



(11)

EP 1 806 070 A1

(12)

EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:

11.07.2007 Bulletin 2007/28

(51) Int Cl.:

A47B 81/06 (2006.01)

H02G 5/06 (2006.01)

H05K 7/18 (2006.01)

(21) Application number: **05788051.0**

(86) International application number:

PCT/JP2005/018152

(22) Date of filing: **30.09.2005**

(87) International publication number:

WO 2006/038560 (13.04.2006 Gazette 2006/15)

(84) Designated Contracting States:

DE FR GB

(30) Priority: 05.10.2004 JP 2004292832

(71) Applicants:

- Pioneer Corporation
Tokyo 1538654 (JP)
- Pioneer Design Corporation
Meguro-ku,
Tokyo 153-8654 (JP)

(72) Inventors:

- **TANAKA, Junichi,**
Pioneer Design Corporation
Tokyo 153-8654 (JP)
- **KAMATA, Tetsuya,**
Pioneer Design Corporation
Tokyo 153-8654 (JP)

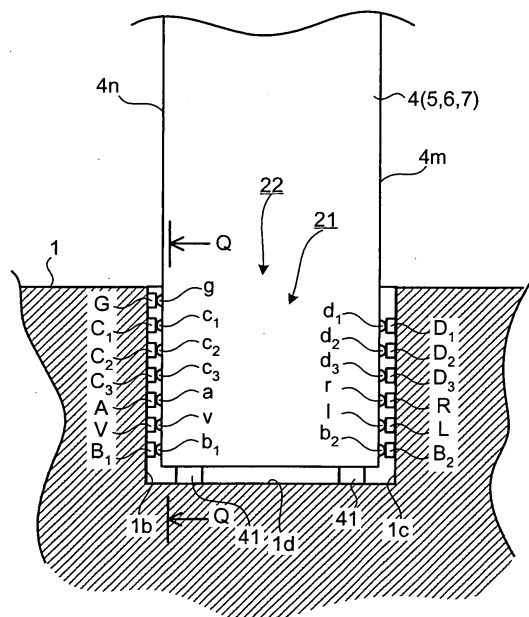
(74) Representative: **HOFFMANN EITLE**

Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) **AUDIO RACK**

(57) To include an audio rack body 1 having a trench 1a capable of supporting plural audio apparatuses 5, 6, 7 at optional positions; a rack-side connector installed along the trench 1a, having plural terminals to be connected to common terminals b_1, b_2, g and signal terminals $C_1, C_2, C_3, d_1, d_2, d_3$ exclusive for individual audio apparatuses, respectively, and capable of connecting apparatus-side connectors 22 at optional positions; and a controller 4 that controls each audio apparatus by being electrically connected to the plural audio apparatuses via a rack-side connector. This arrangement facilitates a wiring and connection operation at the time of setting the plural audio apparatuses and a wiring and connection operation at the time of changing the layout of the apparatuses.

FIG.3-1



Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to an audio system, and, more particularly to an audio rack that supports plural digital audio apparatuses such as a CD player and a DVD player by electrically connecting these apparatuses to each other.

BACKGROUND ART

10 **[0002]** According to a conventional electronic apparatus rack such as an audio rack, plural accommodation spaces for separately accommodating various kinds of electronic apparatuses are provided, and electronic apparatus jacks and power supply receptacles are provided on the back surface of the accommodation spaces, and electronic apparatus cords and power supply cords are divided between the inside and the outside of the rack. According to this rack, an
 15 electronic apparatus cord is connected to a power supply cord at the inside of the rack between the electronic apparatus and the corresponding electronic apparatus jack and the power supply receptacle, and the electronic apparatus cord and the power supply cord at the outside of the rack are connected between the electronic apparatus jack and the power supply receptacle or between each power supply receptacle and a commercial power supply. With this arrangement, the electronic apparatus system is set, or the setting of the system is changed easily (for example, see Patent Document 1).
 20 **[0003]** Patent Document 1: Japanese Utility Model Application Laid-open No. H5-72188 (Paragraphs [0005], [0006], [0012], Fig. 1 to Fig. 3)

DISCLOSURE OF INVENTION

25 PROBLEM TO BE SOLVED BY THE INVENTION

[0004] However, according to the conventional electronic apparatus rack, at the time of setting the electronic apparatus system to the rack, respective accommodation spaces of a tuner, an amplifier, a cassette deck, a CD player or the like are determined first. At a first step, a jack board exclusive for each apparatus needs to be engaged and fixed to the rack
 30 back surface of each accommodation space. At a second step, the cord of each apparatus and the exclusive jack board need to be wired and connected together inside the rack. At a third step, the cords of jack boards need to be wired and connected together at the outside of the rack to connect between the apparatuses. At the time of changing the audio system such as a replacement and an addition of an audio apparatus or a change of a layout of the apparatuses within the rack, an exclusive jack board needs to be prepared and fixed to the rack back surface. Subsequently, the second
 35 and the third wiring and connection works need to be carried out. Therefore, the wiring and connection work becomes complex.

[0005] The above problem is an example of problems to be solved by the present invention. An object of the present invention is to provide an audio rack that makes it possible to install plural audio apparatuses such as a CD player and a DVD player at free optional positions, and electrically connect between the audio apparatuses, thereby facilitating the
 40 wiring and connection at the time of setting the audio apparatuses and the wiring and connection at the time of changing a layout of the apparatuses.

MEANS FOR SOLVING PROBLEM

45 **[0006]** To solve the above problems, and to achieve the above objects, an audio rack that supports a plurality of audio apparatuses by electrically connecting between the audio apparatuses that have apparatus-side connectors having common terminals provided in common to each audio apparatus and signal terminals exclusive for individual audio apparatuses, includes an audio rack body having a long supporting unit capable of supporting the plurality of audio
 50 apparatuses at optional positions; a rack-side connector installed along the long supporting unit, having a plurality of terminals to be connected to the common terminals and the signal terminals exclusive for the individual audio apparatuses, respectively, and capable of connecting the apparatus-side connectors at optional positions; and a controller that controls each audio apparatus by being electrically connected to the plurality of audio apparatuses via the rack-side connector.

EFFECT OF THE INVENTION

55 **[0007]** An audio rack according to the present invention makes it possible to install and support plural audio apparatuses at free optional positions of a supporting unit of an audio rack body, and facilitates the wiring and connection at the time of setting the audio apparatuses and the wiring and connection at the time of changing a layout of the apparatuses.

BRIEF DESCRIPTION OF DRAWINGS

[0008]

- 5 [Fig. 1] Fig. 1 is a front view of an audio system 100 according to a first embodiment.
 [Fig. 2] Fig. 2 is a left-front perspective view of the audio system 100.
 [Fig. 3-1] Fig. 3-1 is an enlarged cross section of a trench 1a along a line P-P in Fig. 1.
 [Fig. 3-2] Fig. 3-2 is an enlarged cross section of a trench 1d along the line P-P in Fig. 1.
 [Fig. 4] Fig. 4 is a cross section along a line Q-Q in Fig. 3-1.
 10 [Fig. 5] Fig. 5 is a wiring diagram of wiring between apparatuses of the audio system 100.
 [Fig. 6] Fig. 6 is an enlarged cross section of the trench 1a along the line P-P in Fig. 1 depicting another example of a connector.
 [Fig. 7] Fig. 7 is a cross section along a line S-S in Fig. 6.
 [Fig. 8] Fig. 8 is a left-front perspective view of an audio system 200 according to a second embodiment.
 15 [Fig. 9] Fig. 9 is a right-front perspective view of an audio system 300 according to a third embodiment.
 [Fig. 10] Fig. 10 is a front view of the audio system 300.
 [Fig. 11] Fig. 11 is a front view of an audio system 400 according to a fourth embodiment.
 [Fig. 12] Fig. 12 is a cross section along a line T-T in Fig. 11.
 [Fig. 13] Fig. 13 is a front view of an audio system 500 according to a fifth embodiment.
 20 [Fig. 14] Fig. 14 is a right-forward perspective view of the audio system 500.

EXPLANATIONS OF LETTERS OR NUMERALS

[0009]

- 25 1 Audio rack body
 1a, 1d Trench (Long supporting unit)
 4 Controller
 5, 6, 7 Audio apparatus
 30 12 Wall
 13a, 13b Pole (Audio rack body)
 16a, 16b Rail (Audio rack body)
 17 Board (Audio rack body)
 17a Trench (Long supporting unit)
 35 17b Wide part
 19 Rack (Audio rack body)
 19a Bottom plate (Long supporting unit)
 19b Ceiling plate (Long supporting unit)
 20, 25 Rack-side connector
 40 22, 26 Apparatus-side connector
 100, 200, 300, 400, 500 Audio system
 b₁, b₂, g Common terminal
 C₁, C₂, C₃, d₁, d₂, d₃ Signal terminal
 B₁, B₂ Power supply terminal

BEST MODE(S) FOR CARRYING OUT THE INVENTION

[0010] Exemplary embodiments of an audio rack according to the present invention will be explained below in detail with reference to the accompanying drawings. The invention is not limited to the embodiments.

First embodiment

[0011] Fig. 1 is a front view of an audio system 100 having various kinds of audio apparatuses 5, 6, 7 set on a plate-shaped audio rack body 1, according to a first embodiment; Fig. 2 is a left-front perspective view of the digital audio apparatuses 5, 6, 7 of the audio system 100; Fig. 3-1 is an enlarged cross section of a trench 1a along a line P-P in Fig. 1; Fig. 3-2 is an enlarged cross section of a trench 1d along the line P-P in Fig. 1; Fig. 4 is a cross section along a line Q-Q in Fig. 3-1; Fig. 5 is a wiring diagram of wiring between the apparatuses of the audio system 100; Fig. 6 is an enlarged cross section of the trench 1a along the line P-P in Fig. 1 depicting another example of a connector; and Fig.

