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102007023670.2 22 May 2007 (22.05.2007) DE(71) Applicants (for all designated States except US): **TYCO ELECTRONICS AMP GMBH** [DE/DE]; Ampèrestrasse 12-14, 64625 Bensheim (DE). **TYCO ELECTRONICS AUSTRIA GMBH** [AT/AT]; Pilzgasse 33, A-1210 Wien (AT).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LANGJAHR, Hanspeter** [DE/DE]; Arnoldstrasse 70, 70378 Stuttgart (DE). **FALKNER, Werner** [AT/AT]; Eulenbach 47, 3902 Vitis (AT). **STERL, Norbert** [AT/AT]; Johnstrasse 69, 1150 Wien (AT). **FELDMEIER, Günter** [DE/DE]; Karolinger Strasse 26, 64653 Lorsch (DE). **KLENNER, Thomas** [DE/DE]; Gutenbergstrasse 27, 67112 Mutterstadt (DE).(74) Agent: **KUHL, Dietmar**; Grünecker, Kinkeldey, Stockmair & Schwanhäusser, Leopoldstrasse 4, 80802 München (DE).

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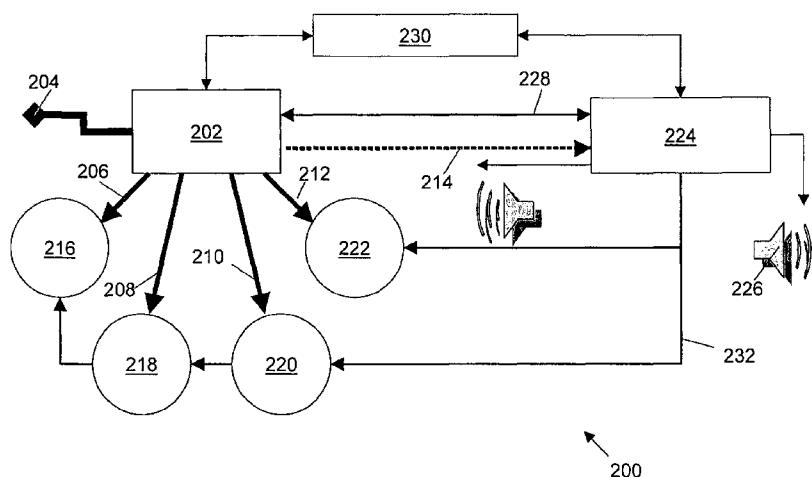


FIG. 2

(57) Abstract: A power supply unit (202) in an electromechanical appliance (200) comprises a voltage transformer for generating an internal supply voltage (206, 208, 210, 212) from an external input voltage (204) and an output terminal for outputting the internal supply voltage (206, 208, 210, 212) to electronic and mechanical components (216, 218, 220, 222). The power supply unit (202) is configured as a modular component suitable for assembly in various electromechanical appliances (200). Furthermore, a power supply and communication system comprises a power supply unit (202) and a control unit (224) which can be connected to and operated with an external input signal in order to trigger the electronic and mechanical components (216, 218, 220, 222). The control unit (224) is configured as a modular component for various electromechanical appliances (200) and, during operation, is supplied with an associated internal supply voltage (214) by the power supply unit (202).

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POWER SUPPLY UNIT AND POWER SUPPLY AND COMMUNICATION SYSTEM IN AN ELECTROMECHANICAL APPLIANCE

The present invention relates to a power supply unit for supplying electronic and
5 mechanical components in an electromechanical appliance and to a power supply and
communication system in an electromechanical appliance. In particular, the present
invention relates to the power supply and signal supply of household appliances which
can be controlled in a comparatively complex form by centralized control systems.

An important aspect when reducing energy demands and carbon dioxide
10 emission is the development of what is known as intelligent heating technology in
combination with networked building system engineering and intelligent control of
energy-consuming household appliances. The intelligent home of the future does not
consist of an accumulation of automated individual solutions, but rather the main focus
is the networking and standard control strategy of the appliances and therefore also
15 their ability to communicate and to exchange data with one another.

