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Applicant: **ERICSSON RADIO SYSTEMS B.V.**
Nieuw Amsterdamsestraat 40
NL-7814 VA Emmen(NL)

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Inventor: **Zijlstra, Gauke Klaas**
28, Hulsackers
NL-7824 LD Emmen(NL)

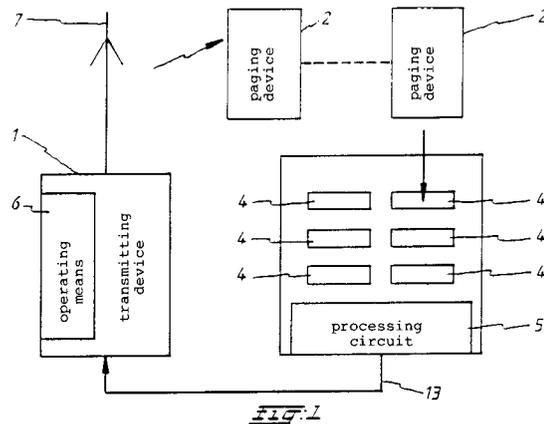
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Representative: **van der Arend, Adrianus G.A.,**
Ir. et al
EXTERPATENT B.V. P.O. Box 3241
NL-2280 GE Rijswijk(NL)

Paging system suitable for checking the operation of portable paging devices of the system.

Paging system, comprising a central transmitting device, a number of portable paging devices and a rack having a number of compartments which are each suitable for placing a paging device therein. Each paging device can be paged from the transmitting device by means of a message which contains a first individual identification number assigned to the paging device. Each paging device has a passive feature which represents a second individual identification number of the paging device. If the paging device is being placed in a compartment of the rack, a sensor and a processing circuit of the rack detect the feature on the paging device in order to thereby generate an identification signal which contains the second number of the paging device. The processing circuit of the rack delivers the identification signal to the transmitting device which, on receipt thereof, compiles and broadcasts a check message of which the first number is the first number of the paging device whose second number is present in the identification signal. If the transmitting device does not receive a presence signal in response to the check message from the paged paging device within a predetermined time after broadcasting the check message, the transmitting device assesses the paging device as defective. The paging system may optionally be designed to store a datum in a memory for each paging device, which datum indicates the presence or absence of the paging de-

vice in the rack.



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The invention relates to a paging system as defined by the preamble of claim 1.

A paging system of the abovementioned type is described in US Patent Specification 3808538. If a paging device in the known system receives a message whose identification number is equal to the identification number stored in the paging device, an equality signal is generated and delivered to a control input of an amplifier for generating an acoustic paging signal. If the paging device has been placed in the rack, it receives a supply voltage for charging a storage battery in the paging device from the rack via a number of contacts. If the paging device has been placed in the rack, the supply voltage is also delivered to a control input of the amplifier in order to suppress the generation of the acoustic paging signal. If the paging device has been placed in the rack and it generates the equality signal, this produces a presence signal which is delivered to the transmitting device via a processing circuit in the rack so that the transmitting device receives an indication of the presence of the paging device in the rack and, consequently, of the accessibility of the user of the paging device.

The equality signals or presence signals received from the various compartments of the rack are the same and are delivered via a number of conductors to the transmitting device.

In the known paging system, it is impossible to detect the presence of a paging device in the rack if the paging device is defective or an accumulator or battery thereof is empty. This has the important drawback that the transmitting device never automatically receives an indication of the accessibility of the user of the defective paging device after this paging device has become in such a state. Because as a result of this communication between the transmitting device and said user is in fact deemed to exist but is impossible, the operation of the organisation in which said user and other users of defective paging devices are employed may be seriously disrupted. Usually, this problem is more serious if the user of a defective paging device is a person who has to be paged as quickly and reliably as possible in the event of disasters.

Another drawback of the known system is that the presence of a paging unit in the rack can only be detected if, while it is still unaware of said presence, the transmitting device broadcasts a message intended for said paging device, which might occur any length of time after the paging device has been placed in the rack.

