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(54) **System for detecting the presence in a rack of a portable unit suitable for transmitting or receiving a signal having an assigned identification number.**

(57) In a system for detecting the presence in a rack of a portable unit suitable for transmitting or receiving a signal having an assigned identification number said portable unit comprises a detection means which detects the placing of the portable unit in, or its removal from, a compartment. If said detection means detects placing of the portable unit in a compartment the portable unit transmits a presence report signal which is received by a receiving means of a detection device of the rack in reponse to which a control circuit of the detection device stores a presence datum in a location of a memory indicating the presence of the portable unit in the rack. Removal of the presence datum out of the memory can be caused in several ways. According to one solution the portable unit detects said removal and transmits an absence report signal ARS in response to which the control circuit of the detection device removes said present datum from the memory. According to a second solution the portable unit, if placed in a compartment, transmits continuously or intermittently a hold signal HS. If the detection device of the rack does not receive the holdsignal HS during a predetermined period of time it removes the present datum. According to a third solution the compartment has a detection means, e.g. a switch, which can detect the removal of the portable unit from the compartment. If the detection means detects such removal the controle device of the rack removes the present datum out of the memory. According to a fourth solution the detection device of the rack scans each compartment in which the presence of a portable unit has been detected by transmitting a scanning signal to each of these portable units. If the detection device does not receive a response signal from a scanned portable unit within a predetermined period of time it removes the presence datum for this portable unit out of the memory. For both the first and second of said solutions the initiative for storing or removal a present datum in the memory lies with the portable unit. With both of said third and fourth solutions the initiative for storing a presence datum lies with the portable unit and the initiative for removing the presence datum out of the memory lies with the detection device of the rack.

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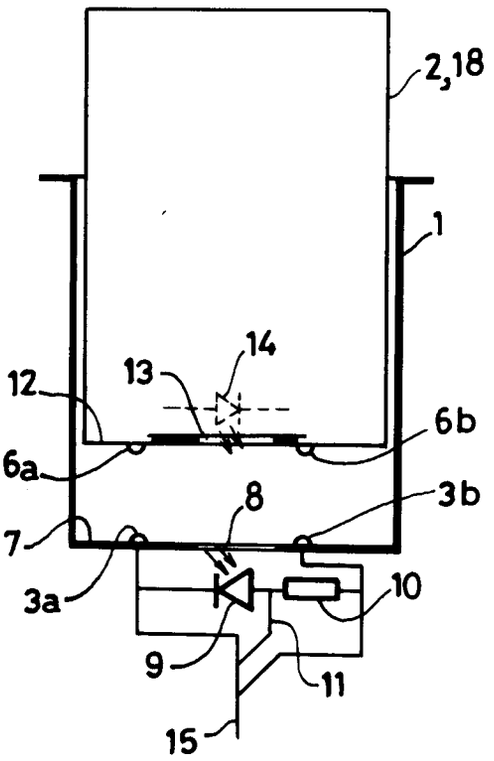


Fig. 1.

The invention relates to a presence detection system according to the preamble of Claim 1. The portable unit may be, for example, a pager unit of a paging system, a transponder, an alarm transmitter or an electronic key.

A presence detection system of the abovementioned type is described in Dutch Patent Application 90.01318 with was filed on 11 June 1990 in the name of the Applicant (at that time: Ericsson Paging Systems B.V.) and was not laid open at the instant of filing of the present application. In said previously described system, at least the compartments of a rack in which a portable unit has been placed are scanned for the presence of a portable unit on the initiative of, and actively by the control circuit of the detection device. For all the variants of the system described earlier, it is necessary that each compartment has a transmitting means and each portable unit has a receiving means for transmitting a scanning signal to the control circuit of the portable unit from the control circuit of the detection device. In addition, each portable unit has to have a transmitting means and each compartment has to have a receiving means for transmitting a response signal which the control circuit of the portable unit transmits to the control circuit of the detection device in response to the receipt of the scanning signal.

According to a variant of the previously described system, all the compartments of the rack are continuously and sequentially scanned by the detection device. According to another variant, each compartment has, in addition, a detection means for detecting the presence of a portable unit in the compartment. In this second variant, the detection device transmits a scanning signal via the compartment to the portable unit only after detection of the presence of a portable unit in the compartment. For both cases, there is only one type of response signal. Said response signal contains the identification number or identification datum assigned to the portable unit.

The previously described presence detection system has the drawback that quite a large number of means are necessary to detect the presence/absence of a portable unit in a compartment and to determine the identity of the portable unit placed in a compartment.

The object of the invention is to eliminate the drawback of the previously described presence detection system.

This object is achieved for the presence detection system according to the invention described in the preamble of Claim 1 by means of the measures of the characterising part of Claim 1. As a result of this, when a portable unit is placed in a compartment, the portable unit takes the initiative of reporting with its identification number to the detection device that it is in a compartment, . As a result of this, the portable units and the racks can be relatively simple.

The receiving means of the rack can be common to all the compartments of the rack, it being possible for the report signal to be transmitted radiographically, inductively or optically. As an alternative, each compartment of the rack can have its own receiving means, the report signal being transmitted between a compartment and a portable unit present therein, and the report signal can also be transmitted as an alternative via contacts of the compartment and the portable unit which touch one another after placing the portable unit in the compartment. Such contacts may be contacts mounted on the bottom of the compartment and oppositely situated contacts of the portable unit, but they may also be wiper contacts running in the plug-in direction of the portable unit, the connection between the contacts being maintained while the portable unit is being moved over a certain distance. The contacts may be contacts of a storage battery charging current circuit, the portable unit detecting the flow of a storage battery charging current or the connection to an external storage battery charging voltage source in order to detect the presence of the unit in a compartment, and the portable unit may modulate the storage battery charging current for transmitting the report signal.

The presence detection system may detect in various ways whether a certain portable unit is being removed from the compartment.

According to a first embodiment, the control circuit of each portable unit monitors removal thereof from a compartment and if this occurs, the portable unit transmits an absence report signal. On receiving said absence report signal, the control circuit of the detection device removes a presence datum from the memory which was previously stored in the memory for the portable unit. Depending on the type of transmission path between a portable unit and a compartment and/or to increase the reliability, the absence report signal may contain the identification number of the portable unit. In addition, the presence report signal and the absence report signal may be identical, possibly with the exception of a section which characterises each of said signals.