Existing individual control systems in a home will therefore, in the future, be
increasingly replaced with energy and comfort management systems for the entire
home. Currently, a plurality of functions is included in the term "home automation." A
plurality of various functions and system components in a building is therefore
20 networked to form a complete system, for example:

- complex lighting and curtain/blind controls, which can be operated both
locally and centrally and are additionally dependent on the position of the sun,
presence etc., and presence simulation by automatic operation of light or
curtains/blinds,

- temperature-controlled heating in individual rooms dependent on temperature and presence as well as automatic confirmation of the requirements to a heating system,

- monitoring and remote control of individual functions via the telephone
5 network,

- the operation of room functions via the wireless remote control of hi-fi and TV appliances,

- the operation and monitoring of various household appliances, such as washing machines, dishwashers, tumble dryers, ovens, cookers and the like via central
10 monitors (what are known as "home assistants" or "home managers"),

- remote notification of faults and remote diagnosis for improved maintenance of household appliances.

In particular, when controlling household appliances it is of utmost importance that they are supplied not just with electric power but also with control signals and that
15 they are fully able to communicate when a request is made by status signals.

Various possibilities of a communications platform of this type are disclosed, for example, in the German patent application DE 10208147 A1. According to this document, the household appliances to be controlled are controllingly coupled to a building gateway computer device via a power line communication connection and a
20 European Home System Communications Protocol. The household appliances to be controlled therefore include, for example, a washing machine, microwave, fridge, freezer, oven and dishwasher.

These appliances are generally referred to as unattended electromechanical appliances, or just "unattended appliances", as defined, for example in the IEC 60335
25 international standard.

With regard to the scenario outlined above, the manufacturers of such household appliances are faced with the problem that the different household appliances each comprise a completely different internal power supply and signal supply. In particular, washing, cooling and heating appliances differ greatly in their complexity and in the voltage and signal characteristics.

Normally, the individual components in household appliances are supplied with power and a signal by a set of cables which is expensive and complex to install.

Furthermore, increasing globalisation also poses the problem that a household appliance must be able to operate in various countries and therefore under completely different conditions relating to input voltage supply.

Fig. 1 shows, in an exemplary manner, the components and interfaces provided in an unattended electromechanical appliance as well as the usual connections present for power and signal supply. The thinner connecting lines therefore represent connections 102 carrying a signal, which carry a low power, whilst connections 104 shown with thicker lines represent the connections 104 carrying power. The known household appliance 100 comprises a power supply unit 106 which can be connected to a mains or external input voltage 108.

The known electromechanical appliance in the example shown in Fig. 1 is a washing machine which comprises a heating element 110, a pump 112 and a motor 114 which are supplied with supply voltage by the power supply unit 106. A control unit 116 controls the mechanical components and receives signals from sensors 118 and an input/display unit 120. The control unit 116 also communicates with switches 122 and a timer 124 and possibly with other components not shown.

A drawback of this known arrangement is that the respective household appliance 100 must be set up specifically for the intended environment for use, both

with regard to the input voltage requirements and the intended communications protocol. It is complicated and expensive to convert the appliance for changing usage conditions.

The object of the present invention is therefore to supply a power supply and
5 communication system which can be assembled in a cost-effective and efficient manner and can be flexibly adapted, as far as possible, to various environments for use.

This object is achieved by a power supply unit with the features of claim 1. Advantageous developments are the subject of the dependent claims.

10 The present invention is thus based on the idea of configuring at least the power supply unit as a modular ready-made component which can be used universally.

A power supply unit for supplying electronic and mechanical components in an electromechanical appliance according to the present invention can be connected to
15 an external input voltage and comprises at least one voltage transformer for generating at least one internal supply voltage from the external input voltage and at least one output terminal for outputting the at least one supply voltage. According to the present invention, the power supply unit is configured as a modular component which is suitable for assembly in different types of electromechanical appliances. By
20 means of said modular construction, power supply units can advantageously be provided as ready-made modules and, depending on the intended environment for use, can be quickly installed and also replaced, if necessary.

If a control input for receiving a control signal is provided in the power supply unit, the power supply unit can be directly controlled by a control provided in the
25 appliance or even via a communications device by an external central control member.

The modular power supply unit can be directly fitted with a power plug-in connection and a power cable which conforms to the respective national standards. Therefore, depending on the desired location, different power supply units can be installed in an electromechanical appliance.

5 In order to prevent a spread of electromagnetic interference, the power supply unit may comprise at least one integrated input filter for filtering the external input voltage.

The power supply unit may comprise at least one switching device for connecting a selectable internal supply voltage to the at least one output terminal in
10 order to achieve increased flexibility during use of said power supply unit. In this way, different types of household appliance allow for internal supply voltages which may possibly be different.

The internal supply voltages occurring may be, for example, 240 V, 120 V, 24 V, 12 V and/or 5 V.