The object of the invention is to eliminate the drawbacks of the known paging system and to improve the system.

According to the invention, this object is achieved for the paging system of the abovementioned type by means of the measures which are stated in the characterising part of claim 1.

Whenever a paging device is placed in the rack, the satisfactory operation of the paging device can consequently be checked from the transmitting device. Because the passive feature which the second identification number of the paging device represents is insensitive to electronic interferences, defects and/or an empty accumulator or battery, the satisfactory operation of the paging device can be detected in good time and with high reliability.

The check message may be broadcast by the transmitting device at an intensity different from other messages, as a result of which the transmitting device can check whether the receiving sensitivity of the paging device is adequate. If desired, the transmitting device may broadcast a series of check messages at different transmission intensities for this purpose.

According to one or more of the characterising parts of the subordinate claims, the passive feature, which represents the second identification number of a paging device, may be such a simple feature that it can easily be provided on paging devices of the type described in said US Patent Specification 3808538 without the paging devices having to be modified further. As a result, the cost of implementation of the invention can be kept down.

Within the scope of the invention, the paging system may optionally be designed for storing in a memory data which indicate, for the various paging devices of the system, the presence or absence thereof in a rack.

Other characteristics and advantages of the invention will emerge from the explanation, which follows below, of embodiments of the paging system according to the invention with reference to the drawings. In the drawings:

Figure 1 diagrammatically shows a paging system in which the invention is used;

Figure 2 shows, in perspective, a paging device of the paging system of figure 1;

Figure 3 diagrammatically shows a section of a compartment of a rack of the system of figure 1;

Figure 4 shows an electrical block diagram of a paging device of the system of figure 1; and

Figure 5 diagrammatically shows a section of another embodiment of a compartment of a rack of the system of figure 1.

Figure 1 diagrammatically shows a paging system according to the invention. The system comprises a central transmitting device 1, a number of portable paging devices 2 and a rack 3. The rack 3 has a number of compartments 4 which are each suitable for placing a paging device 2 therein. The rack 3 also has a processing circuit 5 which is connected to the transmitting device 1. The trans-

mitting device 1 may comprise operating means 6 and/or means for the remote reception of control signals for broadcasting a message.

Assigned to each paging device 2 is a first individual identification number which, as explained with reference to figure 4, is stored in a memory 24 of the paging device 2.

The transmitting device 1 is suitable for compiling a message which contains a first individual identification number and for broadcasting the message via an aerial 7.

Figure 2 shows, in perspective, a paging device 2 which bears on one side a passive feature 9 which represents a second individual identification number assigned to the paging device. The passive feature 9 may be a simple feature, for example an optically, magnetically or mechanically detectable feature.

Within the scope of the invention, the first and second identification numbers of any paging device may be any symbol which can represent an identification code or identification number. Furthermore, it is not necessary that the first and second identification numbers assigned to a paging device 2 are identical.

Figure 3 diagrammatically shows a section of a compartment 4 into which a paging device 2 is partly inserted via an opening 10. The compartment 4 has three contacts 11a, 11b, 11c. The paging device 2 has three contacts 12a, 12b, 12c. Once the paging device 2 has been completely inserted in the compartment 4, the contacts 11a, 11b, 11c touch the contacts 12a, 12b, and 12c, respectively. The contacts 11a, 11b, are connected via two conductors of a bundle 15 to the terminals of a supply source (not separately shown) of the rack 3, to which the processing circuit 5 of the rack is also connected. The contacts 12a, 12b are connected to terminals of a storage battery or storage battery supply circuit 27, shown in figure 4, of the paging device 2.

The compartment 4 also has a sensor 16 which is connected to the processing circuit 5 via a pair of conductors of the bundle 15.