According to another embodiment of the system, a portable unit, after transmitting a presence report signal, continuously or periodically transmits a hold signal and the control circuit of the detection device monitors the receipt of such a hold signal and if it has not received a hold signal for a predetermined time, removes the presence datum stored in the memory for the portable unit. If the contacts mentioned are used as transmission paths for the presence report signal, said contacts can

also be used to transmit the hold signal, as a result of which no other transmission or detection means are necessary and the detection system is relatively simple.

According to yet another embodiment, each compartment of a system has a detection means for detecting the presence of a portable unit in the compartment and, after receiving a presence report signal from the compartment, the detection device monitors the presence of the portable unit by means of the detection means, the detection device removing, on detecting the absence of the portable unit in the compartment, a presence datum from the memory which was previously stored for the unit. In this case, a simple detection system is also obtained in which, with respect to the previous embodiment, a portable unit only needs to transmit a signal when it is placed in a compartment, and this results in current saving and counteracts any interference with other signals.

According to yet another embodiment of the system, each compartment has a transmitting means and each portable unit has a corresponding receiving means for transmitting a scanning signal from the control circuit of the detection device to a portable unit placed in the compartment after the detection device has received a presence report signal from the portable unit, and after receiving a scanning signal, the portable unit transmits a response signal and the detection device removes a presence datum from the memory which was previously stored for the portable unit if the device has not received a response signal for a predetermined time. Because as regards the detecting of the removal of a portable unit from a compartment, the same type of means are used and the scanning signal and the response signal have the same function as in an embodiment of the system according to the said NL 90.01318, reference is made to the description of the said NL 90.01318 for a more detailed explanation thereof, although this is not deemed necessary for a person skilled in the art.

Other characteristics and advantages of the invention will become clear from the explanation, which follows below, of some embodiments of the invention with reference to the attached drawings. In the drawings:

Figure 1 shows diagrammatically a compartment of a rack with a portable unit placed therein;

Figure 2 shows a diagram of a pager as portable unit of a paging system and of the detection system according to the invention;

Figure 3 shows a diagram of an embodiment of a detection system according to the invention;

Figure 4 shows a flow chart of an operation of the control circuit of the pager of Figure 2 relating to presence detection;

Figure 5 shows a flow chart of an operation of a control circuit of the rack when the portable unit operates according to the operation of Figure 4;

Figure 6 shows an embodiment of a detection device of the detection system according to another operation of the control circuits of the portable units and of the detection device relating to the presence detection of a portable unit in a compartment;

Figure 7 shows a flow chart of the operation of a portable unit for use in the circuit of Figure 6;

Figure 8 shows a flow chart of the operation of the control circuit of the detection device for the circuit of Figure 6;

Figure 9 shows a replacement section for the flow chart of Figure 8 for a different operation of the portable unit;

Figure 10 diagrammatically shows another embodiment of a compartment of a rack with a portable unit placed therein;

Figure 11 shows a flow chart for the operation of a portable unit when compartments are used as shown in Figure 10; and

Figure 12 shows a replacement section for the flow chart of Figure 8 when compartments are used as shown in Figure 10 and portable units operate according to Figure 11.

Figure 1 shows diagrammatically an embodiment of a compartment 1 of a rack (not shown) having a number of similar compartments, it being possible to place a portable unit 2 in each compartment 1.

In the embodiment of Figure 1, each compartment 1 has two contacts 3a, 3b which are connected via a conductor bundle 15 to the terminals of a voltage source (not shown) of the rack. Each portable unit 2 has two contacts 6a, 6b which, after the portable unit 2 is placed in a compartment 1, touch the contacts 3a and 3b, respectively, and which are connected to the terminals of a storage battery or storage battery supply circuit (27 in Figure 2) of the portable unit 2. After the portable unit 2 has been placed in a compartment 1, the voltage source of the rack will charge the storage battery of the portable unit 2.

The base 7 of each compartment 1 has a light-transmitting opening 8 below which a photosensitive device, in particular a photosensitive diode 9, is mounted. The diode 9 is connected with a suitable orientation of its polarality in series with a resistor 10 to the contacts 3a, 3b of the compartment 1. If the photosensitive diode 9 receives light, a voltage across the resistor 10 alters. This voltage is tapped off by a conductor 11 which is a conductor of the conductor bundle 15 and which is connected to the junction of the diode 9 and the resistor 10.

As shown diagrammatically and with small

dashes, the portable unit 2 has a light-transmitting opening 13 in its bottom 12 behind which a light-emitting device, in particular a light-emitting diode or LED 14 is mounted. When the portable unit 2 has been completely or partly placed in a compartment 1, the photosensitive diode 9 is able to receive the light emitted by the light-emitting diode 14.

The portable unit 2 of the presence detection system according to the invention can be any portable unit which is suitable for the wireless reception and/or transmission of a transmission signal which contains an identification number assigned to the portable unit and stored in a register of the unit.

The portable unit is, for example, a pager of a paging system.

Figure 2 shows a diagram of a pager 18 as portable unit 2. The pager 18 comprises an aerial 19, a receiving circuit 20 which is connected to the aerial 19 and to a decoder 21 which is connected to a comparator 22 and a control circuit 23 which is connected to a register 24, operating means, such as switches, 25, a signal generator 26, the light-emitting diode 14 and a storage battery or storage battery supply circuit 27.

The register 24 is also connected to the comparator 22 and contains an identification number or identification datum assigned to the pager 18.

The signal generator may be an optical and/or acoustical and/or electromechanical signal generator. The paging system furthermore comprises a central station (not shown) with operating means and a transmitter for assembling a call message containing the identification number of the pager 18 and for transmitting a transmission signal containing the call message. The aerial 19 and the receiving circuit 20 of the pager 18 are suitable for receiving and demodulating the transmission signal transmitted by the central station. After receiving a calling message, the receiving circuit 20 supplies it to the decoder 21 which separates the identification number and other data from the message. The comparator 22 compares the identification number received with an identification number stored in the register 24 and, in the event of equality, supplies an enable signal to the control circuit 23 for the further processing of the other data received, which may be presented by means of the signal generator 26.