7 is a cross section along a line S-S in Fig. 6.

[0012] As shown in Fig. 1 and Fig. 2, the audio system 100 includes the audio rack body 1 having a rectangle plate shape installed on a floor; a display 2 set at the center in engagement with a linear trench 1d as a long supporting unit provided over approximately the whole length in the left to the right direction at the backside of the audio rack body 1; two right speakers 3a and two left speakers 3b installed at the left and right sides of the display 2 respectively in engagement with the trench 1d; a tuner 5, a CD player 6, and a DVD player 7 as digital audio apparatuses (hereinafter, simply "audio apparatuses") installed in engagement with the linear trench 1a as a long supporting unit provided over approximately the whole length in the left to the right direction at the front side of the audio rack body 1; and a controller 4 that is installed in engagement with the trench 1a, and that controls the audio apparatuses 5, 6, 7.

[0013] The CD player 6 reproduces and records information from and into a CD disk 61, and the DVD player 7 reproduces and records information from and into a DVD disk 71. The audio apparatuses also include an MD player, a hard disk device or the like. The trench 1a and the trench 1d have the same cross-sectional shapes.

[0014] As shown in Fig. 3-1, Fig. 3-2, and Fig. 4, total 13 rack-side contact terminals, including rack-side power supply terminals B₁, B₂, a rack-side antenna terminal A, a rack-side GND terminal G, a rack-side video signal terminal V, a rack-side right audio signal terminal R, a rack-side left audio signal terminal L, rack-side control signal terminals C₁, C₂, C₃, and rack-side data signal terminals D₁, D₂, D₃ are disposed on front and back sidewalls 1b, 1c of the trench 1a provided on the audio rack body 1, at predetermined intervals in a depth direction of the trenches 1a, 1d, extending in a belt shape over the total length in the lateral direction. The rack-side terminals disposed in the trench 1a are electrically connected to the same rack-side terminals disposed in the trench 1d.

[0015] The trenches 1a, 1d, and the total 13 belt-shaped rack-side contact terminals disposed within the trenches 1a, 1d constitute the rack-side connector 20. The rack-side connector 20 includes at least a necessary number of terminals to electrically connect between the controller 4, the audio apparatuses 5, 6, 7, the display 2, and the speakers 3a, 3b. The rack-side power supply terminals B₁, B₂ are connected to an AC power supply cord 10, and the rack-side antenna terminal A is connected to an antenna cable 11.

[0016] As shown in Fig. 5, the controller 4 that is connected to the audio apparatuses such as the tuner 5, the CD player 6, and the DVD player 7 and that individually controls these apparatuses includes: a changeover switch 4a that selects the controlled audio apparatuses 5, 6, 7; a general-purpose interface 4b that can communicate with any one of the audio apparatuses 5, 6, 7; a CPU 4c that processes control signals and data signals of the audio apparatuses 5, 6, 7; a ROM 4d that stores a control program; a RAM 4e that temporarily stores data; audio processors 4f, 4g that output audio signals to the speakers 3a, 3b; a video processor 4h that outputs a video signal to the display 2; an operation input unit 4i; and a display unit 4j.

[0017] As shown in Fig. 3-1, the controller 4 has an external shape formed in a rectangular solid shape, and has legs 41 at four corners of the lower surface. A lower part of the controller 4 is formed to have a depth size smaller than the widths of the trenches 1a, 1d so that the lower part is inserted into the trenches 1a, 1d and is engaged with the trenches 1a, 1b.

[0018] As shown in Fig. 3-1 and Fig. 4, at the lower left side of side surfaces 4m, 4n before and after the controller 4, there are disposed total 13 apparatus-side contact terminals: apparatus-side power supply terminals b₁, b₂ as common terminals formed in a semispherical projection shape; an apparatus-side antenna terminal a; an apparatus-side GND terminal g as a common terminal; an apparatus-side video signal terminal v; an apparatus-side right audio signal terminal r; an apparatus-side left audio signal terminal l; apparatus-side control signal terminals C₁, C₂, C₃ as exclusive signal terminals for the audio apparatuses; and apparatus-side data signal terminals d₁, d₂, d₃ as exclusive signal terminals for the audio apparatuses, in the same height as that of the rack-side contact terminals, respectively, and these apparatus-side contact terminals are brought into contact with the rack-side contact terminals.

[0019] In the controller 4, the apparatus-side antenna terminal a is a dummy terminal, and is not electrically connected to the inside of the controller 4. To ensure an electric connection and a mechanical fixing, preferably two apparatus-side contact terminals are provided at the lower left side and the lower right side of the controller 4, respectively.

[0020] The audio apparatuses 5, 6, 7 have the external shapes formed in a rectangular solid shape, and have the legs 41 at four corners of the lower surface, like the controller 4. A depth size of the audio apparatuses 5, 6, 7 is set the same as the size of the controller 4 so that the apparatuses are inserted into the trenches 1a, 1b and are engaged with the trenches 1a, 1b.

[0021] As shown in Fig. 3-1 and Fig. 4, like the controller 4, at the lower left side of side surfaces 4m, 4n before and after the audio apparatuses 5, 6, 7, there are disposed total 13 apparatus-side contact terminals: apparatus-side power supply terminals b₁, b₂ as common terminals formed in a semispherical projection shape; an apparatus-side antenna terminal a; an apparatus-side GND terminal g as a common terminal; an apparatus-side video signal terminal v; an apparatus-side right audio signal terminal r; an apparatus-side left audio signal terminal l; apparatus-side control signal terminals c₁, c₂, c₃ as exclusive signal terminals for the audio apparatuses; and apparatus-side data signal terminals d₁, d₂, d₃ as exclusive signal terminals for the audio apparatuses, in the same height as that of the rack-side contact terminals, respectively, and these apparatus-side contact terminals are contacted and electrically connected to the rack-

side contact terminals.

[0022] As shown in Fig. 5, in the tuner 5, the apparatus-side power supply terminals b_1 , b_2 and the apparatus-side antenna terminal a as common terminals, the apparatus-side GND terminal g as a common terminal, and the apparatus-side control signal terminal c_1 and the apparatus-side data signal terminal d_1 as exclusive signal terminals for the tuner 5 are the apparatus-side contact terminals that are electrically connected to the inside of the tuner 5. Other terminals are dummy terminals to fix the tuner 5 to the trenches 1a, 1b.

[0023] In the CD player 6, the apparatus-side power supply terminals b_1 , b_2 and the apparatus-side GND terminal g as common terminals, and the apparatus-side control signal terminal C_2 and the apparatus-side data signal terminal d_2 exclusive for the CD player 6 are the apparatus-side contact terminals that are electrically connected to the inside of the CD player 6. Other terminals are dummy terminals to fix the CD player 6 to the trenches 1a, 1b

[0024] In the DVD player 7, the apparatus-side power supply terminals b_1 , b_2 and the apparatus-side GND terminal g as common terminals, and the apparatus-side control signal terminal C_3 and the apparatus-side data signal terminal d_3 exclusive for the DVD player 7 are the apparatus-side contact terminals that are electrically connected to the inside of the DVD player 7. Other terminals are dummy terminals to fix the DVD player 7 to the trenches 1a, 1b

[0025] As explained above, in the audio apparatuses 5, 6, 7, the apparatus-side power supply terminals b_1 , b_2 and the apparatus-side GND terminal g are common terminals provided in common to the audio apparatuses 5, 6, 7, and the apparatus-side control signal terminals c_1 , c_2 , c_3 and the apparatus-side data signal terminals d_1 , d_2 , d_3 are signal terminals exclusive for the audio apparatuses. In the rack-side connector 20, rack-side control signal terminals and rack-side data signal terminals are installed corresponding to the number of connected audio apparatuses.

[0026] The rectangular solid shape lower part of the controller 4 and the audio apparatuses 5, 6, 7, including the legs 41 becomes a supported part 21 that is supported by being engaged with the trench 1a. The supported part 21 and the apparatus-side contact terminals disposed on the side surfaces before and after the supported part 21 constitute an apparatus-side connector 22.

[0027] When the supported parts 21 of the controller 4 and the audio apparatuses 5, 6, 7 are inserted into and engaged with the trenches 1a, 1d as long supporting units, the apparatus-side connectors 22 are connected to the rack-side connector 20. Because the belt-shaped rack-side contact terminal extends along approximately the whole length of the trenches 1a, 1d, the controller 4 and the audio apparatuses 5, 6, 7 can be installed at free optional positions of the trenches 1a, 1d, and these positions can be continuously moved.

[0028] As shown in Fig. 3-2, the lower parts of the display 2 and the speakers 3a, 3b have a depth size smaller than the width of the trenches 1a, 1d, and a disk-shaped frame 2a is provided to protect falling.

[0029] In the display 2, the apparatus-side power supply terminals b_1 , b_2 , the apparatus-side GND terminal g , and the apparatus-side video signal terminal v are apparatus terminals that are electrically connected to the inside of the display 2. Other terminals are dummy terminals to fix the display 2 to the trenches 1a, 1d.

[0030] In the speakers 3a, 3b, the apparatus-side GND terminal g , and the apparatus-side right audio signal terminal r or the apparatus-side left audio signal terminal l are apparatus-side terminals that are electrically connected to the inside of the speakers 3a, 3b. Other terminals are dummy terminals to fix the speakers 3a, 3b to the trenches 1a, 1b.