If the paging device 2 having the passive feature 9 is moved with respect to the sensor 16, the sensor 16 is suitable for detecting the feature 9. As a result, the sensor 16 and the processing circuit 5 are capable of detecting the second identification number represented by the feature 9. Once the processing circuit 5 has detected the placing of the paging device 2 in the compartment 4 and the feature 9 of the paging device 2, the processing circuit 5 delivers an identification signal to the transmitting device 1 via a connection 13, which identification signal contains the second identification number of the feature 9. In response thereto, the transmitting device 1 compiles a check mes-

sage of which the first identification number is the first identification number of the paging device whose second identification number is embodied in the identification signal received from the rack 3.

The transmitting device 1 then broadcasts the check message. If the paging device 2 to which said first and second identification numbers are assigned is working satisfactorily and receives the control message mentioned in the rack 3, the paging device 2 generates an equality signal which is delivered via the contacts 11c, 12c to the processing circuit 5 of the rack 3. The processing circuit 5 delivers the equality signal, hereinafter also referred to as presence signal, to the transmitting device 1 which consequently obtains an indication of the satisfactory operation of the paging device 2, paged by means of the check message, in the rack 3.

By broadcasting the check message at an intensity different from that of other messages, the transmitting device 1 can also obtain an indication of the receiving sensitivity of said paging device 2. For that purpose, the transmitting device 1 may broadcast the check message a number of times at various transmission intensities.

As stated, the feature 9 may be an optically detectable feature. The feature consists, for example, of a bar code, the bars of which cross the direction of insertion of the device 2 into the compartment 4. The sensor 16 is in that case an optical sensor which may have a light-providing device, such as a light-emitting diode (LED), for illuminating a feature 9 which is being fed past, and a light-sensitive device, such as a light-sensitive diode, for detecting reflected light.

The feature 9 may, as an alternative, be a magnetically detectable feature and consist, for example, of a magnetic tape strip. In that case the sensor 16 is a magnetically sensitive sensor.

The feature 9 may, as an alternative, be a mechanically detectable feature, for example consisting of a pattern of depressions or elevations. The depressions or elevations may be detected by one or more switches which form the sensor 16 or in another way, for example with a laser scanner like that of a CD player.

The sensor 16 is preferably mounted close to the feed opening 10 of the compartment 4, as a result of which the feature 9 can be relatively long and is consequently able to contain a lot of information or the information can be spread over a longer distance. As a result, the feature 9 must be produced less precisely and/or the sensor 16 must be less sensitive and/or less precise. In addition, with such a location of the sensor 16, the feed-through speed will be more uniform, as a result of which the risk of incorrect detection of the feature 9 is counteracted.

In particular, if the feature 9 is an optically or magnetically detectable feature of the abovementioned type, it is possible for the feature 9 to be mounted, for example, as an adhesive strip on paging devices of before the invention, for example of the type described in the said US Patent Specification 3808538.

Figure 4 shows an electrical block diagram of a paging device 2 of a paging system according to the invention. The paging device 2 comprises an aerial 19, a receiving circuit 20 which is connected to the aerial 19 and to a decoder 21, the latter being connected to a comparator 22 and a control circuit 23 which is connected to a memory 24, operating means, such as switches 25, a signal generator 26 and the storage battery or storage battery supply circuit 27 already mentioned.

The memory 24 is also connected to the comparator 22 and contains at least one first individual identification number assigned to the paging device 2.

The signal generator 26 may be an optical and/or acoustic and/or electromechanical signal generator.

The aerial 19 and the receiving circuit 20 of the paging device 2 are suitable for receiving and demodulating a message transmitted by the central transmitting device 1. After receiving and extracting a message, the receiving circuit 20 delivers the message to the decoder 21 which extracts the first identification number and any other data in the message. The comparator 22 compares the first identification number received with the at least one identification number stored in the memory 24 and, in the event of equality, delivers an enable signal to the control circuit 23 for further processing the other data received, which may be presented by means of the signal generator 26. If the comparator 22 detects the equality mentioned, the control circuit 23 delivers an equality signal or presence signal to the contact 12c of the paging device 2. The signal delivered to the contact 12c may simply be the output signal of the comparator 22, in which case the contact 12c may be connected directly to the output of the comparator 22 instead of to an output of the control circuit 23. However, the signal delivered to the contact 12c may contain, according to the invention, the first identification number stored in the memory 24. As a result, the transmitting device 1 achieves greater certainty about whether a presence signal received from the rack 3 does, or does not, originate from the paged paging device 2. The contact 12c is in that case connected to the control circuit 23.