Figure 3 shows a diagram of a detection device for applying the invention. A rack has a number of compartments 1 which are connected via conductor bundle 15 to a control circuit 28. For the embodiment of a compartment 1 as shown in Figure 1, the conductors connected to the contacts 3a and to the contacts 3b of the various compartments 1 may, however, also be connected directly to one another. A control circuit 28 then needs to receive only two conductors from all the compartments 1 for connection to the storage battery charging voltage source and as many conductors 11 as there are compartments 1. The control circuit 28 is connected to a memory 29, a section of which is suitable for the storing a presence datum therein for each portable unit 2, 18 which has been placed in a compartment 1. The memory 29 may have a separate location for each portable unit 2, 18 or a location can be assigned to each compartment for storing an identification number after the associated portable unit 2 has been placed in a compartment 1 and possibly a compartment number and a rack number if the compartments 1 are spread over a number of racks. To apply the invention, these different ways of storage are unimportant. The control circuit 28 may be a microprocessor. The control circuit 28 and the memory 29 may be mounted in each rack. The control circuit 28 and the memory 29 may also be assigned to a group of racks. Furthermore, one or more control circuits 28 can be connected to a common control circuit (not shown) for example of the central station in order to store and remove the presence data in a common memory connected to the common control circuit. The memories 29 connected to the control circuits 28 may possibly then be omitted. The connections and communi-cation rules necessary for this are deemed to be readily embodiable for a person skilled in the art and are therefore not described further here.

Instead of a photosensitive device, such as the diode 9, of the compartment 1 and instead of a visual light-emitting device, such as the diode 14, of a portable unit 2, 18, radiographic (high-frequency) or inductive (low-frequency) transmitting and receiving means may be used. If an inductive transmission path is used, a coil of the compartment 1 and a coil of the portable unit 2, 18 are preferably directed in the plug-in direction of the portable unit 2 in the compartment 1 in order to increase the distance over which the portable unit 2 is moved and transmission of the signal between the coils is possible.

It is pointed out that, in the figures of all the flow charts explained hereafter, "Y" represents an answer "YES" and "N" an answer "NO" to a question asked in an adjacent block.

Figure 4 shows a flow chart of a first operation of a portable unit 2, 18 according to the invention. After initialisation, indicated by block 30, the control circuit 23 detects that the portable unit 18 is, according to block 31, being placed in a compartment 1. The control circuit 23 is able to detect this in the case of the embodiment of the portable unit 18 shown in Figure 2 because, after the unit 2 has been placed in compartment 1, the contacts 6a, 6b

touch the contacts 3a, 3b, connected to a voltage source, of the compartment 1 and because a control input of the control circuit 23 is connected to a contact 6a (or to a terminal (not shown) of the storage battery supply circuit 27). If the control circuit 23 detects the placing of the unit 18 in a compartment 1, it emits a presence report signal PRS, otherwise it proceeds with block 33 to test the removal of the unit 18 from the compartment 1. If the control circuit 23 detects that the portable unit 18 is being removed from the compartment 1, it emits, according to block 34, an absence report signal ARS, otherwise it returns to block 31. After blocks 32 and 34, block 31 is returned to.

Figure 5 shows a flow chart of the operation of the control circuit 28 of the detection device of the detection system according to the invention for an operation of a portable unit 18 according to the flow chart of Figure 4. After initialisation, indicated by block 35, of the control circuit 28, the control circuit 28 detects, according to block 36, whether it has received a presence report signal PRS. If this is the case, it determines, according to block 37, the identification number from the presence report signal PRS and writes the presence datum for the identification number determined into the memory 29. Otherwise, block 38 is proceeded to. If the control circuit 28 has received, according to block 38, an absence report signal ARS, it determines, according to block 39, the identification number from the absence report signal ARS and removes the presence datum for the identification number determined from the memory 29, otherwise block 36 is returned to. After the blocks 37 and 39, block 36 is returned to.

It will be clear that in the case of an operation of the presence detection system according to Figures 4 and 5, the rack can also be designed with a single common receiving means for receiving the report signals instead of a separate receiving means for each compartment 1. The transmission strength of the transmission means for the report signal of a portable unit 2, 18 and the receiving sensitivity of the common receiving means are then preferably adjusted so that a good transmission of the report signals can only take place in the vicinity of the rack in order to avoid interference with report signals of other racks.

Figure 6 shows a diagram of another embodiment of the detection system according to the invention. In this embodiment, the portable units 2, 18 have, instead of the light-emitting diode 14, a resistor 40 which is connected between the control circuit 23 and the contact 6a. The rack has a storage battery charging voltage source 41, one terminal of which is connected to the contacts 3b of the compartments 1 of the rack. The contact 3a of a rack 1 is connected to the other terminal of the voltage source 41 via a resistor 42 associated with the compartment 1 having said contact 3a. The contacts 3a of the different compartments 1 are connected to respective inputs of a multiplexer 43. An output of the multiplexer 43 is connected to an input of the control circuit 28' via a capacitor 44. The multiplexer 43 has control inputs which are connected to outputs of the control circuit 28' for selecting one of the inputs of the multiplexer 43 which is connected to the output of the multiplexer 43.

It will be clear that when a portable unit 2, 18 is placed in a compartment 1 in a rack having a detection device according to Figure 6, a modulation signal which is supplied to the resistor 40 by the control circuit 23 of the portable unit 2, 18 loads the voltage source 41 as a function of the modulation and, as a result of this, the voltage at the respective input of the multiplexer 43 alters as a function of the modulation. The capacitor 41 transmits only the alternating voltage component of the input signals of the multiplexer 43. The control circuit 28' is, according to a manner known per se, suitable for demodulating and decoding the alternating voltage signal received from a compartment 1.

Figure 7 shows a flow chart for an operation of a portable unit 2, 18 if a detection system according to Figures 1 and 2 or according to Figure 6 is used. After initialisation, indicated by block 45, the portable unit 2, 18 determines, according to block 46, whether it is being placed in a compartment 1 of a rack. If this is the case, it emits, according to the block 47, the presence report signal PRS just as in the diagram of Figure 4, otherwise it determines, according to block 48, whether it is still in the compartment 1 and if this is the case, it emits, according to block 49, continuously or periodically a hold signal HS, otherwise block 46 is returned to.

The hold signal HS may be a simple signal which is identical for all portable units 2, 18, for example, a sine-wave signal having a frequency of 10 kHz.

However, the hold signal HS may, still more simply, consist of a constant voltage such that an associated, essentially constant voltage drop consequently occurs across each of the resistors 40 and 42, respectively. The output of the multiplexer may then also be connected, as shown by a broken line, to another input of the control circuit 28' which detects said constant voltage drop. If the voltage source 41 supplies a, for example, positive voltage to the contact 3a via the resistor 42, the output of the control circuit 23 which is connected to the resistor 40 may have a low level with the exception of when the (modulation of the) presence signal is being emitted. If a portable unit 2, 18 is being placed in a compartment 1, the control input,

connected to the contact 6a, of the control circuit 23 will then go from a low level to a high level, as a result of which the control circuit 23 is able to detect the placing. By including a diode between the contact 6a and the input, connected thereto, of the storage battery supply circuit 27, it is possible to prevent the resistor 40 from accidentally discharging the storage battery of the unit 2, 18 during normal use of the portable unit 2, 18. After the blocks 47 and 49, block 46 is returned to.