15 The power supply unit is advantageously included in an integrated power supply and communication system. Said system further comprises a control unit which can be connected to and operated with an external input signal so as to control the electronic and mechanical components of the electromechanical appliance. According to the invention, the control unit is also configured as a modular component which is
20 suitable for assembly in different types of electromechanical appliance. The control unit is supplied by the necessary internal supply voltage from the power supply unit.

According to an advantageous development, the control unit is set up to output a control signal for controlling the power supply unit. This may take place either via a separate signal line or via the power supply unit according to the known principle of
25 what is known as Power Line Communication. Furthermore, all communication

channels may be configured either in part or completely for wireless communication, corresponding internal interfaces being provided for this.

According to an advantageous development, the control unit comprises a display unit for displaying information to a user. Said display unit may furthermore be configured as a touch panel for a user to input control commands. Of course, other forms of operating elements for operation by a user, such as buttons, rotary switches and the like, may also be provided.

According to an advantageous development of the present invention, the control unit comprises an interface for wireless communication with an external control computer. In this manner, the electromechanical appliance can be used in a centrally-controlled automated home technology system.

Furthermore, the power supply unit may be configured together with the control unit as a one-piece module. The advantage of this arrangement is that the entire system can be ready-made and stored as a complete module without difficulty.

In the system according to the invention, a plurality of power supply units and/or a plurality of control units may be provided in order to adjust the function according to requirements with regard to the use and desired function of the electromechanical appliance. This considerably increases the flexibility of the arrangement.

The present invention further relates to an electromechanical appliance with a power supply unit or a power supply and communication system according to the present invention. Examples of appliances of this type are washing machines, fridges, freezers, ovens, dishwashers or microwaves.

Embodiments of the present invention will be explained hereinafter in greater detail and with reference to the figures, in which:

Fig. 1 is a block diagram of a known electromechanical appliance;

Fig. 2 is a block diagram of a power supply unit according to the invention in a power supply and communication system;

Fig. 3 is a block diagram of an alternative embodiment of a power supply and communication system according to the present invention;

5 Fig. 4 is a block diagram of further embodiment of a power supply and communication system according to the present invention;

Fig. 5 is block diagram of a further embodiment of a power supply and communication system in an electromechanical appliance.

10 The present invention will now be described in detail with reference to Figs. 2 to 5.

A power supply and communication system in an electromechanical appliance 200 according to the present invention comprises a power supply unit 202 which can be connected via a power plug-in connection to a mains or external input voltage 204. The power supply unit 202 internally outputs a plurality of internal supply voltages 206, 208, 210, 212 and 214. The internal supply voltages 206 to 214 may be of different values depending on the components that are desired to be controlled.

The power supply unit 202 therefore supplies electronic and/or mechanical components 216, 218, 220, 222, which in the illustrated embodiment consists of a motor, a pump, a heater and a further electronic and/or mechanical component, respectively, with power. According to the invention, the power supply unit 202 also 20 supplies a control unit 224 with the internal supply voltage 214.

In the form illustrated here, the control unit 224 is also configured in a modular manner and is provided with an integrated display 230 in the present example. It is also schematically shown that an external communications device 226 is provided for 25 communicating with a central control computer. The external communications device

226 is wireless, however, the external communications device 226 may also be a wired communications device.

An additional signal line 228 connects the control unit 224 to the power supply unit 202. What is known as a Power Line Connection may also optionally be provided
5 between the control unit 224 and the power supply unit 202. As can be seen from Fig. 2, the control unit 224 controls the electronic and/or mechanical components 216, 218, 220 and 222 via a bus line 232. Alternatively, all communication channels may also be wireless. As a result, instead of the bus line 232 for example, a blue tooth connection may be provided.

10 The external communications device 226 may be configured in such a way that communication can take place via the wireless local area network (WLAN), blue tooth, Power Line or Power Bus.

The power supply unit 202 in the various variations may advantageously be ready-made and can be used in any type of household appliance or combination of
15 household appliances, either individually or in multiple, to supply power and signal. Furthermore, the internal wiring of different household appliances (separated into what are known as hot, wet or dry appliances) and the combinations of said appliances can be simplified and also possibly standardised.

In the arrangement shown in Fig. 2, the power supply unit 202 supplies, for
20 example, the motor, the pump and the heater with 120 V or 230 V. The further electronic and/or mechanical component may, for example, also be supplied with 120 V or 230 V of the internal supply voltage 212. In contrast, the control unit 224 is only supplied with, for example, 5 V or 24 V of the internal supply voltage 214.

