. there should be an alarm signal when there is no detected incoming intelligible signal from the mobile unit, the system could obviously be used for the surveillance of an object related to said mobile unit or e.g. prevent that such an object will be forgotten by a person carrying a base station which person is not supposed to leave e.g. a room without carrying the surveyed object.

One embodiment of the system for detection according to the invention is characterised in that it comprises a radio frequency transmitter, forming part of the

mobile unit which is arranged to be fixed on the object or the person or to be integrated in said object the proximity of which should be detected. Said transmitter is intermittently transmitting a signal e.g. with a given frequency. The system is further comprising a receiver forming part of a base station capable of receiving the signal with the given frequency which receiver further could comprise means for adjusting the reception sensitivity, means for detection of reception, means for detection of absence of reception, means for commutation for activating either the means for the detection of presence of reception or the means for detection of absence of reception and means for emitting an acoustical, optical or tactile detection signal.

It is clear that both the base station and the mobile unit could be "mobile". Proximity is of course referring to the relative positions between the two parts of the system.

Depending on the status presence/absence of the means for commutation of the receiver of the base station this unit is sending out a detection signal, e.g. an acoustical signal, signifying either the presence of the object or the person within a predetermined distance from the base station or the non-presence within the same distance.

Contrary to the case with known anti-theft alarm apparatuses the acoustical signal is not generated by the object to survey but by the receiver.

The base station may comprise several circuits arranged for the reception of different frequencies which allows the survey of several mobile units sending out signals with e.g. different frequencies. In this case the base station advantageously comprises means for identification and displaying the different mobile units.

The identification of the different mobile units could of course also be made if the mobile units are transmitting at the same frequency in e.g. PCM mode.

The system according to the invention could be realised by the man skilled in the art by means of small and cheap transmitters and receivers which can be found on the market.

It turns out that the battery dimensions and weight, rechargeable or not, are decisive for the design parameters of especially the mobile units. On one hand it is usually of interest to make the physical dimensions, especially of the mobile unit(s), as small as possible, which implies small batteries, in order to extend the application possibilities to small objects as e.g. glasses, pens, key-holders etc.. On the other hand it might be advantageous to extend the time between the battery replacements or recharging and to be able to use the system for larger survey areas which will imply larger batteries.

It is clear that the design of low power mobile units is of prime interest.

With a system realised according to the invention it has been possible to reach dimensions in the order of a few square centimetres for the mobile units having a lifetime of the batteries of more than 2000 hours. In the future even smaller units will be possible to realise.

The mobile unit could be fixed by means of different means on the object or the person which should be surveyed, e.g. by means of a band of Velcro (trademark). Another example of system for the fixation comprises a small tag advantageously glued to the object to survey provided with a loop of a flexible material fixing the mobile unit.

The mobile unit as well as the base station could also be integrated in an object, as e.g. in a watch, handbag, belt, portable telephone etc..

One way to reduce the power needed by the mobile unit, is to activate the transmitter intermittently, e.g. a few milliseconds or tens of milliseconds each minute.

The receiver of the base station could advantageously be equipped with means for adjusting the sensitivity of the reception of the signals from the transmitters in order to be able to change the distance for the detection of the mobile unit(s). This distance could e.g. be set to values between 1 and 20 meters.

According to one embodiment of the invention the receiver of the base station is equipped with means allowing to raise the sensitivity of the reception during a certain time, e.g. from 1 two 5 minutes, in order to allow the person carrying the base station to temporarily move outside the area of detection without causing an alarm.

The receiver could also be equipped with means for interruption of the reception during a certain time, e.g. 1 to 5 minutes with automatic reset. The interruption time could also be introduced in the receiver by means of pulses on a pushbutton or similar whereby every pulse e.g. could corresponds to 1 minute of interruption.

The receiver could also be equipped with means, e.g. in the form of a push-button, connected in parallel to the commutation means for presence/absence making it possible to easily verify the presence of an object when the base station is set to detect absence. This push-button could also be used when searching an object.