Figure 8 shows a flow chart of an operation of a detection device of the detection system according to the invention in the case of an operation of the portable units 2, 18 according to the flow chart of Figure 7. After initialisation, indicated by block 50, the detection unit determines, according to block 51, whether the presence report signal is being received. If this is the case it proceeds to block 52, otherwise to block 53. According to block 52, the detection device determines, after receiving a presence report signal PRS, from which compartment i said signal was received. In the diagram of Figure 6, this can be deduced in a simple way from the selection address supplied by the control circuit 28' to the multiplexer 43. If each compartment 1 were to have a separate receiving means, this can of course also be determined in a simple manner. Furthermore, the detection device determines the identification number from the presence report signal PRS received. It then writes a presence datum and the compartment number i for the identification number detected into the memory 29. Because the number of compartments 1 of the detection system in each embodiment is limited and possibly a portably unit 2, 18 may be located therein, in an alternative embodiment, a separate location can be assigned to each compartment 1 in the memory 29, in which location only the presence datum for the detected identification number needs to be stored. As stated, the presence datum may be formed by the identification number itself. If, according to block 53, the detection device has received no hold signal HS from the compartment i for a predetermined time, it proceeds to block 54, otherwise it returns to block 51. According to block 54, the detection device searches for the location assigned to compartment i in the memory and then determines the identification number of said location and removes the presence datum for the identification number from the memory 29.

Depending on the design of the detection device, with or without multiplexer, and depending on the type of hold signal HS, continuous or intermittent, the detection device for block 53 also possibly comprises an integrator function for each compartment 1.

After the blocks 52 and 54, block 51 is returned to.

Figure 9 shows a replacement section for the diagram of Figure 8, in which block 55 of Figure 9 replaces block 53 of Figure 8. According to block 55, the detection device determines whether it has received an absence report signal ARS from a compartment i. Such an operation of the detection device can be used if, in contrast to the operation according to Figures 4 and 5, the absence report signal does not contain an identification number of a portable unit 2, 18. If an absence report signal ARS is not (no longer) being received from compartment i, block 54 is proceeded to, otherwise block 51 is returned to.

Figure 10 shows an embodiment of a compartment 1' which differs with respect to the embodiment of compartment 1 of Figure 1 in that the compartment 1' has a switch 56 which switches over when a portable unit 2, 18 is placed in, or removed from, the compartment 1'. The bundle of conductors 15' has in accordance with this at least one conductor more than the bundle 15 of Figure 1.

Figure 11 shows a flow chart of the operation of a portable unit 2, 18 used in a detection system having compartments 1' according to Figure 10. After initialisation, indicated by block 57, the portable unit determines, according to block 58, whether it is being placed in a compartment and if this is the case, it emits, according to block 59, a presence report signal PRS. If, according to block 58, no placing of the portable unit 2, 18 in a compartment 1' is detected, and also after block 59, block 58 is returned to.

Figure 12 shows a replacement section for the flow chart of Figure 8, in which block 60 of Figure 12 replaces block 53 of Figure 8. If, according to block 60, the detection device for compartment i detects that a portable unit 2, 18 previously present in the compartment 1' is being removed from the compartment 1', it proceeds to block 54, otherwise block 51 is returned to.

In order to ensure, in the event of any interference, a good transmission of the presence report signal PRS and possibly of the absence report signal ARS (with identification number), the portable unit 2, 18 may repeat, within the scope of the invention, once or several times the emission of such a report signal.

It is pointed out that modern portable units of the type mentioned above are based on microprocessor techniques and often comprise an ASIC (Application Specific Integrated Circuit) with which both analog and digital functions can be fulfilled. It is therefore assumed that a person skilled in the art will be able to embody the flow charts shown in the drawings for the various operations of a portable unit in such a system without substantial problems. The diagrams for the various operations of the

detection devices also appear readily capable to be embodied for a similar system for a person skilled in the art. An explanation of a physical embodiment of such a system is therefore omitted.

The detection devices explained may be independent devices for indicating therewith, by means of presentation means which are not shown, the presence or absence of particular portable units 2, 18 in compartments 1, 1' of one or more racks. The detection device 28, 28' may, however, also be connected by using connections and communication rules known per se to a central station where the presence or absence of portable units 2, 18 in racks is being monitored. Such a central station may be a central calling station of a paging system. The central station may in that case be equipped for checking, after receiving an instruction to emit a call message having a particular identification number of a portable pager 18, whether said pager 18 is or is not in a compartment 1, 1' and for preventing the emission of the call message in the event of presence in a compartment 1, 1'.

Although the term "identification number" is used in the description and claims for indicating identity (individual identity or group identity), it is pointed out that this is understood to mean any type of datum with which such an identity can be represented.

Claims

1. Presence detection system for detecting the presence of a portable transmission unit in a compartment of a rack of one or more racks which each have a number of compartments, in which presence detection system each portable unit has a control circuit and a transmission circuit and a register connected to the control circuit for the wireless reception or transmission of a transmission signal which contains an identification number assigned to the portable unit and stored in the register, and also a signalling means which is connected to the control circuit and of which an output signal is dependent on the presence of a portable unit in a compartment and a transmission means which is connected to the control circuit and which is intended for transmitting, depending on the output signal of the signalling means, a report signal which may contain the identification number of the portable unit, and furthermore comprising a detection device having a control circuit to which there are connected a receiving means which is suitable for receiving a report signal originating from a portable unit which is in the vicinity of a rack and a memory in which the control circuit stores, or from which the control circuit removes, a datum about the presence of a portable unit in a compartment depending on report signals received from portable units, characterised in that the signalling means of a portable unit is a detection means which detects the placing of the portable unit in, or its removal from, a compartment, in that, when the portable unit is placed in a compartment, the control circuit of each portable unit controls the transmission means of the portable unit in order to transmit a presence report signal which is a report signal with the identification number of the portable unit, and in that, when a presence report signal is received, the control circuit of the detection device stores a presence datum in a location of the memory assigned to the portable unit having the identification number of the report signal.