[0031] A method of electrically connecting the controller 4 to the display 2 and the speakers 3a, 3b via the rack-side connector 20 is explained above. The display 2 and the speakers 3a, 3b do not require a frequent change of their installation positions on the audio rack body 1. Therefore, the display 2 and the speakers 3a, 3b can be fixedly installed on the audio rack body 1, instead of providing the trench 1d. The controller 4 can be electrically connected to the display 2 and the speakers 3a, 3b by directly connecting between them by wire, without via the rack-side connector 20 and the apparatus-side connector 22. While the trench 1a is explained as a long continuous trench, instead of this, plural short trenches into which the audio apparatuses 5, 6, 7 can be inserted separately can be provided.

[0032] Next, another example of the rack-side connector and the apparatus-side connector is explained with reference to Fig. 6 and Fig. 7. As shown in Fig. 6, a trench 1e having a smaller width than the width of the trench 1a is provided at the center of the trench 1a of the audio rack body 1, over the whole length of the trench 1a. A rack-side pin connector 25 connected to a multi-line cable 27 is provided, instead of the rack-side connector 20, within the trench 1e. Plural rack-side pin connectors 25 are provided corresponding to a maximum installed number of audio apparatuses, and the rack-side pin connectors 25 are inserted into and connected to apparatus-side pin connectors 26 provided at a lower part of the audio apparatuses 5, 6, 7, respectively, with the multi-line cable 27 bent in a U-shape as shown in Fig. 7. The apparatuses are electrically connected in the same manner as that shown in Fig. 5.

[0033] When the multi-line cable 27 is bent in a U-shape, the audio apparatuses 5, 6, 7 can be installed at optional positions on the trench 1a, and the installation positions can be moved continuously. The display 2 and the speakers 3a, 3b can be also connected to the controller 4 based on this connection form. According to this connection form, the apparatuses are connected using the multi-pin cable 27 and the pin connectors 25, 26. Therefore, the electrical connection has high reliability.

[0034] Next, assembling and operation of the audio system 100 are explained. First, the display 2, the speakers 3a, 3b, the controller 4, and the audio apparatuses 5, 6, 7 are installed on the trenches 1a, 1d of the audio rack body 1. The

apparatus-side connectors 22 (26) are connected to the rack-side connectors 20 (25).

The power supply cord 10 is connected to the power supply, and the antenna cable 11 is connected to the antenna.

[0035] When the operation input unit 4i is operated to turn on the power supply to the controller 4, a connection apparatus identification program stored in a ROM 4e is started. When this connection apparatus identification program is operated, the change-over switch 4a is controlled to first connect the signal terminals C₁, D₁ of the tuner 5 to the controller 4, and measure the potential of the signal terminal C₁ or D₁. A power supply to the tuner 5 is on through the apparatus-side power supply terminals b₁, b₂. Therefore, a predetermined potential V1 corresponding to the internal resistance of the tuner 5 is generated in the signal terminals C₁, D₁. When the predetermined potential V1 is generated, it is recognized that the tuner 5 is connected, and this effect is displayed in the display unit 4j. When the potential V1 is not generated, it is recognized that the tuner 5 is not connected.

[0036] Next, the changeover switch 4a is switched to connect the signal terminals C₂, D₂ of the CD player 6 to the controller 4. The potential of the signal terminal C₂ or D₂ is measured, and a connection or non-connection of the CD player 6 is recognized. When a predetermined potential V2 corresponding to the internal resistance of the CD player 6 is generated, it is recognized that the CD player 6 is connected. Similarly, a connection or non-connection of all connectable apparatuses is recognized, and the connectable and usable audio apparatuses 5, 6, 7 are displayed in the display unit 4j.

[0037] When a user operates the operation input unit 4i to select the CD player 6 displayed in the display unit 4j, the changeover switch 4a selects the signal terminals C₂, D₂, and connects the signal terminals C₂, D₂ to the general-purpose interface 4b of the controller 4. When the user carries out the start operation, a control signal is transmitted from the control signal terminal C2 to the CD player 6, thereby operating the CD player. A data signal is fetched from the data signal terminal D2, and the CPU 4c processes this signal. At least one of the audio processors 4f, 4g and the video processor 4h outputs at least one of the audio signal and the video signal to at least one of the audio signal terminals R, L and the video signal terminal V, thereby operating at least one of the display 2 and the speakers 3a, 3b.

[0038] Other audio apparatuses 5, 7 can be also selected and operated in a similar manner to the above. The change-over switch 4a can be switched to connect the tuner 5 and the CD player 6 or the DVD player 7 to the controller 4, and data from the tuner 5 can be recorded in the CD disk 61 or a DVD disk 71.

[0039] The configuration and the operation of the audio system 100 are as explained above. The audio rack according to the first embodiment includes the plate-shaped audio rack body 1 having the trench 1a as a long supporting unit, the rack-side connectors 20 (25), and the controller 4, out of the constituent elements of the audio system 100. According to the audio rack of the first embodiment, plural audio apparatuses such as the tuner 5, the CD player 6, and the DVD player 7 can be installed at free and optional positions of the trench 1a of the audio rack body 1. Therefore, the wiring and connection operation at the time of setting the audio apparatuses 5, 6, 7, and the wiring and connection operation at the time of changing the layout of the apparatuses become easy.

Second embodiment

[0040] Fig. 8 is a left-front perspective view of a digital audio system 200 having the audio apparatuses 5, 6 7 installed in pole-shaped audio rack bodies 13a, 13b. In Fig. 8, constituent elements equivalent to those shown in Fig. 1 to Fig. 7 are denoted with like reference numerals, and their detailed explanations will be omitted.

[0041] The audio system 200 includes: two poles 13a, 13b as audio rack bodies laterally fitted in parallel to a room wall 12, as long supporting parts; the controller 4 that is provided with the two pole through-holes 13c, 13d in a lateral direction as upper and lower supported parts, has the poles 13a, 13b passed through the through-holes 13c, 13d, and is suspended by the poles 13a, 13b; the tuner 5, the CD player 6, and the DVD player 7 as audio apparatuses that are provided with the two pole through-holes 13c, 13d in a lateral direction as upper and lower supported parts, and have the poles 13a, 13b passed through the through-holes 13c, 13d, and are suspended by the poles 13a, 13b; the display 2 that is suspended by the wall 12; and the speakers 3a, 3b that are suspended by two wires 15a, 15b extended in a lateral direction on a corner part of the wall 12 and a ceiling 14.

[0042] To suspend the controller 4 and the audio apparatuses 5, 6, 7 by the poles 13a, 13b, the poles 13a, 13b are extracted from the wall 12. The controller 4 and the audio apparatuses 5, 6, 7 can be arranged in an arbitrary order and suspended by the poles 13a, 13b. The individual apparatuses can be moved to the left and right directions on the poles 13a, 13b. The speakers 3a, 3b can be also moved to the left and right directions on the wires 15a, 15b.

[0043] Although not shown, the controller 4 and the audio apparatuses 5, 6, 7 have apparatus-side pin connectors 26 at the back side, respectively, and are connected to the apparatus-side pin connectors 26 with the rack-side pin connectors 25 and the multi-line cables 27. The display 2 and the speakers 3a, 3b are connected to the controller 4 with wires without via the rack-side pin connectors 25 and the multi-line cables 27. The rack-side pin connectors 25 and the multi-line cables 27 pass through the wall 12 along the poles 13a, 13b. The rack-side pin connectors 25 are drawn out from holes provided on the wall 12, and are connected to the apparatus-side pin connectors 26.

[0044] The AC power supply cord 10 is connected to the controller 4. Power is supplied from the controller 4 to the

apparatuses via the rack-side pin connectors 25 and the multi-line cables 27 or wires. Although not shown, the antenna cable 11 is directly connected to the tuner 5.

[0045] Functions of the above apparatuses of the audio system 200 according to a second embodiment are equivalent to the functions of the apparatuses according to the first embodiment. The audio system 200 can carry out the same operation as that of the audio system 100 according to the first embodiment.

[0046] The configuration and the operation of the audio system 200 are as explained above. The audio rack according to the second embodiment includes the poles 13a, 13b as long supporting parts and also as audio rack bodies, the rack-side pin connectors 25, and the controller 4, among the constituent elements of the audio system 200. According to the audio rack of the second embodiment, plural audio apparatuses such as the tuner 5, the CD player 6, and the DVD player 7 can be suspended by and supported by the poles 13a, 13b at free optional positions on the poles. It is sufficient to only connect the apparatus-side pin connectors 26 of the audio apparatuses 5, 6, 7 to the rack-side pin connectors 25. Therefore, the wiring and connection operation at the time of setting the audio apparatuses 5, 6, 7, and the wiring and connection operation at the time of changing the layout of the apparatuses become easy. Third embodiment

[0047] Fig. 9 is a right-front perspective view of an audio system 300 having the audio apparatuses 5, 6, 7 suspended in rail-shaped audio rack bodies 16a, 16b. Fig. 10 is a front view of the audio system 300. In Fig. 9 and Fig. 10, constituent elements equivalent to those shown in Fig. 1 to Fig. 8 are denoted with like reference numerals, and their detailed explanations will be omitted.

[0048] The audio system 300 includes: two rails 16a, 16b as audio rack bodies laterally fitted in parallel to the room wall 12, as long supporting parts; the controller 4 that is provided with the two rail insertion trenches 16c, 16d in a lateral direction as upper and lower supported parts, has the rails 16a, 16b passed through the rail insertion trenches 16c, 16d, and is suspended by the rails 16a, 16b; the tuner 5, the CD player 6, the DVD player 7, and the MD player 8 as audio apparatuses that are suspended by the rails 16a, 16b; and the display 2 and the speakers 3a, 3b that are separately installed on the wall not shown. The controller 4 and the audio apparatuses 5, 6, 7 suspended by the rails 16a, 16b are arranged in an arbitrary order. The individual apparatuses can be moved to the left and right directions on the rails 16a, 16b.