Within the scope of the invention, the transmitting device 1 and/or the processing circuit 5 of the rack 3 may optionally have a memory (not shown) for the storage therein of data which indicate for

the paging devices of the system whether they have, or have not, been placed in the rack or in one of a number of racks of the system. The presence of a paging device 2 may be detected in the way described above if the paging device 2 is inserted in a compartment 4 of the rack 3. The removal, and consequently the absence, of a paging device 2 from the rack 3 can easily be detected with the aid of the embodiment shown in figure 5 of a compartment 30 which differs from the compartment 4 shown in figure 3 in that the compartment 30 has a switch 31 which is in a first state if a portable device 2 has been placed in the compartment 30 and which is otherwise in a second state. The switch 31 is connected via two conductors of the bundle 15' to the processing circuit 5, which is able to detect the change in state of the switch 31 and, in accordance therewith, can control the memory in order to alter the datum, previously assigned to the paging device 2, which indicated the presence of the paging device 2 in the compartment 30. With this way of detection of removal of a paging device 2 from the compartment 30, it is necessary for the respective datum which indicates the presence of a paging device 2 in the compartment 30 to be coupled to an individual compartment number assigned to the compartment 30. How the first and second identification numbers of a paging device 2 placed in a compartment 30 and then removed and the compartment number assigned to said compartment 30 are processed in order to alter absence/presence data in a memory, intended for this purpose, in the transmitting device 1, or both in the transmitting device 1 and in the processing circuit 5 of the rack 3, is not considered difficult for a person skilled in the art after reading the above and this is therefore not explained further.

Alternatively the passive feature 9, the processing circuit 5 and the sensor 16 can be such that the processing circuit 5 and the sensor 16 can detect the removal of a paging device 2 out of a compartment 4 by that they can detect the passing by of the passive feature (in opposite direction). It is sufficient then that a detection signal is generated which indicates the removal, without the detection signal containing a representation of the feature from which a second individual identification number could be derived.

Other solutions which can be used to detect the removal of a paging device 2 from a compartment of a rack, in which the paging devices 2 are also capable of transmitting the first identification number to the detection means of the compartment are described in Dutch Patent Applications 9001318 and 9002677 of the Applicant.

It is observed that, within the scope of the invention, instead of via the contacts 11c and 12c,

the equality or presence signal, with or without identification number, can also be transferred to the rack 3 in another way, for example inductively, optically or by modulation of the supply current which flows through the contacts 11a, 11b, 12a, 12b, as described in the said Dutch Patent Applications 9001318 and 9002677 of Applicant.

Within the scope of the invention it is further possible that the check message is transmitted by an other transmitter. The other transmitter is for instance a transmitter arranged within the rack, whereby the processing circuit of the rack comprises in a memory a table containing first and second individual identification numbers assigned to the different paging devices, and the processing circuit passing test results to the central transmitting device 1.

It is further observed that modern paging devices 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. In addition, control circuits or processing circuits of modern paging systems are also usually based on microprocessor techniques. It is therefore assumed that, after reading the explanation given above with reference to the drawings, a person skilled in the art can alter a paging system, known per se and employing microprocessor techniques, in order to obtain a paging system according to the invention without much trouble, a number of alterations relating to programs. An explanation of a further detailed physical implementation of a paging system according to the invention is therefore omitted.