2. Presence detection system according to claim 1, characterised in that, when the portable unit is removed from a compartment, the control circuit of each portable unit controls the transmission means of the portable unit in order to transmit an absence report signal, and in that, on receiving an absence report signal from a portable unit from which it has previously received a presence report signal, the control circuit of the detection device removes a presence datum from the memory stored for the portable unit in the memory.

3. Presence detection system according to claim 2, characterised in that the absence report signal transmitted by a portable unit contains the identification number of the portable unit.

4. Presence detection system according to claim 3, characterised in that the presence and absence report signals transmitted by a portable unit differ from one another in a section which characterises the type of report signal and which indicates the presence or absence of the portable unit in a compartment.

5. Presence detection system according to claim 1, characterised in that a portable unit transmits a hold signal while it is present in a compartment after transmitting a presence report signal and in that, if the detection device has not received a hold signal for a predetermined time after receiving a presence report signal from a portable unit, the device removes a presence datum from the memory stored for the portable unit in the memory.

6. Presence detection system according to claim

5, characterised in that the portable unit intermittently transmits the hold signal while it is present in a compartment after transmitting the presence report signal.

7. Presence detection system according to claim 5 or 6, characterised in that the hold signal contains the identification number of the portable unit.

8. Presence detection system according to claim 1, characterised in that each compartment has a detection means for detecting the presence of a portable unit in the compartment, and in that if, after receiving a presence report signal of a portable unit placed in a compartment from the detection means of the compartment, the detection device receives a signal which indicates the absence of the portable unit in the compartment, the detection device removes a presence datum from the memory previously stored for the portable unit.

9. Presence detection system according to claim 1, characterised in that the detection device has a number of transmission means, one for each compartment, in that the control circuit of the detection device transmits a scanning signal via the transmitting means of a compartment from which the device has previously received a presence report signal from a portable unit placed in the compartment, in that each portable unit has a receiving means which is suitable for receiving a scanning signal, in that, on receiving a scanning signal, the control circuit of the portable unit controls the transmitting means of the portable unit in order to transmit a response signal, and in that, if the detection device has not received a response signal for a predetermined time after transmitting a scanning signal via a transmitting means of a compartment from which it has previously received a presence report signal from a portable unit, the device removes a presence datum from the memory stored for the portable unit in the memory.

10. Presence detection system according to claim 1, characterised in that the detection means of a portable unit comprises two detection contacts mounted on the outside of the unit and in that each compartment has a conductor which, when a portable unit is placed in the compartment, short-circuits the detection contacts of the portable unit.

11. Presence detection system according to claim 1 or 8, characterised in that a detection means comprises a switch which switches when a portable unit is placed in, and is removed from, a compartment.

12. Presence detection system according to claim 1 or 8, characterised in that a detection means comprises a circuit which detects a connection between a storage battery or storage battery supply circuit of a portable unit and a storage battery charging source of the rack.

13. Presence detection system according to claim 1, characterised in that the transmitting means of a portable unit is a light-emitting device, and in that the receiving means of the rack is a photosensitive device which is suitable for receiving the light emitted by the light-emitting device of a portable unit in the vicinity of the rack.

14. Presence detection system according to claim 1, characterised in that the transmitting means of a portable unit is an inductive device, and in that the receiving means of a rack is an inductive device which is suitable for receiving a signal emitted by the inductive device of the portable unit in the vicinity of the rack.

15. Presence detection system according to claim 1, characterised in that the transmitting means of a portable unit is suitable for modulating a storage battery charging current which a storage battery charging source of the rack supplies to a portable unit which has been placed in a compartment of the rack, and in that the receiving means of the rack is suitable for detecting a modulation of a storage battery charging current.

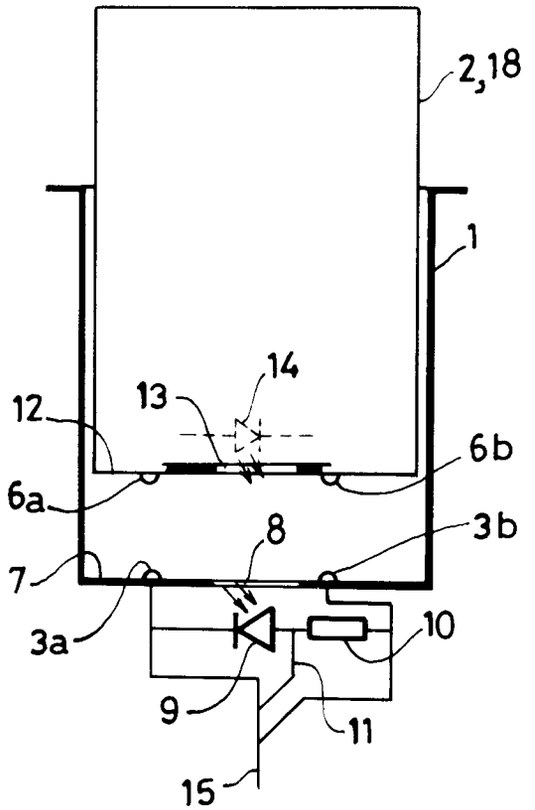

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13
12
6b
6a
8
3b
7
3a
10
9
11
15

Fig. 1.