A modification of the arrangement shown in Fig. 2 is shown in Fig. 3. In this
25 case, the power supply unit 202 additionally comprises a microcontroller and is

configured in such a way that it can directly communicate with the electronic and/or mechanical components 216, 218, 220 and 222. In this manner, feedback may, for example, be achieved with regard to the status of the respective components.

The modular solution according to the invention for the power supply unit 202 and communication in the electromechanical appliance 200 may be used advantageously to combine one of the power supply units 202 No. 1 to N as shown in Fig. 4 with one of the control units 224 No. 1 to N as a power supply unit 202 depending on the desired function and complexity. This permutation of the power supply units 202 and the control units 224 configured in a modular manner and used to construct the entire system allows for great flexibility with regard to supply voltages, communication channels and functions of the respective electronic and/or mechanical components. Furthermore, more than one of the power supply units 202 and/or the control units 224 may also be used.

In this case, at least one of the power supply units 202 contains a plug-in connection which can be connected to an input voltage via a power cable, one or more filters for filtering the input voltage as well as one or more switching elements and a transformer which delivers, for example, 240 V, 120 V, 24 V, 12 V or 5 V as output voltage.

As shown in Fig. 4, each of the power supply units 202 can each be combined with one or more of the control units 224. The complexity and functions of the power supply units 202 increase, as shown by arrow 234.

As can be seen from Fig. 5, module 1 up to N different power supply units 202 can be combined with module 1 up to N associated control units 224 in such a way that the functions, of which the increase is represented by the arrow 234, can be adapted to the corresponding demands. As a result, the desired function and therefore

also the eventual required size of the entire wiring system depends on the complexity of the power supply units 202 and the control units 224 used.

Since, according to the invention, the power supply units 202 and the control units 224 may be freely combined, excellent flexibility can be achieved during
5 assembly of household appliances which can be used universally in automated building systems.

CLAIMS

1. Power supply unit (202) for supplying electronic and mechanical components (216, 218, 220, 222) in an electromechanical appliance (200), wherein the power supply unit (202) can be connected to an external input voltage (204) and comprises:

at least one voltage transformer for generating at least one internal supply voltage (206, 208, 210, 212, 214) from the external input voltage (204);

at least one output terminal for outputting the at least one internal supply voltage (206, 208, 210, 212, 214);

the power supply unit (202) being configured as a modular component which is suitable for assembly in various types of electromechanical appliances.

2. Power supply unit (202) according to claim 1, which further comprises at least one control input for receiving a control signal.

3. Power supply unit (202) according to either claim 1 or claim 2, on which a power plug-in connection with a power cable is arranged.

4. Power supply unit (202) according to at least one of the preceding claims, which comprises at least one switching device for connecting a selectable internal supply voltage (206, 208, 210, 212, 214) to the at least one output terminal.

5. Power supply unit (202) according to at least one of the preceding claims, which comprises at least one input filter for filtering the external input voltage (204).

6. Power supply unit (202) according to at least one of the preceding claims, wherein the internal supply voltage (206, 208, 210, 212, 214) values are 240 V, 120 V, 24 V, 12 V and/or 5 V.

7. Power supply and communication system in an electromechanical appliance (200), wherein the system comprises:

at least one power supply unit (202) according to any one of claims 1 to 6;

at least one control unit (224) which can be connected to and can be operated with an external input signal in order to trigger the electronic and mechanical components (216, 218, 220, 222);

the control unit (224) being configured as a modular component which is suitable for assembly in various types of electromechanical appliance (200) and is connected to the power supply unit (202) in such a way that, during operation, it is supplied with an associated internal supply voltage (206, 208, 210, 212, 214).

8. System according to claim 7, wherein the control unit (224) is set up so as to output a control signal for controlling the power supply unit (202).

9. System according to either claim 7 or claim 8, wherein the control unit (224) comprises a display unit for displaying information to a user.

10. System according to any one of claims 7 to 9, wherein the control unit (224) comprises at least one operating element for operation by a user.