In another embodiment of the invention the base station is additionally provided with a transmitter and the mobile unit is additionally provided with a receiver. The base station is in this embodiment intermittently sending out modulated

"question signals" urging the mobile unit or units to respond. Said signal could be addressing one specific mobile unit at a time or all the mobile units at the same time. In the first case the base station is waiting for the response from the addressed mobile unit before the next one is addressed. In the second case each mobile unit could be programmed for a specific time delay between incoming question signal and the response signal. Typically, communications from the base station to the mobile unit utilise amplitude modulated radio signals which are easily demodulated. However, other modulation principles could also be used. The mobile units could respond by electrically switching the antenna from being an absorber of radio frequency radiation to being a reflector to radiation. Signals reflected in this way by an antenna forming part of the mobile unit is in this description considered to be "transmitted" by the mobile unit. Data and software stored in the mobile unit could control the switching of the antenna thereby modulating the reflected signal which will be demodulated at the base station. In this way data could be transferred from the mobile unit to the base station. The data stored in the mobile unit could be fixed or varying due to some parameter. In the simple case data could e.g. be a fixed identification number of the mobile unit.

Other concepts for the radio communication between the base station and the mobile units e.g. according to the DECT or BLUETOOTH standards could also be used.

A system according to the above will be more flexible in that the power used by the mobile unit(s) will be very low and to some extent can be controlled from the base station.

In a still further embodiment the signal sent out from the base station could be used for "waking up" the mobile units from a low power "sleeping" state.

CLAIMS

1. System for detection of proximity of an object or a person comprising a base station and at least one mobile unit, said mobile unit being arranged to be fixed on said object or said person or to be integrated in said object the proximity relative to the base station of which object should be detected, comprising a radio frequency transmitter transmitting a signal, said base station comprising a receiver capable of receiving the signal sent out by the at least one mobile unit, means for detection of the presence of reception, means for detection of absence of reception, means for emitting a acoustical, optical or tactile detection or alarm signal, **characterised in that** said transmitter forming part of said mobile unit is transmitting intermittently and in that said base station is further provided with means for commutation for activating either the means for the detection of presence of reception or the means for detection of absence of reception.

2. System according to claim 1, **characterised in that** said base station is further provided with a radio frequency transmitter for sending out question signals urging the at least one mobile unit to respond, said at least one mobile unit is further provided with a receiver for the signal sent out by the base station, said radio frequency transmitter forming part of said at least one mobile unit has the form of a radio frequency reflector for incoming radiation having variable reflection coefficient.

3. System according to claim 1 or 2, **characterised in that** said receiver forming part of said base station further comprises means for temporarily increasing the sensitivity of the reception.

4. System according to claim 1 or 2, **characterised in that** said receiver forming part of said base station further comprises means for temporarily interrupting the reception.

5. System according to one of the claims 1 to 4, **characterised in that** it comprises several mobile units each comprising a transmitter transmitting a pulse code modulated signal (PCM) and that the receiver forming part of the base station comprises means for identification of these pulse code modulated signals.

6. System according to any of the claims 1 to 5, **characterised in that** the receiver forming part of the base station comprises means for identification and display of the different mobile units.

7. System according to claim 2, **characterised in that** the base station by means of its question signal is addressing all the mobile units at the same time and that the mobile units are all responding with a specific delay set for each mobile unit in the system.

8. System according to any of the claims 2 to 7, **characterised in that** the signal sent out from the base station and received by a specific mobile unit will cause said mobile unit to wake up from a low power sleeping mode.

INTERNATIONAL SEARCH REPORT

Inte[illegible]nal Application No
PCT/EP 00/02215

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08B21/00 G08B13/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 0 840 265 A (E LEAD ELECTRONIC CO LTD) 6 May 1998 (1998-05-06) the whole document	1 2,4-8
Y	DE 35 29 127 A (BBC BROWN BOVERI & CIE) 19 February 1987 (1987-02-19) the whole document	2,4-8
A	WO 96 13819 A (SCHLAGER DAN ;BARINGER WILLIAM B (US)) 9 May 1996 (1996-05-09) claim 50	3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
30 June 2000	10/07/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sgura, S

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte nal Application No
PCT/EP 00/02215

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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