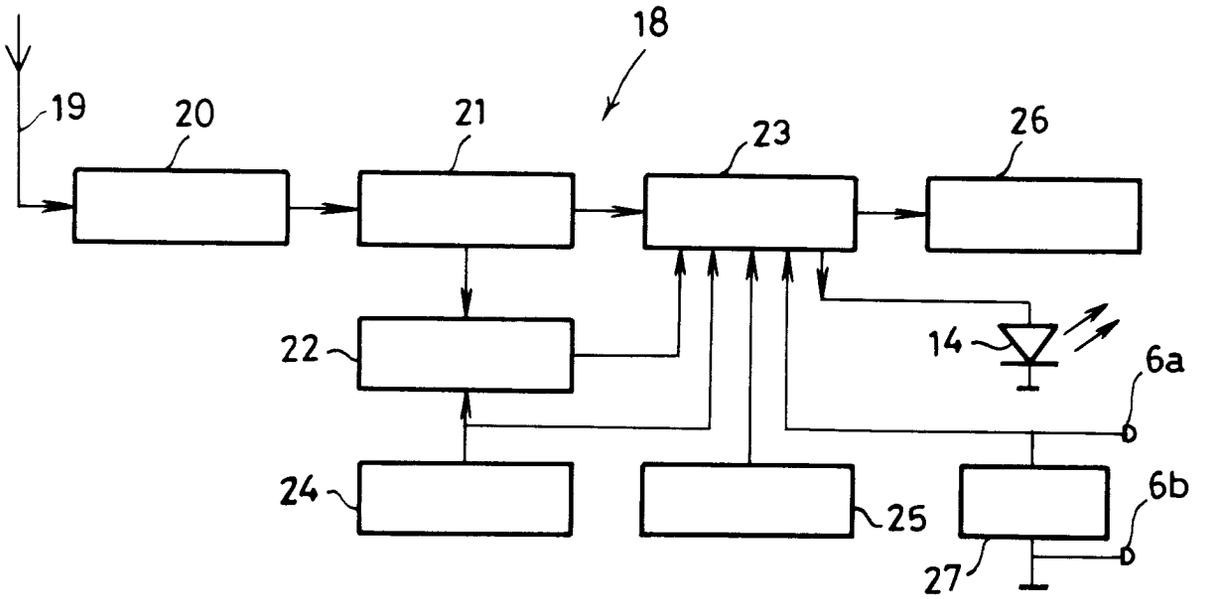

18
19
20
21
23
26
22
14
6a
24
25
6b
27

Fig. 2.

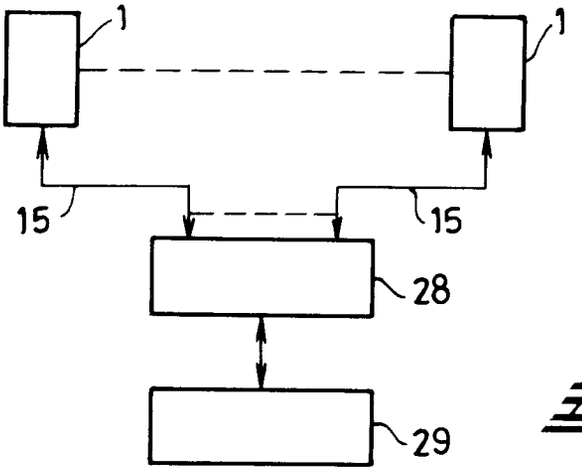

1
1
15
15
28
29

Fig. 3.

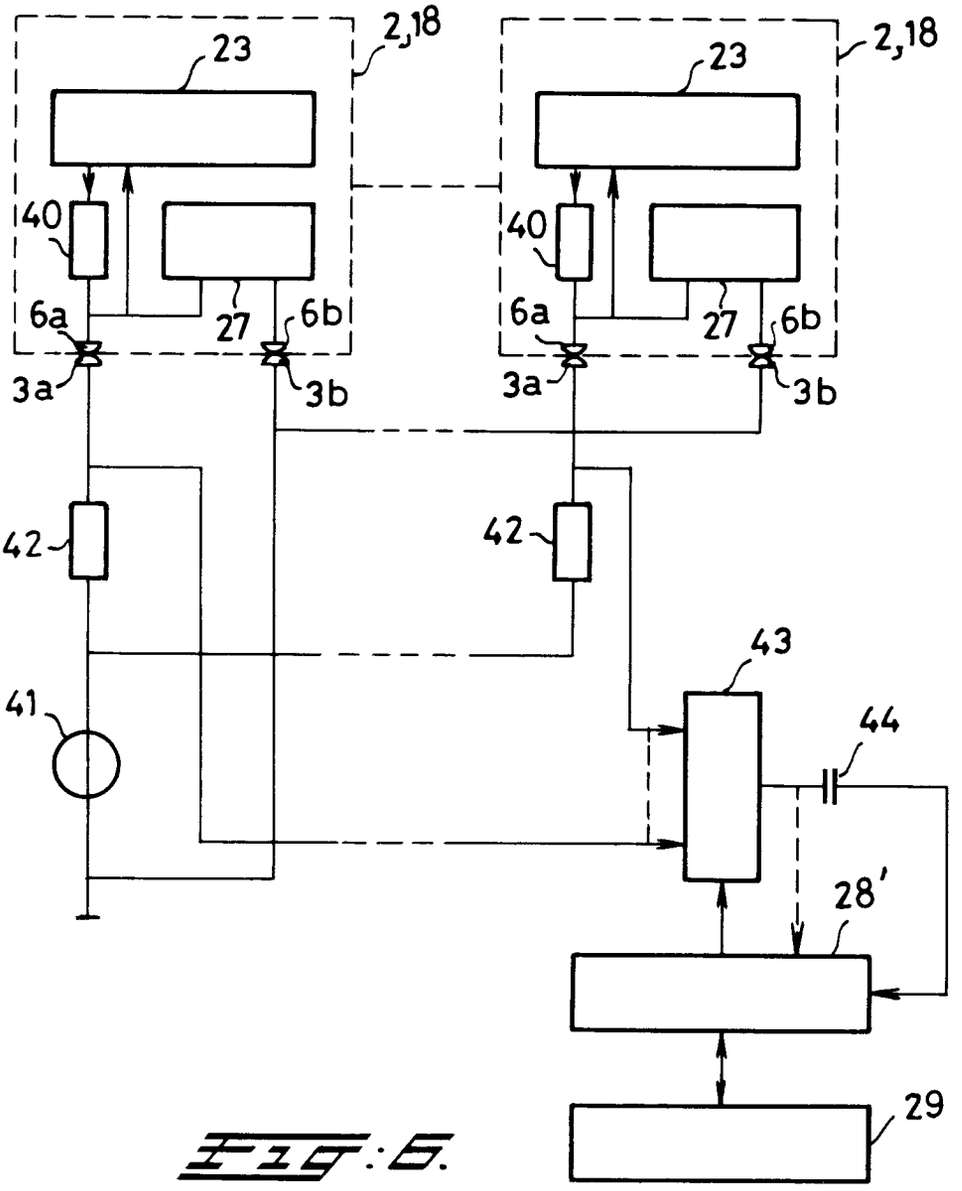

2,18
23
40
6a
27
6b
3a
3b
2,18
23
40
6a
27
6b
3a
3b
42
42
43
41
44
28'
29

Fig. 6.