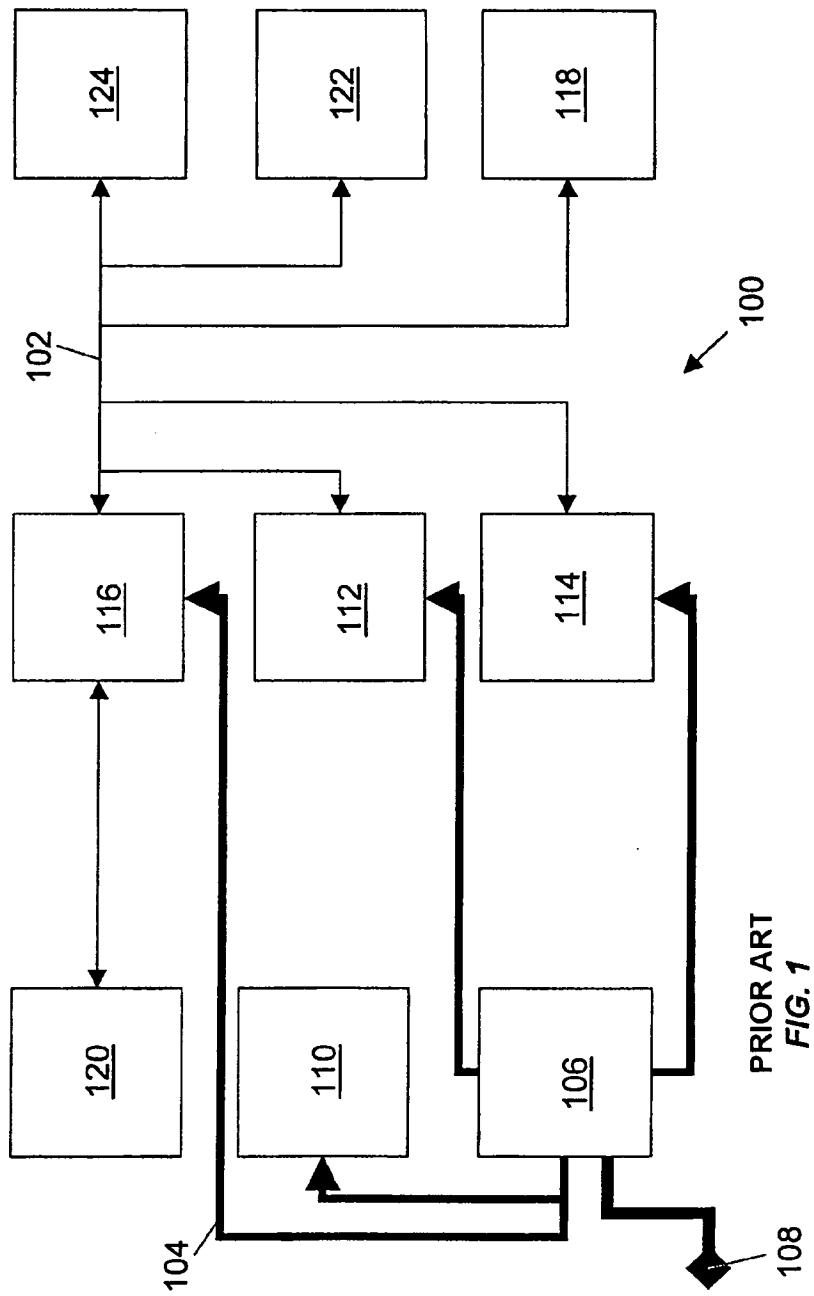
11. System according to any one of claims 7 to 10, wherein the control unit (224) comprises an external communications device (226) for wireless communication with external components.

12. System according to any one of claims 7 to 11, wherein the power supply unit (202) and the control unit (224) are configured as a one-piece module.

13. Electromechanical appliance (200) comprising at least one power supply unit (202) according to any one of claims 1 to 6 or at least one power supply and communication system according to any one of claims 7 to 12.

14. Electromechanical appliance (200) according to claim 13, wherein a plurality of power supply units (202) and/or a plurality of control units (224) are provided.

15. Electromechanical appliance (200) according to claim 14, wherein the plurality of power supply units (202) can be operated so as to generate a plurality of internal supply voltages (206, 208, 210, 212, 214).