[0049] Although not shown, the controller 4 and the audio apparatuses 5, 6, 7, 8 are provided with the apparatus-side pin connectors 26, on the back surfaces, respectively. The apparatus-side pin connectors 26 are connected to each other by the rack-side pin connectors 25 and the multi-pin cables 27. The display 2 and the speakers 3a, 3b are connected to the controller 4 by wires, without via the rack-side pin connectors 25 and the multi-line cables 27. The rack-side pin connectors 25 and the multi-line cables 27 are passed through the wall 12 along the rails 16a, 16b. The rack-side pin connectors 25 are drawn out from the holes formed on the wall 12, and are connected to the apparatus-side pin connectors 26.

[0050] The AC power supply cord 10 is connected to the controller 4. Power is supplied from the controller 4 to each apparatus via the rack-side pin connectors 25 and the multi-line cables 27 or wires. Although not shown, the antenna cable 11 is directly connected to the tuner 5.

[0051] Functions of the apparatuses of the audio system 300 according to a third embodiment explained above are equivalent to those of the apparatuses according to the first embodiment. The audio system 300 can carry out the operation equivalent to those of the audio system 100 according to the first embodiment.

[0052] The configuration and the operation of the audio system 300 are as explained above. The audio rack according to the third embodiment includes the rails 16a, 16b as long supporting units and as audio rack main bodies, the rack-side pin connectors 25, and the controller 4, among the constituent elements of the audio system 300. According to the audio rack of the third embodiment, plural audio apparatuses such as the tuner 5, the CD player 6, the DVD player 7, and the MD player 8 can be suspended and supported at free optional positions on the rails 16a, 16b. It is sufficient to only connect the apparatus-side pin connectors 26 of the audio apparatuses 5, 6, 7, 8 to the rack-side pin connectors 25. Therefore, the wiring and connection operation at the time of setting the audio apparatuses 5, 6, 7, 8 and the wiring and connection operation at the time of changing the layout of the apparatuses become easy.

Fourth embodiment

[0053] Fig. 11 is a front view of an audio system 400 according to a fourth embodiment, and Fig. 12 is a cross section along a line T-T in Fig. 11. In Fig. 11 and Fig. 12, constituent elements equivalent to those shown in Fig. 1 to Fig. 10 are denoted with like reference numerals, and their detailed explanations will be omitted.

[0054] The audio system 400 includes: a long plate-shaped board 17 as an audio rack body fitted to the room wall 12; a linear trench 17a as a long supporting unit provided at a vertically center position of the board, in a lateral direction over approximately the whole length of the board 17; the display 2 provided at the center of the linear trench 17a as a long supporting unit, in engagement with the trench 17a; the controller 4 installed at the right side of the display 2 in engagement with the trench 17a; the CD player 6 and the DVD player 7 as audio apparatuses installed at the left and right sides of the display 2 in engagement with the trench 17a; and the speakers 3a, 3b not shown separately installed on the wall. The display 2 and the audio apparatuses 6, 7 that are suspended by being engaged with the trench 17a

can be arranged in an arbitrary order. Individual apparatuses can be moved to the left and right directions on the trench 17a.

[0055] As shown in Fig. 12a, the trench 17a as a long supporting unit has a wide part 17b on the bottom. The supported parts of the display 2, the controller 4 and the audio apparatuses 6, 7 are fitted on the back surfaces of the apparatuses, and include a hook portion 18 engaged with the wide part 17b.

[0056] Although not shown, the apparatus-side pin connectors 26 are provided on the back surfaces of the display 2, the controller 4, and the audio apparatuses 6, 7, respectively. The apparatus-side pin connectors 26 are connected to each other by the rack-side pin connectors 25 and the multi-pin cables 27. The speakers 3a, 3b are connected to the controller 4 by wires, without via the rack-side pin connectors 25 and the multi-line cables 27. The rack-side pin connectors 25 and the multi-line cables 27 are passed through the backside of the board 17 along the trench 17a. The rack-side pin connectors 25 are drawn out from the holes formed on the board 17, and are connected to the apparatus-side pin connectors 26.

[0057] The AC power supply cord 10 is connected to the multi-line cable 27. Power is supplied to each apparatus via the multi-line cable 27 and the pin connectors 25.

[0058] Functions of the apparatuses of the audio system 400 according to the fourth embodiment explained above are equivalent to those of the apparatuses according to the first embodiment. The audio system 400 can carry out the operation equivalent to those of the audio system 400 according to the first embodiment.

[0059] The configuration and the operation of the audio system 400 are as explained above. The audio rack according to the fourth embodiment includes the board 17 as an audio rack main body having the trench 17a as a long supporting unit, the rack-side pin connectors 25, and the controller 4. According to the audio rack of the fourth embodiment, plural audio apparatuses such as the CD player 6 and the DVD player 7 can be suspended and supported at free optional positions on the trench 17a. It is sufficient to only connect the apparatus-side pin connectors 26 of the audio apparatuses 6, 7 to the rack-side pin connectors 25. Therefore, the wiring and connection operation at the time of setting the audio apparatuses 6, 7, and the wiring and connection operation at the time of changing the layout of the apparatuses become easy.

Fifth embodiment

[0060] Fig. 13 is a front view of an audio system 500 according to a fifth embodiment, and Fig. 14 is a right-forward perspective view of the audio system 400. In Fig. 13 and Fig. 14, constituent elements equivalent to those shown in Fig. 1 to Fig. 12 are denoted with like reference numerals, and their detailed explanations will be omitted.

[0061] The audio system 500 includes: a long rack 19 as an audio rack body having a bottom plate 19a and a ceiling plate 19b as a long supporting part; the controller 4, the CD player 6, the DVD player 7, and the speakers 3a, 3b inserted into the rack 19, with partition walls provided between them; and the display 2 hung on the wall 12. The controller 4, the audio apparatuses 6, 7, and the speakers 3a, 3b can be arranged in an arbitrary order in the rack 19. Individual apparatuses can be moved to the left and right directions within the rack 19.

[0062] A bottom 19c and a ceiling 19d of the controller 4, audio apparatuses 6, 7, and the speakers 3a, 3b are formed to be brought into contact with the bottom plate 19a and the ceiling plate 19b, respectively, when inserted into the rack 19. The bottom 19c and the ceiling 19d become supporting unit. Legs 19k are fitted to four corners of the bottom plate 19a.

[0063] Although not shown, the apparatus-side pin connectors 26 are provided on the back surfaces of the controller 4, audio apparatuses 6, 7, and the speakers 3a, 3b. The apparatus-side pin connectors 26 are connected to each other by the rack-side pin connectors 25 and the multi-pin cables 27. The display 2 is connected to the controller 4 by wires, without via the rack-side pin connectors 25 and the multi-line cables 27. The rack-side pin connectors 25 and the multi-line cables 27 are passed through the backside of the rack 19 along the bottom plate 19a or the ceiling plate 19b. The rack-side pin connectors 25 are drawn out from the holes formed on a back plate 19g of the rack 19, and are connected to the apparatus-side pin connectors 26.

[0064] Although not shown, the AC power supply cord 10 is connected to the multi-line cable 27. Power is supplied to each apparatus via the pin connectors 25. Input operation of the controller 4 is carried out from a remote control apparatus 4k.

[0065] Functions of the above apparatuses of the audio system 500 according to the fifth embodiment are equivalent to the functions of the apparatuses according to the first embodiment. The audio system 500 can carry out the same operation as that of the audio system 100 according to the first embodiment.

[0066] The configuration and the operation of the audio system 500 are as explained above. The audio rack according to the fifth embodiment includes the long rack 19 as an audio rack main body having the bottom plate 19a and the ceiling plate 19b as a long supporting unit, the rack-side pin connectors 25, and the controller 4. According to the audio rack of the fifth embodiment, plural audio apparatuses such as the CD player 6 and the DVD player 7 can be installed and supported at free optional positions on the bottom plate 19a. It is sufficient to only connect the apparatus-side pin connectors 26 of the audio apparatuses 6, 7 to the rack-side pin connectors 25. Therefore, the wiring and connection operation at the time of setting the audio apparatuses 6, 7, and the wiring and connection operation at the time of

changing the layout of the apparatuses become easy.

INDUSTRIAL APPLICABILITY

5 **[0067]** As explained above, the audio rack according to the present invention is useful as an audio rack that facilitates wiring and connection at the time of setting plural audio apparatuses such as a CD player and a DVD player and the wiring and connection at the time of changing a layout of the apparatuses.

10 Claims

1. An audio rack that supports a plurality of audio apparatuses by electrically connecting between the audio apparatuses that have apparatus-side connectors having common terminals provided in common to each audio apparatus and signal terminals exclusive for individual audio apparatuses, the audio rack comprising:

15 an audio rack body having a long supporting unit capable of supporting the plurality of audio apparatuses at optional positions;
a rack-side connector installed along the long supporting unit, having a plurality of terminals to be connected to the common terminals and the signal terminals exclusive for the individual audio apparatuses, respectively,
20 and capable of connecting the apparatus-side connectors at optional positions; and
a controller that controls each audio apparatus by being electrically connected to the plurality of audio apparatuses via the rack-side connector.

25 2. The audio rack according to claim 1, wherein the long supporting unit is configured to enable the audio apparatuses to be moved continuously.

3. The audio rack according to claim 1, wherein the connector has power supply terminals as the common terminals, and supplies power to the audio apparatuses from the outside via the power supply terminals.

30 4. The audio rack according to claim 1, wherein the audio rack body is a plate-shaped audio rack body disposed on a floor, and the long supporting unit is a trench provided on the plate-shaped audio rack body.

5. The audio rack according to claim 1, wherein the audio rack body is a pole fitted on a wall in a lateral direction, and the pole constitutes the long supporting unit.