Claims

1. Paging system, comprising a central transmitting device, a number of portable paging devices and a rack having a number of compartments which are each suitable for placing a paging device therein, in which system a first individual identification number is assigned to each paging device, the first number of a paging device is stored in a memory of the paging device, the transmitting device is suitable for compiling and broadcasting a message which contains a first number, each paging device compares a first number received via a message with the first number stored in the memory of the paging device and, in the event of equality, generates an equality signal and, if the paging device has been placed in the rack, delivers a presence signal to the transmitting device via a processing circuit of the rack, characterised in that a second individual identification number is assigned to each portable device, the second number is represented by a passive feature of the paging device, the rack has a sensor connected to the processing circuit of the rack, the sensor and the processing circuit of the rack are suitable for reading the passive feature of the paging device when a paging device is placed in the rack and for generating under these circumstances an identification signal which contains the second number, the processing circuit of the rack delivers the identification signal to the transmitting device, the transmitting device, on receiving an identification signal, compiles and broadcasts a check message of which the first number is the first number of the paging device whose second number is embodied in the identification signal and the transmitting device assesses the paging device, to which the number of the check message is assigned, as satisfactory or defective if the transmitting device receives, or does not receive, respectively, a presence signal in response to the check message from the paging device within a predetermined time after broadcasting the check message.
2. Paging system according to claim 1, characterised in that the transmitting device broadcasts the check message at an intensity different from that of other messages.
3. Paging system according to claim 1 or 2, characterised in that the presence signal contains the first number of the paging device which generates the presence signal.
4. Paging system according to claim 1, 2 or 3, characterised by a memory for storing data therein which represent the presence or absence of the various paging devices, and in that the presence or absence of a paging device in a compartment of the rack is determined by determining the feature of the paging device when the paging device is being placed in the compartment or is being removed from it, respectively.
5. Paging system according to claim 4, characterised in that the identification signal is dependent on the direction of movement and the arrival or departure of the paging device is derived from the identification signal.
6. System according to any of the preceding claims, characterised in that the feature is a feature which can be optically detected by the sensor.

7. System according to claim 3, characterised in that the characteristic is a bar code whose principal plane runs parallel to the direction of insertion of the paging device into a compartment and bars of the code cross the direction of insertion, and the sensor is mounted at a position which is passed by the bars during the insertion. 5
8. System according to any of claims 1 to 5 inclusive, characterised in that the feature is a feature which can be magnetically detected by the sensor. 10
9. System according to any of claims 1 to 5 inclusive, characterised in that the feature is a magnetic strip, in which a longitudinal direction runs essentially parallel to the direction of insertion of the paging device into a compartment. 15
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10. System according to any of claims 1 to 5 inclusive, characterised in that the feature is a feature which can be mechanically detected by the sensor. 25
11. System according to claim 10, characterised in that the feature consists of a pattern of elevations or depressions in a housing of the paging device which can be detected by the sensor. 30
12. System according to claim 11, characterised in that the pattern is elongated and a longitudinal direction thereof runs essentially parallel to the direction of insertion of the paging device into a compartment. 35
13. System according to any of claims 7, 9 and 12, characterised in that the sensor is mounted at an insertion opening of a compartment. 40