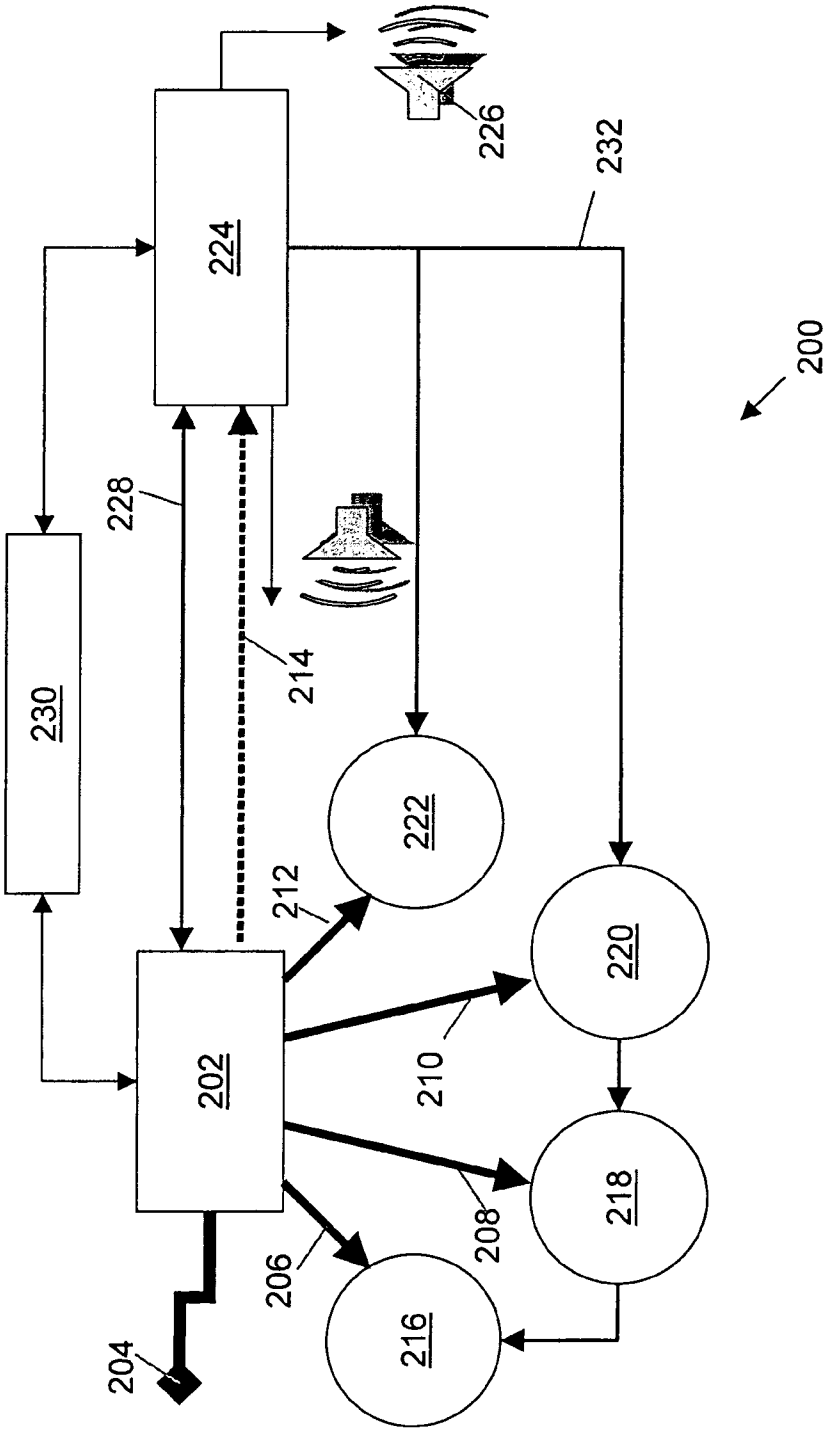


FIG. 2