35 6. The audio rack according to claim 1, wherein the audio rack body is a rail fitted on a wall in a lateral direction, and the rail constitutes the long supporting unit.

40 7. The audio rack according to claim 1, wherein the audio rack body is a board fitted on a wall, the long supporting unit is a trench formed on the board in a lateral direction, and the trench has a wide part in the bottom.

8. The audio rack according to claim 1, wherein the audio rack body is a rack having a bottom plate and a ceiling plate, and the bottom plate and the ceiling plate constitute the long supporting unit.

45

50

55

FIG.1

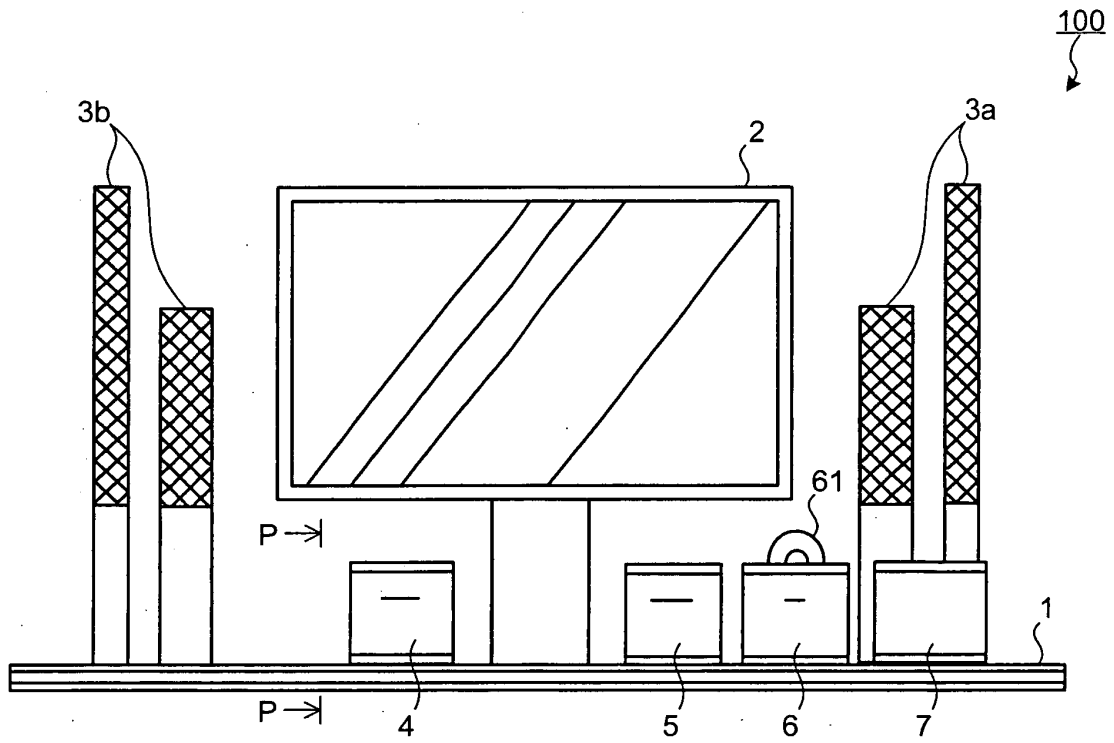


FIG.2

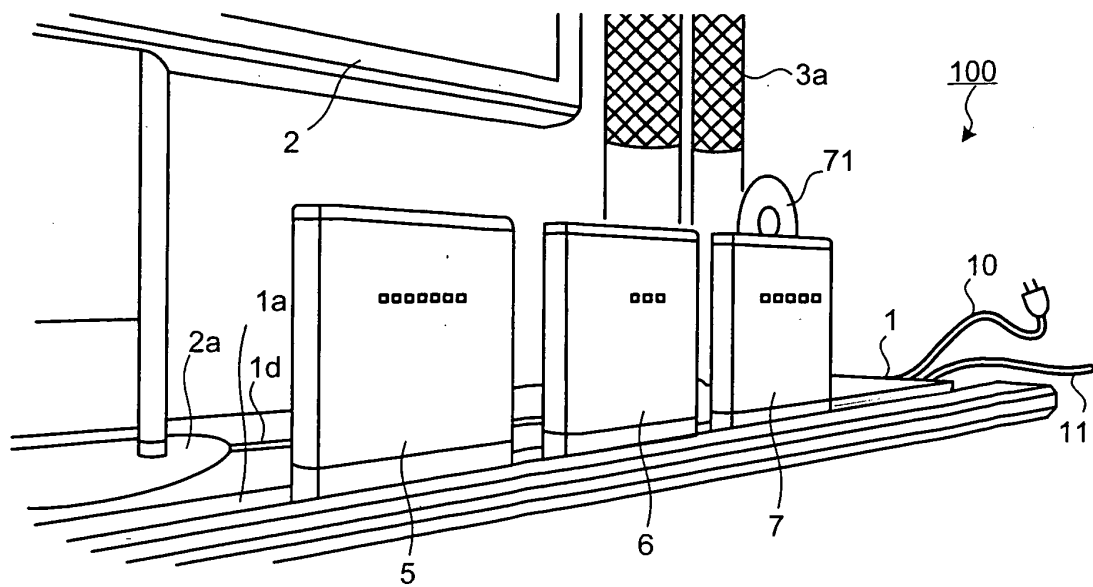


FIG.3-1

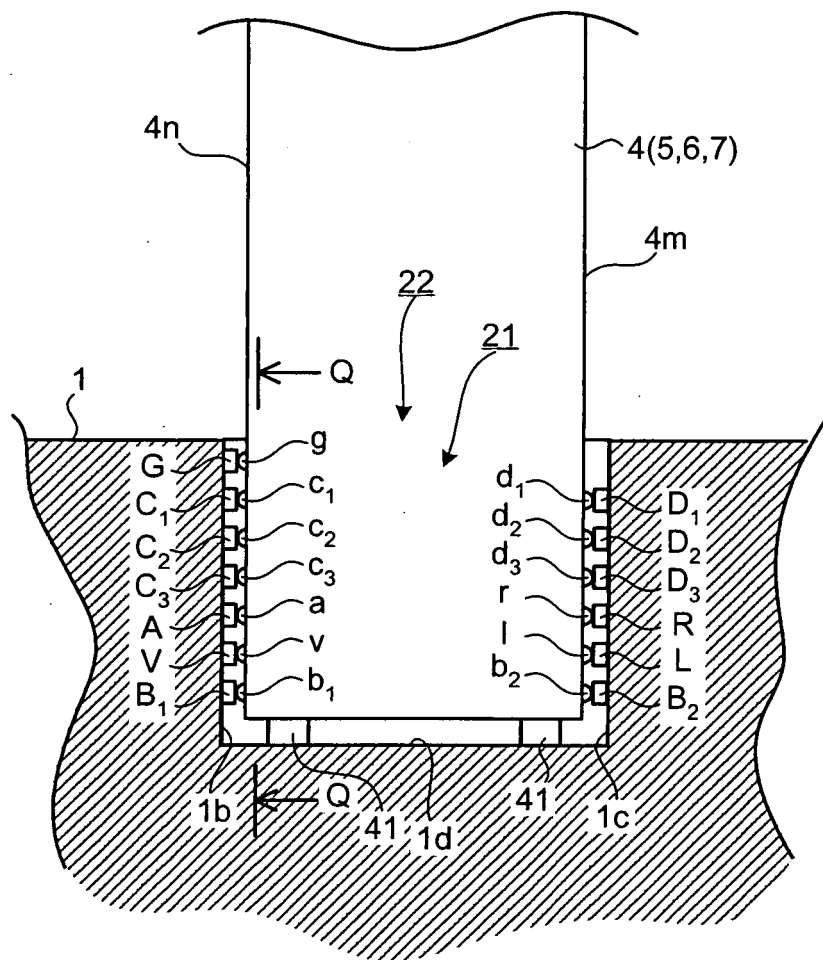


FIG.3-2

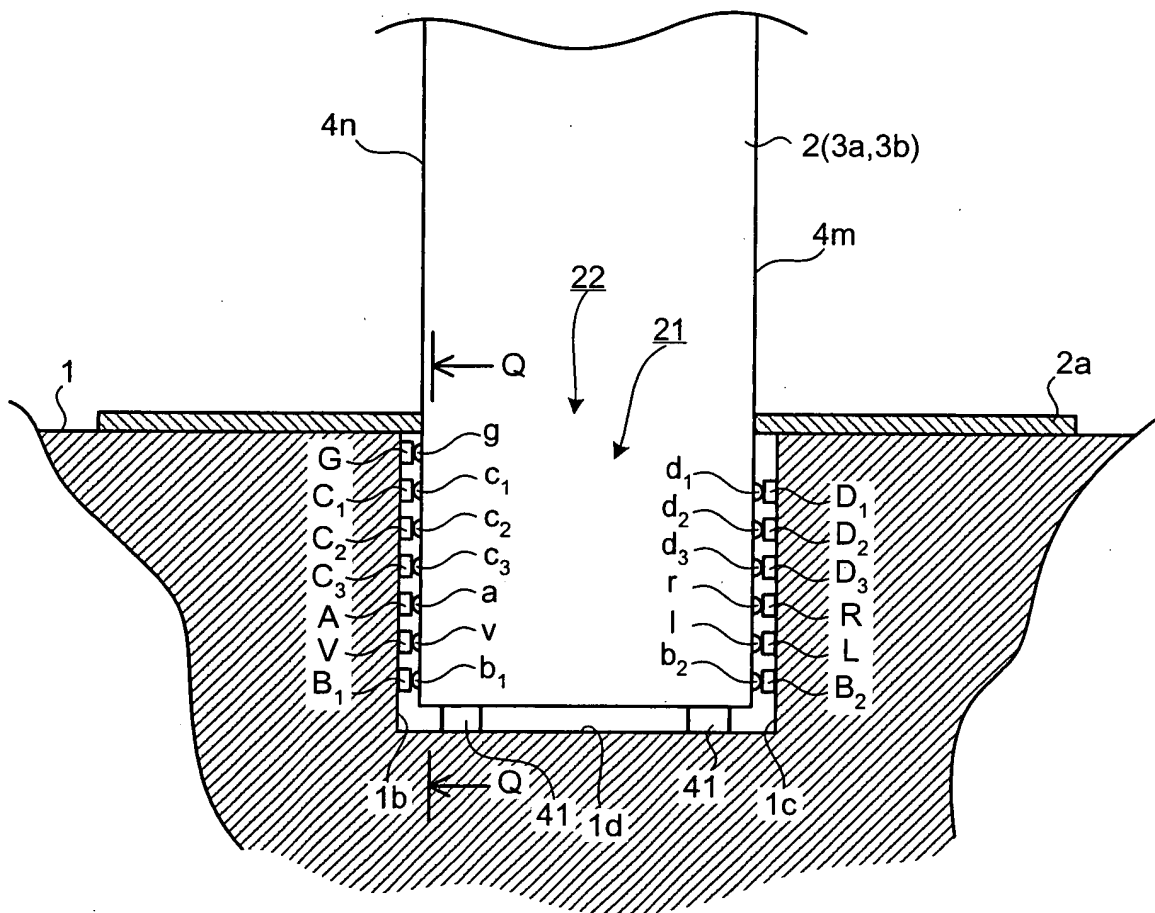


FIG.4

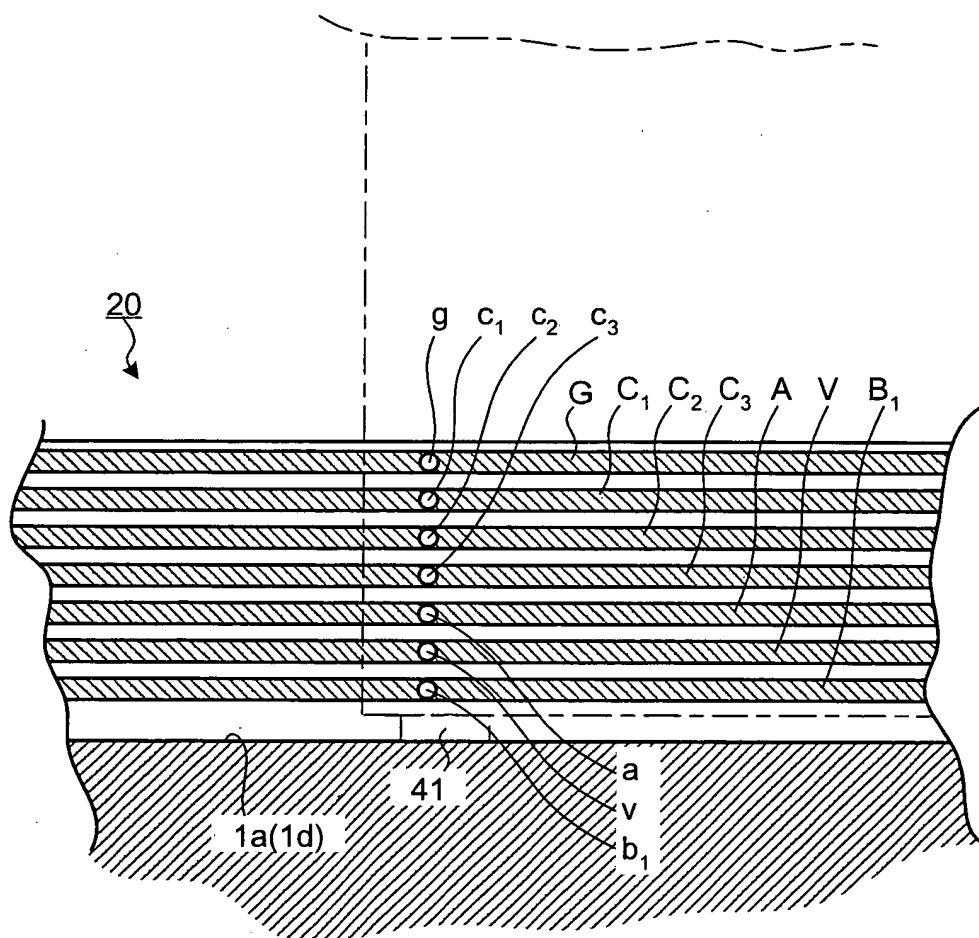


FIG. 5

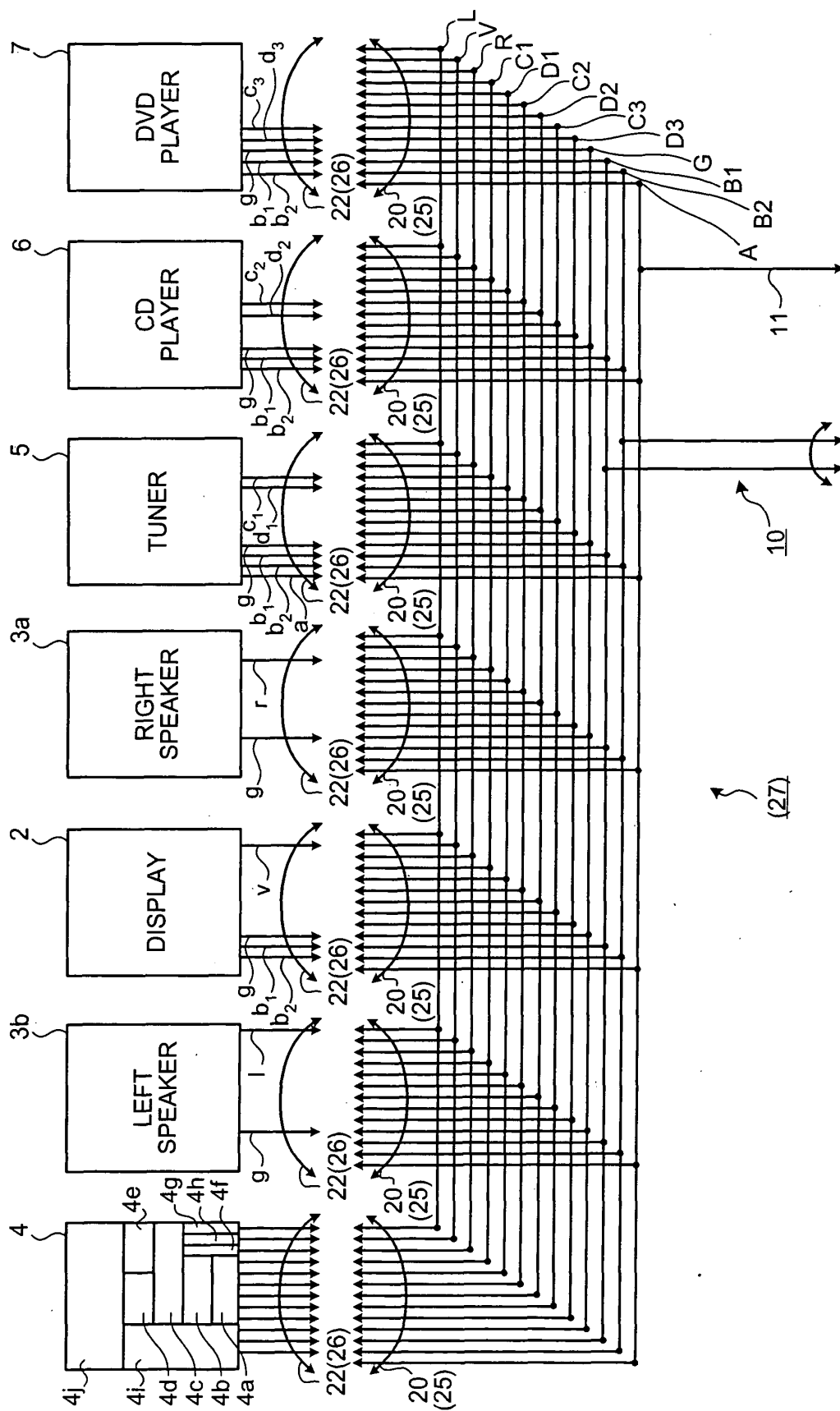


FIG.6

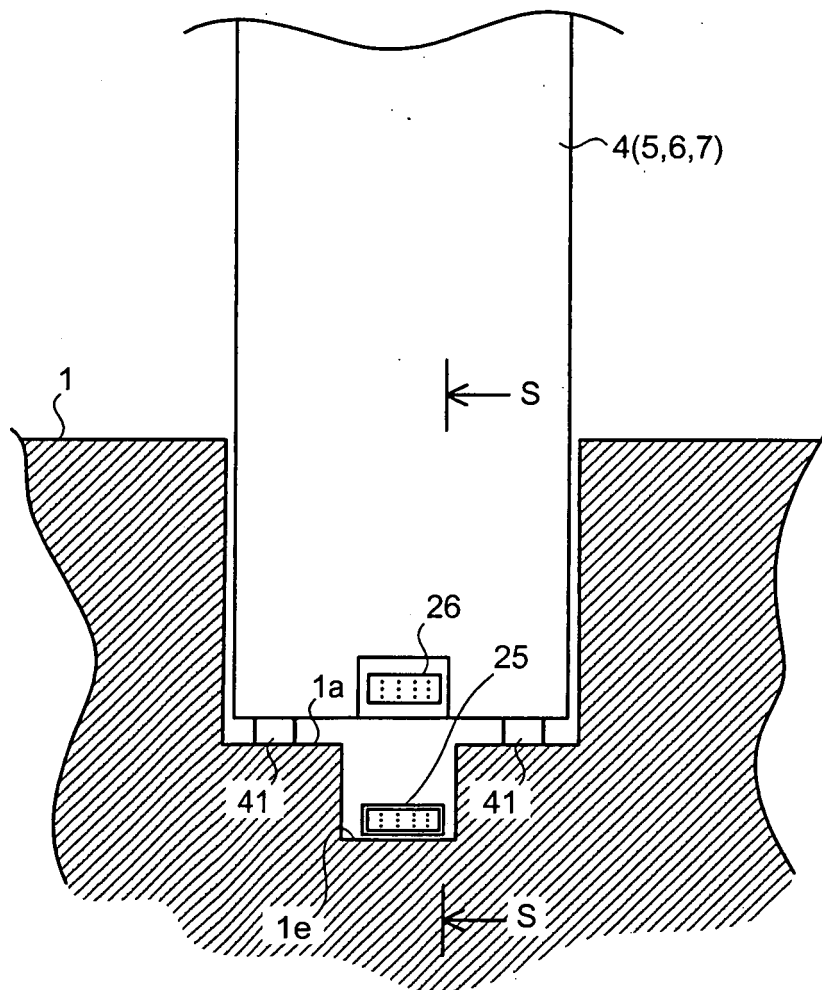


FIG.7

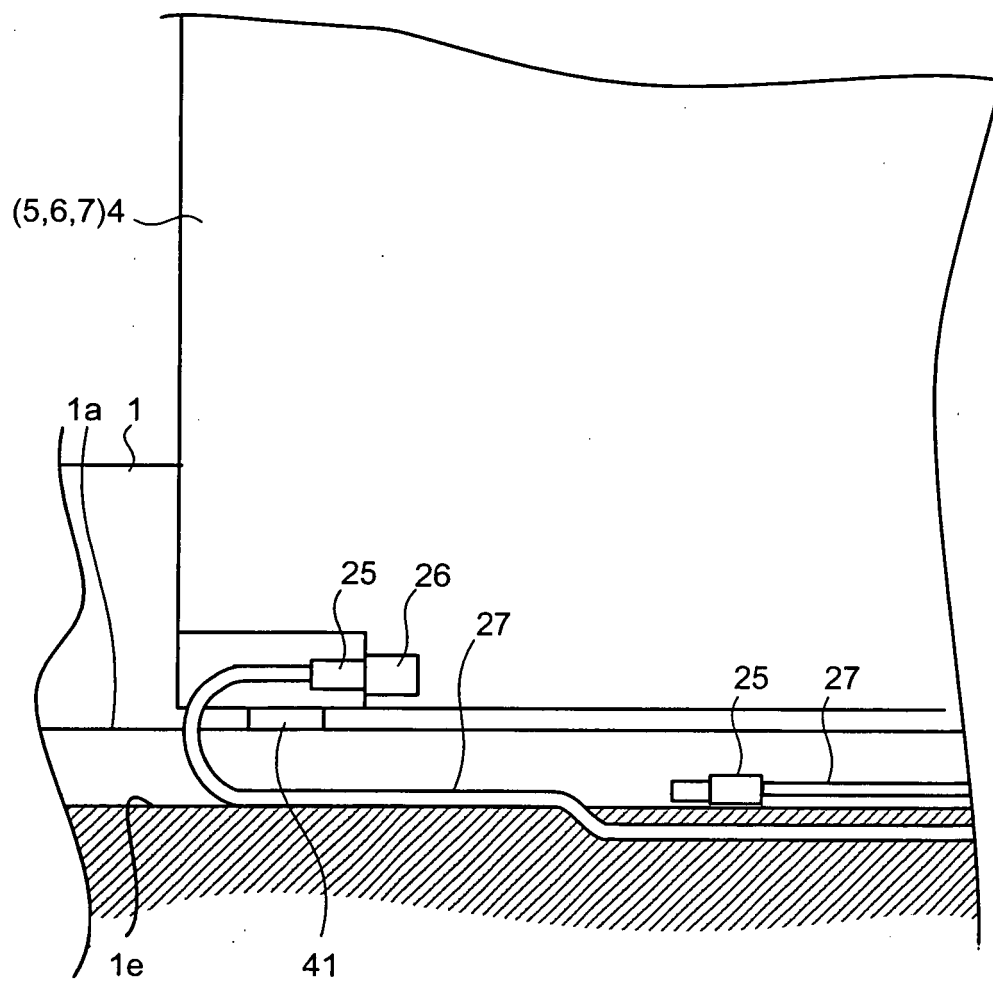


FIG.8

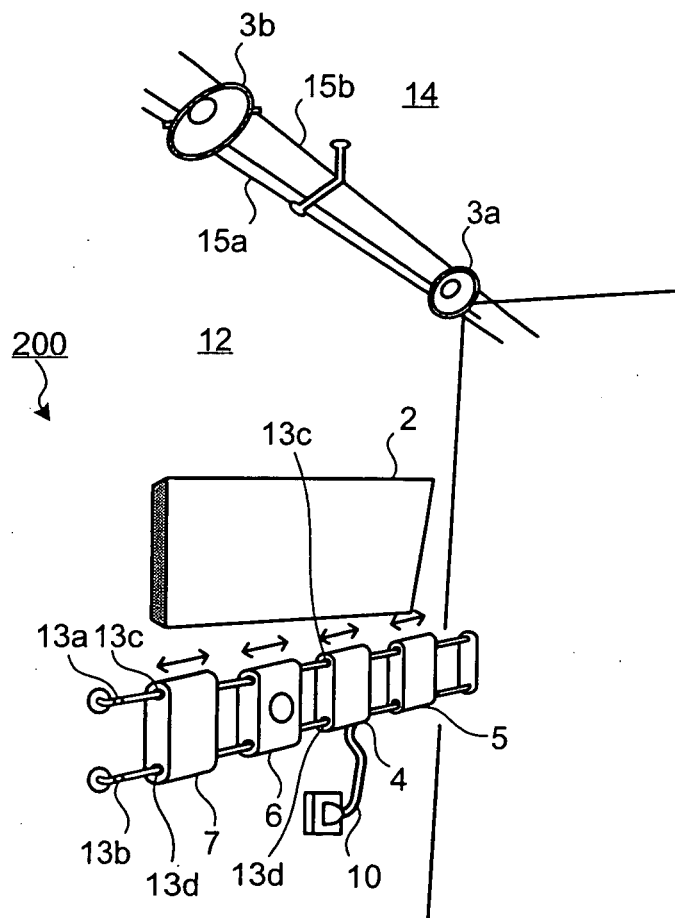


FIG.9

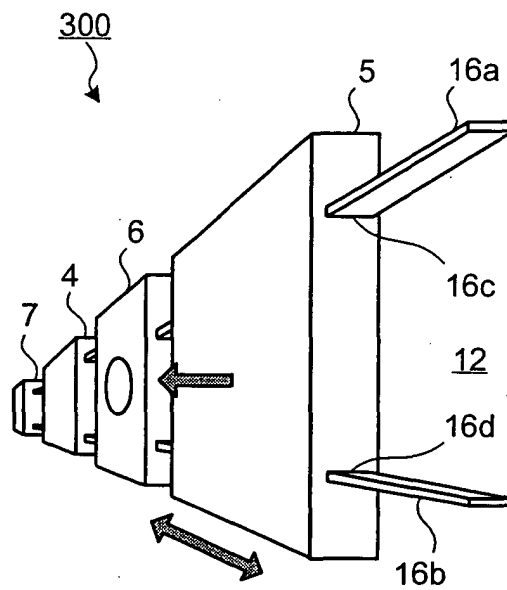


FIG.10

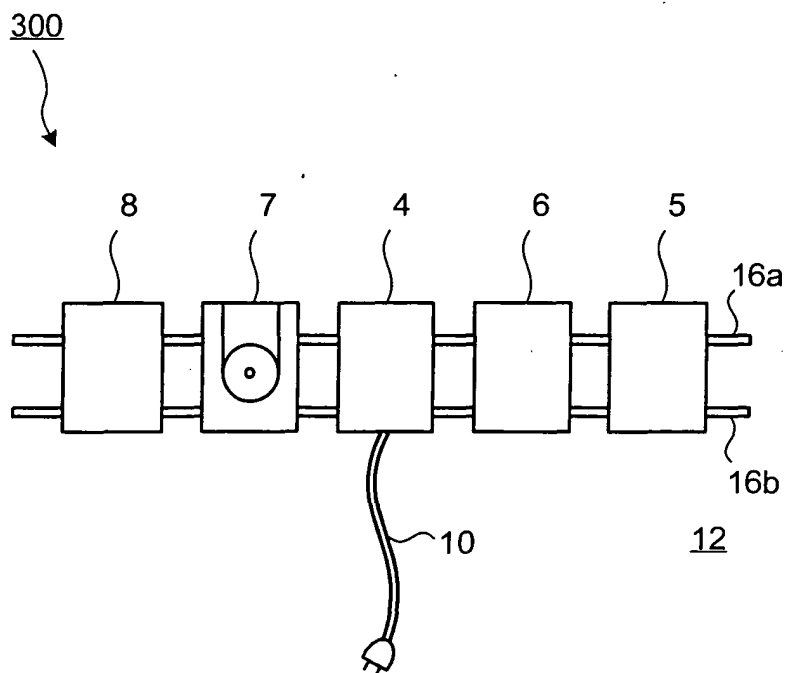


FIG.11

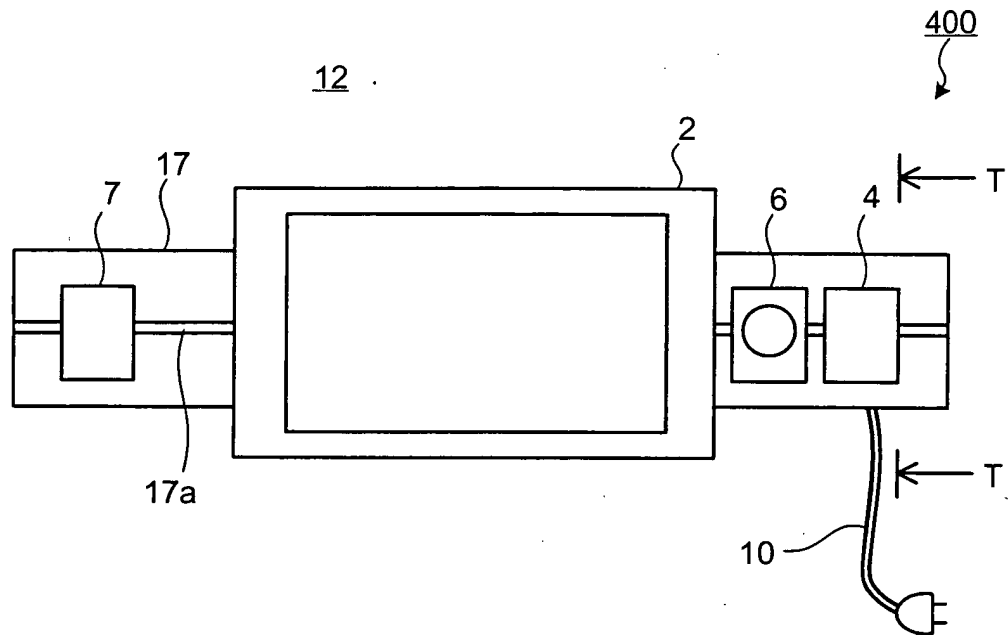


FIG.12

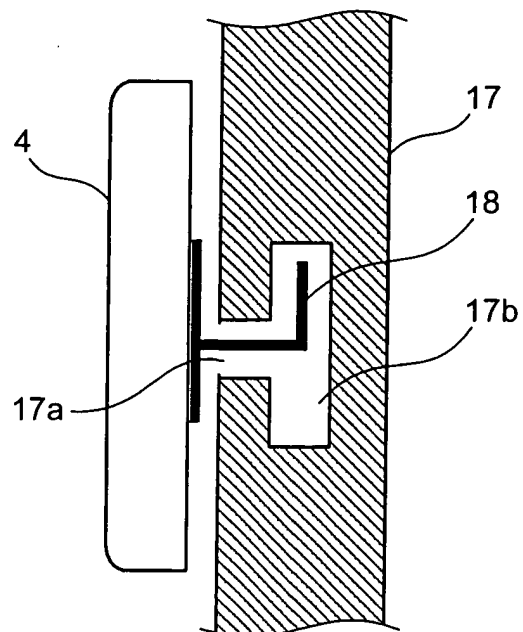


FIG.13