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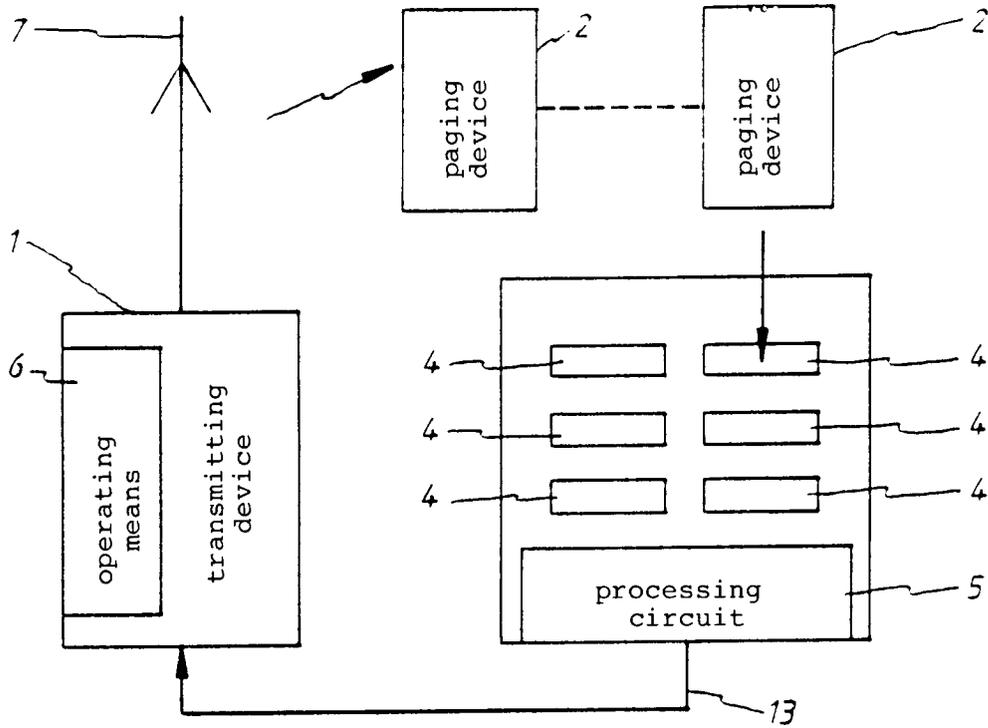