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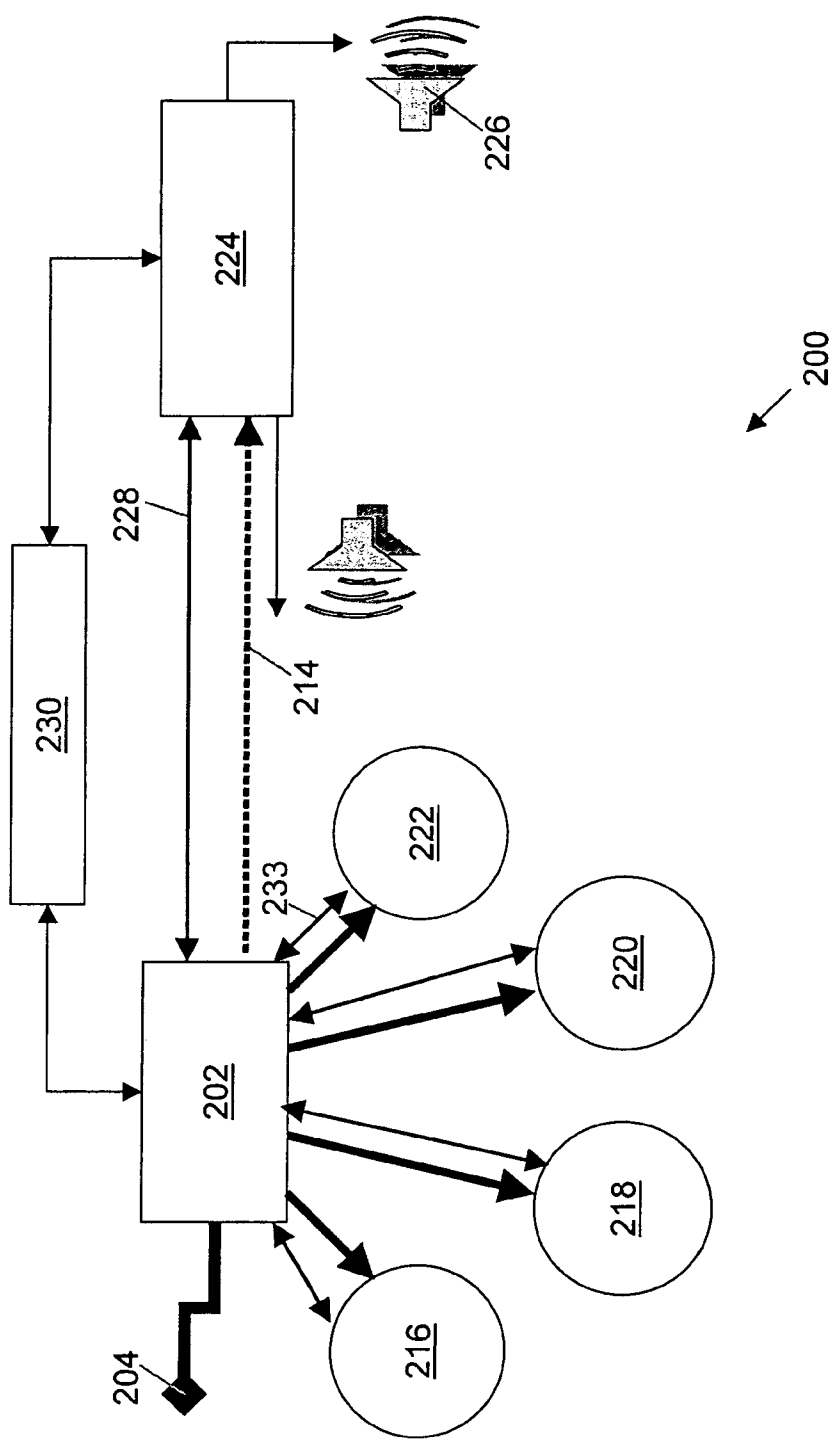