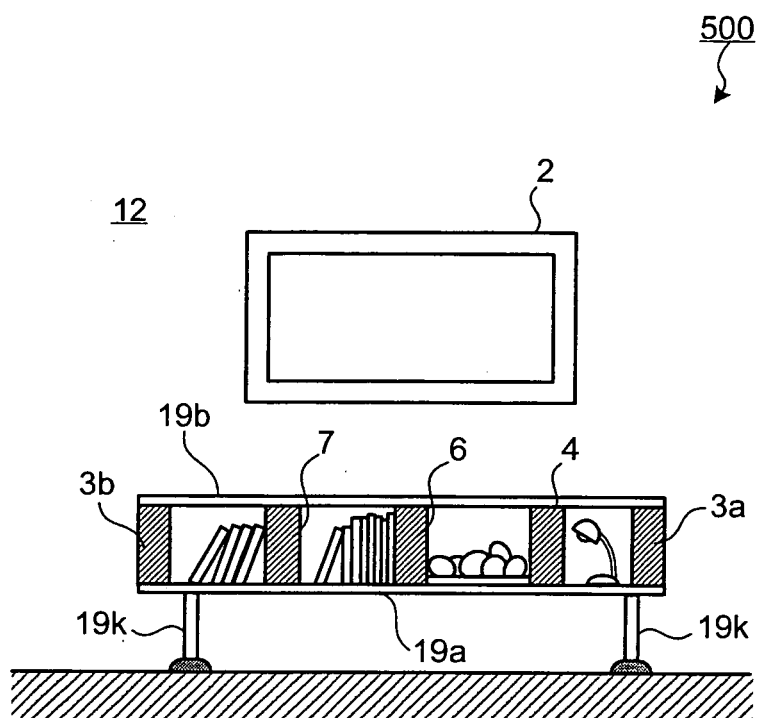
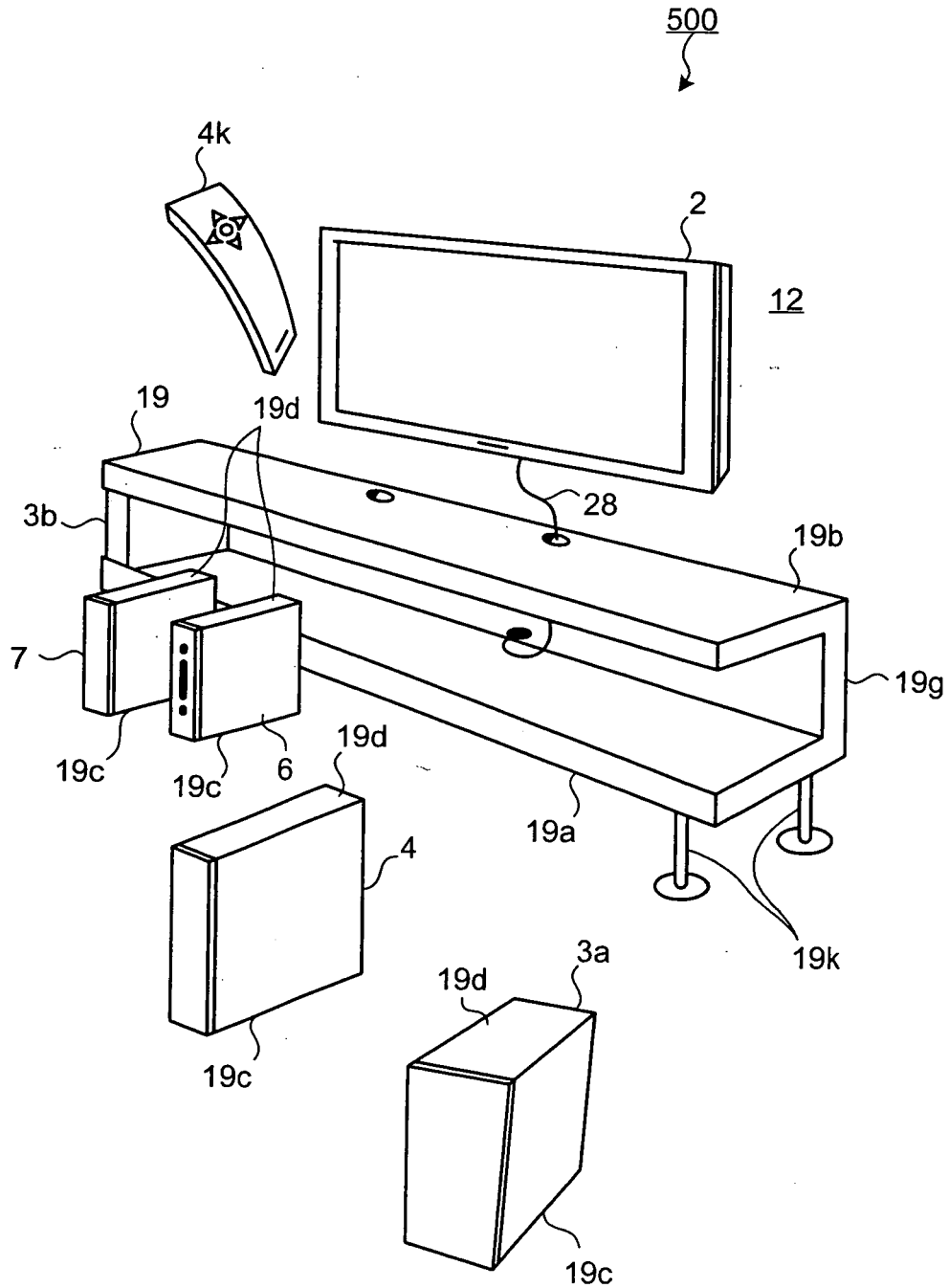


FIG.14



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/018152

A. CLASSIFICATION OF SUBJECT MATTER

A47B81/06 (2006.01), **H02G5/06** (2006.01), **H05K7/18** (2006.01)

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)

A47B81/06 (2006.01), **H02G5/06** (2006.01), **H05K7/18** (2006.01)

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Toroku Jitsuyo Shinan Koho	1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002-314903 A (Sony Corp.), 25 October, 2002 (25.10.02), Par. Nos. [0052] to [0069]; Figs. 9 to 11 & US 2004-0031060 A1 & EP 001379081 A1	1-8
A	JP 2-303312 A (Telemecanique), 17 December, 1990 (17.12.90), Page 4, upper right column, lines 4 to 18 & US 5144530 A & EP 396437 A	1-8

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
12 October, 2005 (12.10.05)Date of mailing of the international search report
25 October, 2005 (25.10.05)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/018152

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 141036/1975 (Laid-open No. 53106/1977) (Matsushita Electric Works, Ltd.), 16 April, 1977 (16.04.77), Page 3, lines 1 to 5 (Family: none)	1-8

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP H572188 A [0003]