FIG. 1

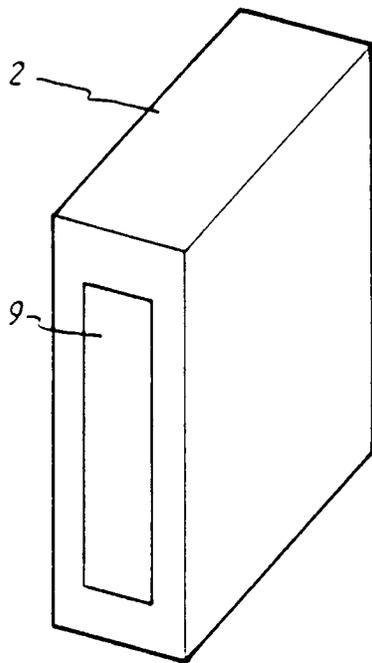


FIG. 2

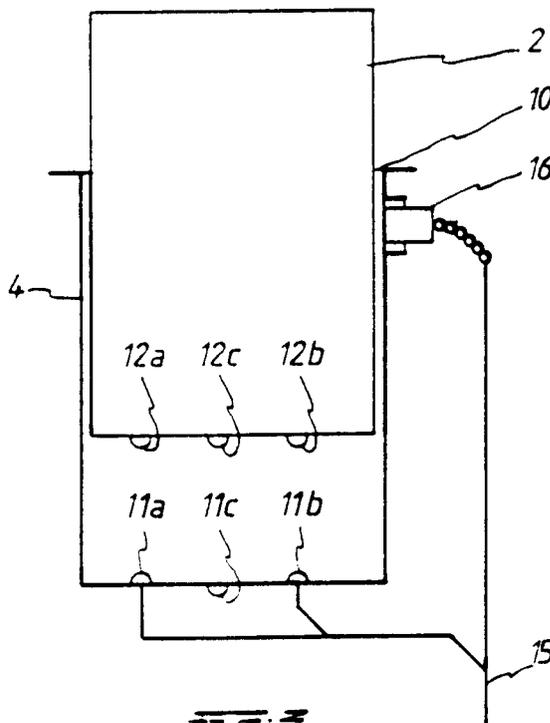


FIG. 3

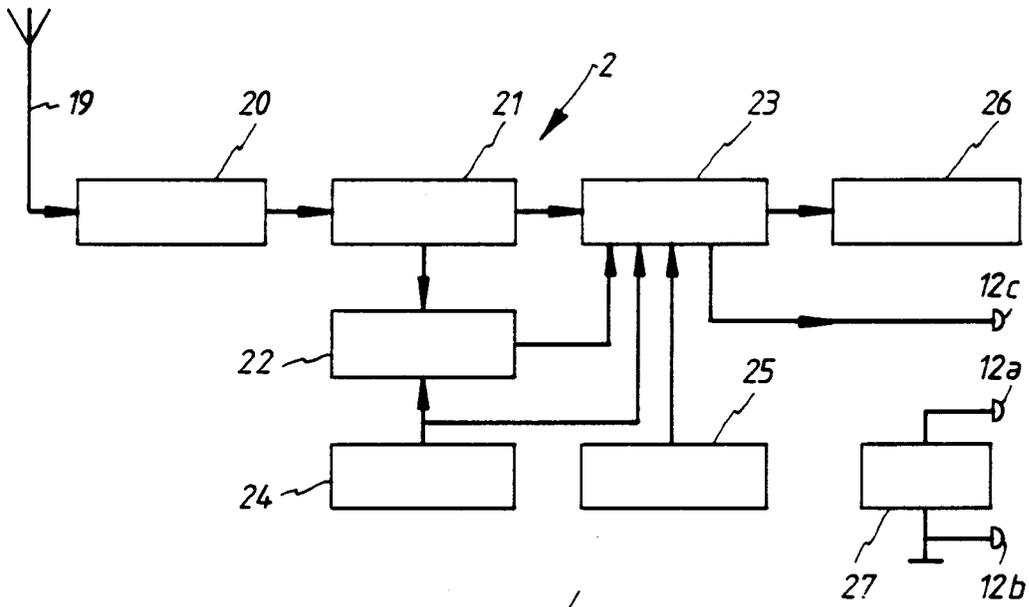


FIG. 4

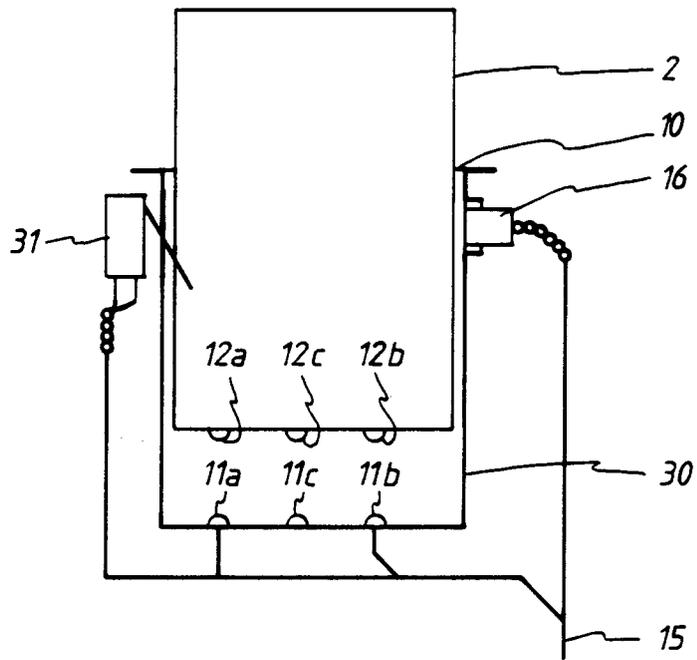


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 0763

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)
Y	DE-A-2 738 887 (LICENTIA PATENT) * page 6, line 11 - page 8, line 11 * ---	1	G0883/10
Y	GB-A-2 212 310 (STEP BY STEP CONSULTANTS) * abstract *	1	G088 G06K
A	---	2-3	
A	US-A-3 808 538 (K. GORANSSON) * column 4, line 45 - column 6, line 16; figures 1-3 * -----	1	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 JULY 1992	Examiner SGURA S.
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	

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