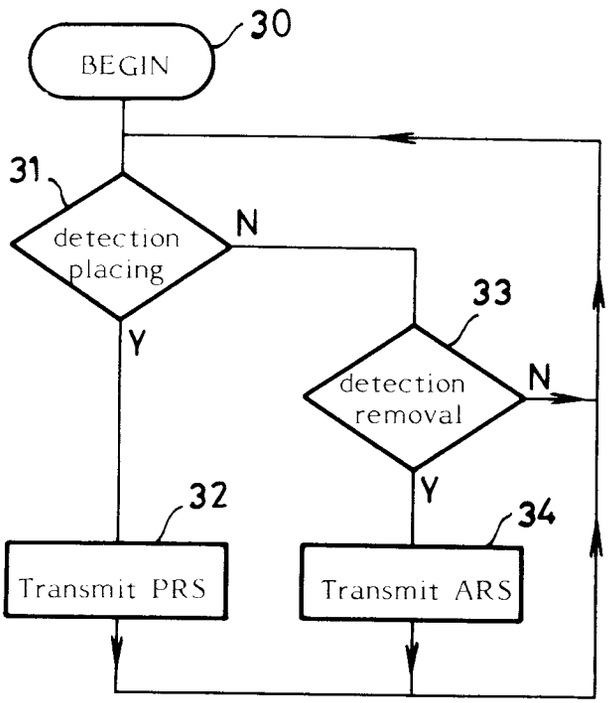

BEGIN
30
31
detection placing
N
Y
33
detection removal
N
Y
32
34
Transmit PRS
Transmit ARS

Fig: 4.

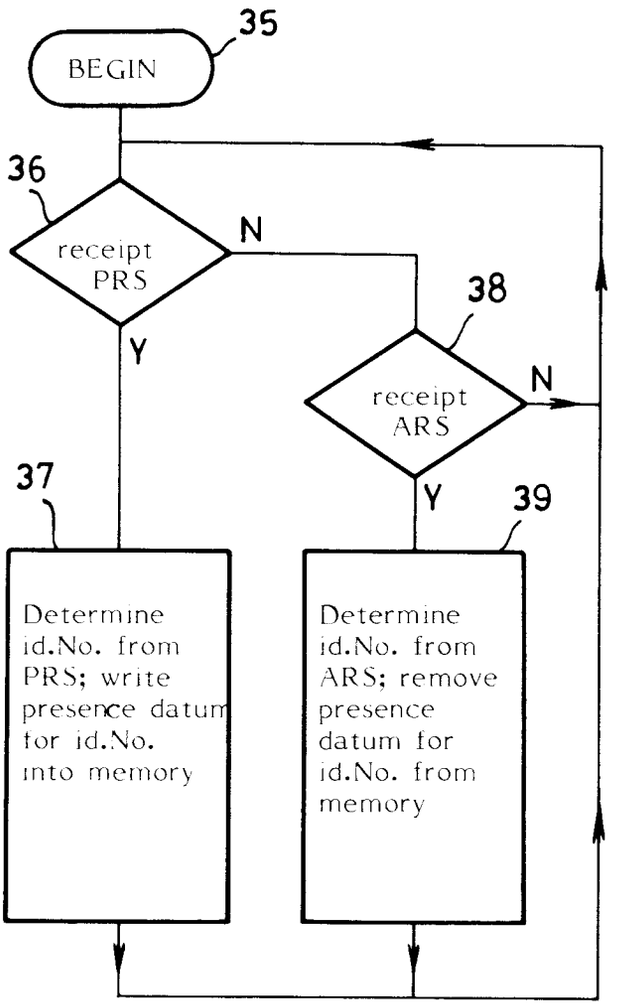

BEGIN
35
36
receipt PRS
N
Y
38
receipt ARS
N
Y
37
39
Determine id.No. from PRS; write presence datum for id.No. into memory
Determine id.No. from ARS; remove presence datum for id.No. from memory

Fig: 5.

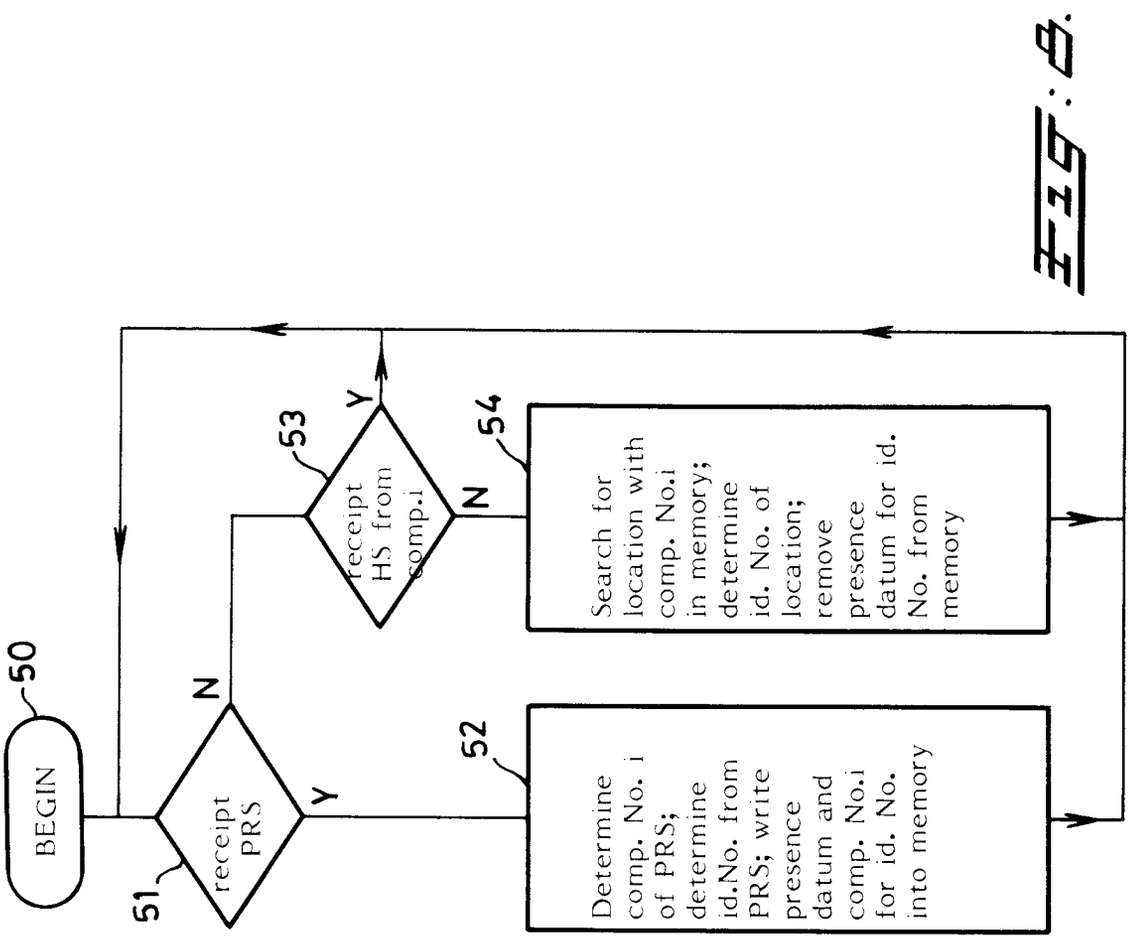

BEGIN
50
receipt PRS
51
N
Y
Determine comp. No. i of PRS; determine id.No. from PRS; write presence datum and comp. No.i for id. No. into memory
52
receipt HS from comp.i
53
Y
N
Search for location with comp. No.i in memory; determine id. No. of location; remove presence datum for id. No. from memory
54

FIG: 8.