FIG. 3

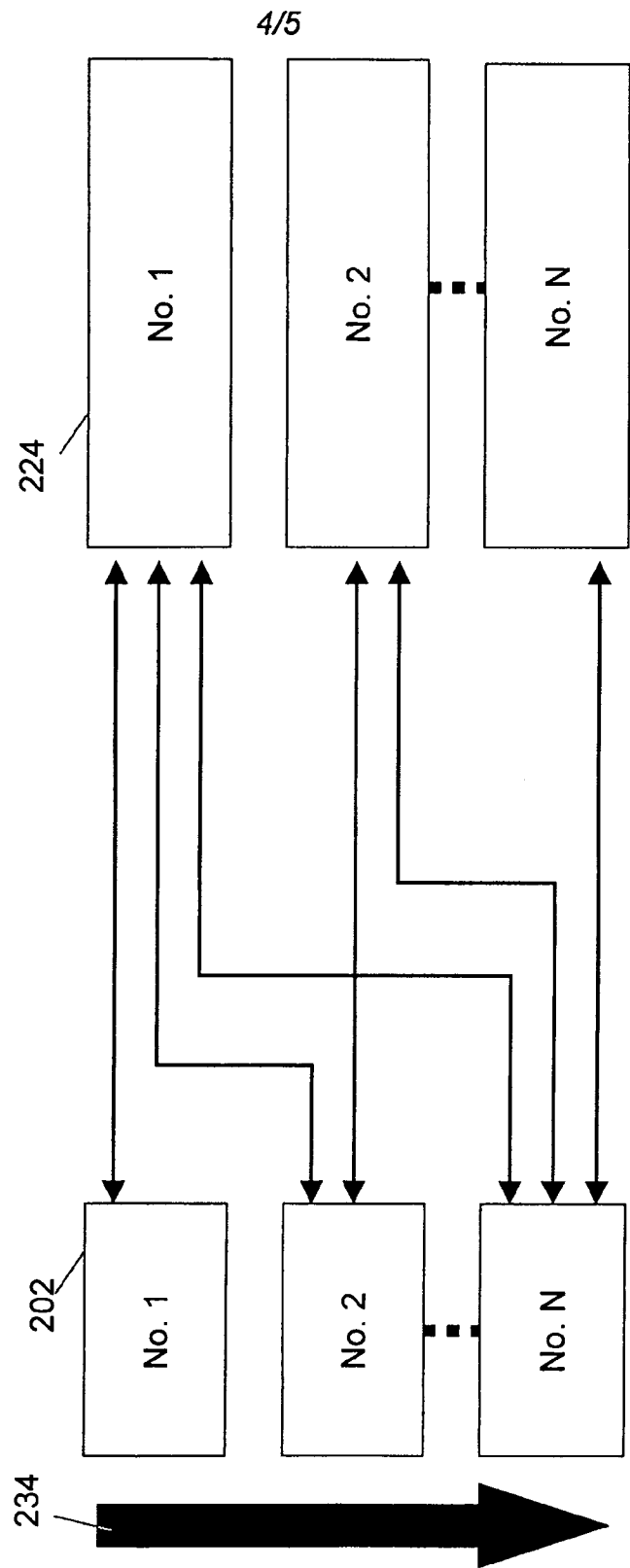


FIG. 4

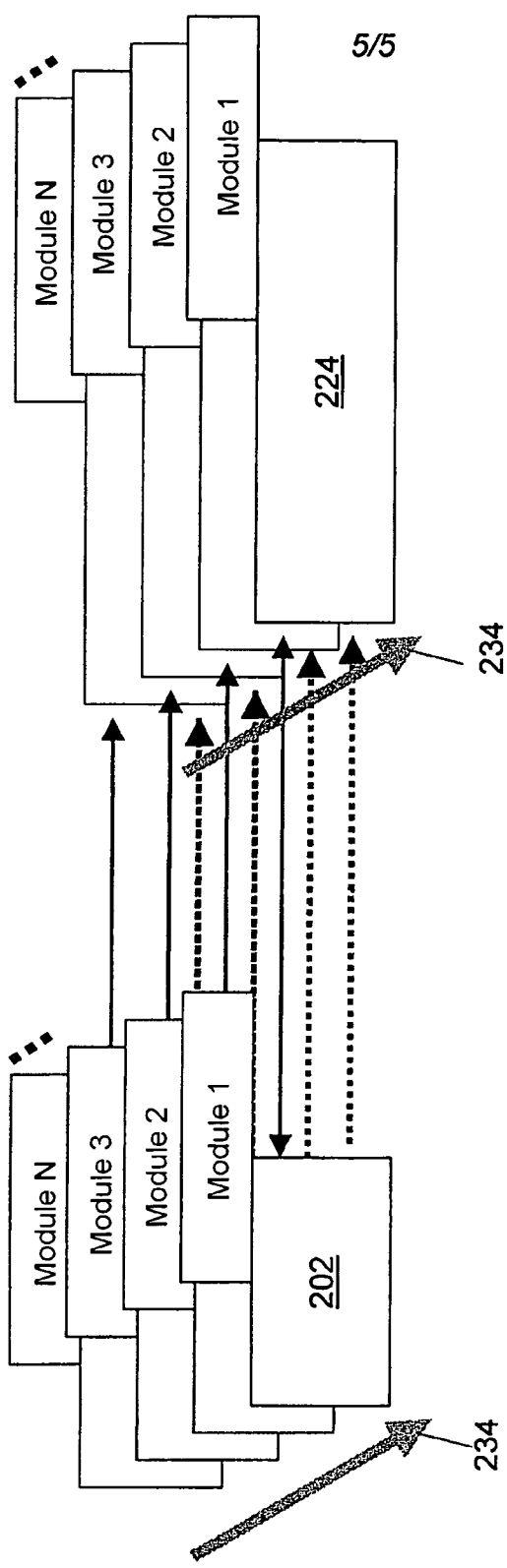


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER

INV. H02M1/00

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)

H02M

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 2003/230934 A1 (CORDELLI GARY GERARD [US] ET AL) 18 December 2003 (2003-12-18) paragraphs [0023] - [0029], [0041] - [0059]; figures 5,6	1, 3, 5, 6, 13-15
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

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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

Authorized officer

Lorenzo Feijoo, S

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/004034

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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