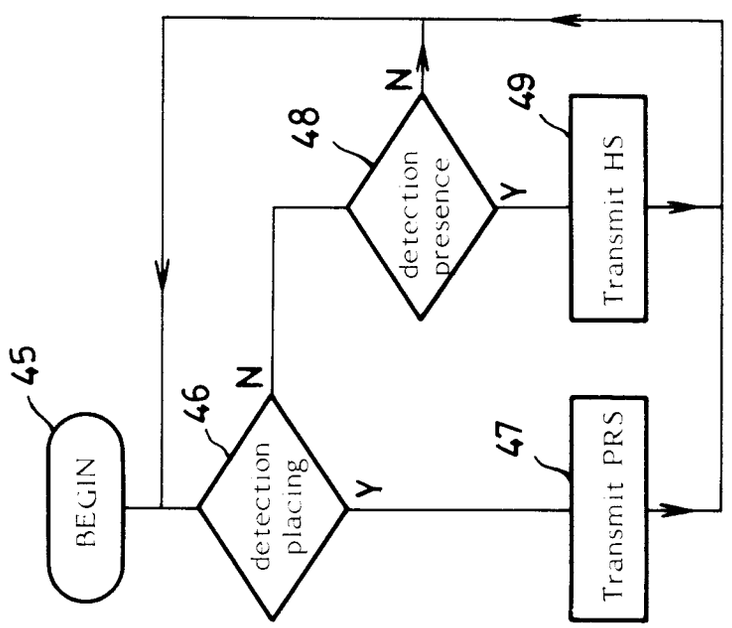

BEGIN
45
detection placing
46
N
Y
Transmit PRS
47
detection presence
48
N
Y
Transmit HS
49

FIG: 7.

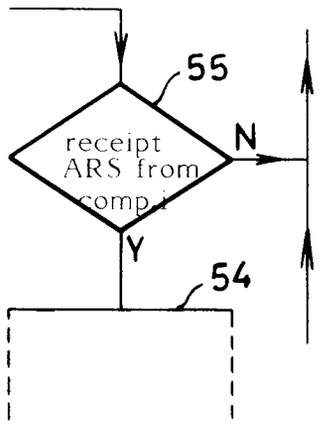


Fig.9.

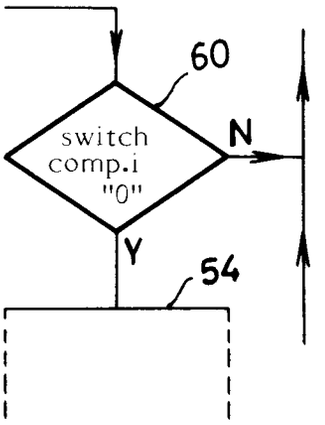


Fig.12.

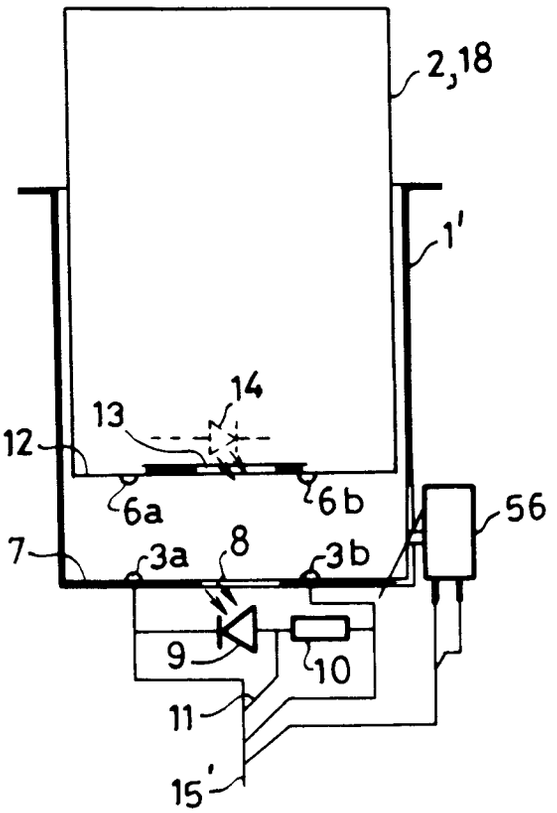


Fig.10.

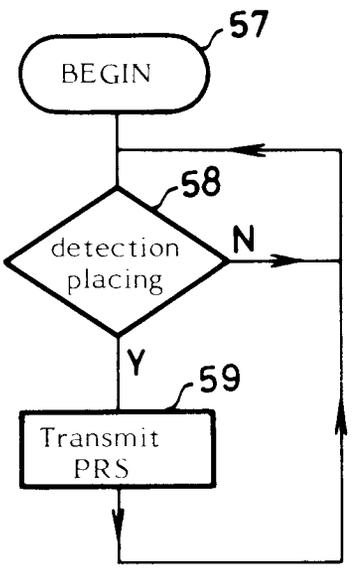


Fig.11.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 20 3127

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 808 538 (GORANSSON ET AL.) * the whole document * ---	1,10-12	G08B3/10 G08B26/00 G08B5/22
A	DE-A-2 738 887 (LICENTIA PATENT-VERWALTUNGS-GMBH) * the whole document * ---	1-3,7	
A	US-A-4 595 922 (COBB ET AL.) * claims * ---	1-3,7	
A	EP-A-0 232 123 (NEC CORPORATION) * claims * ---	1,13	
A	EP-A-0 319 099 (ERICSSON PAGING SYSTEMS B.V.) * abstract * -----	1,14	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09 MARCH 1992	REEKMANS M.V.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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