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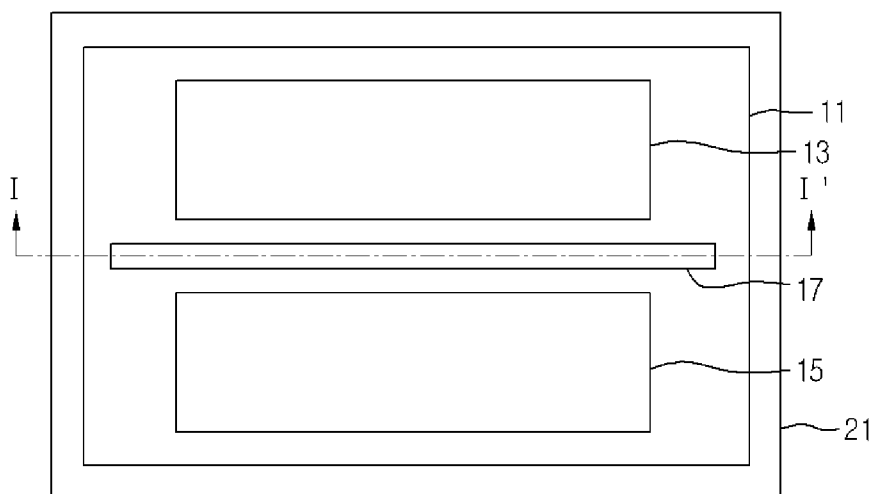
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(54) Title: TUNER MODULE

[Fig. 2]



(57) Abstract: Provided is a tuner module. The tuner module comprises a printed circuit board, a main tuner on the printed circuit board, a sub-tuner on the printed circuit board, and an interface on the printed circuit board. The interface is electrically connected with the main tuner and the sub-tuner.

Description

TUNER MODULE

Technical Field

- [1] Embodiments relate to a tuner module.

Background Art

- [2] A tuner module can be applied to a digital broadcasting receiver such as a digital television (DTV) or a set-top box (STB). The tuner module can be classified into a single tuner module selecting only one channel, and a dual tuner module selecting two channels.
- [3] A digital broadcasting receiver to which the dual tuner module is applied can perform a function of selecting two channels simultaneously to view one of the channels and store contents provided through the other in a storage medium. Also, a digital broadcasting receiver having a picture-in-picture (PIP) function can display one channel through a main screen and display the other channel through a sub-screen.
- [4] Generally, the dual tuner module comprises a main tuner and a sub-tuner to perform a PIP function. At this point, the main tuner and the sub-tuner are disposed inside separate chassis, respectively. The sub-tuner is realized to receive antenna-reception signals from the main tuner through separate cable connection.
- [5] However, since signals are distributed and supplied between the main tuner and the sub-tuner using a separate cable, separate connectors required for the cable connection should be provided to the main tuner and the sub-tuner, respectively. Also, an external noise may be introduced through the cable.

Disclosure of Invention

Technical Problem

- [6] Embodiments provide a tuner module that can prevent an external noise from being introduced and reduce manufacturing costs.

Technical Solution

- [7] In one embodiment, a tuner module comprises: a printed circuit board; a main tuner on the printed circuit board; a sub-tuner on the printed circuit board; and an interface on the printed circuit board, the interface being electrically connected with the main tuner and the sub-tuner.
- [8] In another embodiment, a tuner module comprises: a printed circuit board; an interface on the printed circuit board; and a first tuner on the printed circuit board, the first tuner being electrically connected with the interface through a circuit on the printed circuit board.

Advantageous Effects

- [9] A tuner according to an embodiment can prevent introducing of an external noise and reduce manufacturing costs.

Brief Description of the Drawings

- [10] Fig. 1 is a view illustrating a tuner module according to first embodiment.
[11] Figs. 2 and 3 are views illustrating a tuner module according to second embodiment.
[12] Fig. 4 is a view illustrating a tuner module according to third embodiment.
[13] Fig. 5 is a view illustrating a tuner module according to fourth embodiment.
[14] Fig. 6 is a block diagram of a tuner module according to fifth embodiment.
[15] Fig. 7 is a view illustrating a tuner module according to sixth embodiment.

Mode for the Invention

- [16] Embodiments are described with reference to the accompanying drawings.
[17] Fig. 1 is a view illustrating a tuner module according to first embodiment.
[18] The tuner module comprises a printed circuit board 11, a main tuner 13, a sub-tuner 15, and an interface 17. The main tuner 13 and the sub-tuner 15 are disposed on the printed circuit board 11. For example, the interface 17 can be disposed between the main tuner 13 and the sub-tuner 15. The interface 17 can be disposed in one line or a plurality of lines.
[19] The interface 17 is disposed on the printed circuit board 11 to electrically connect with the main tuner 13. The interface 17 can be electrically connected with the main tuner 13 through a circuit formed on the printed circuit board 11.
[20] Also, the interface 17 is disposed on the printed circuit board 11 to electrically connect with the sub-tuner 15. The interface 17 can be electrically connected with the sub-tuner 15 through a circuit formed on the printed circuit board 11.
[21] The interface 17 can comprise a plurality of terminals 17a. Some of the plurality of terminals 17a can be electrically connected to the main tuner 13. Also, some of the plurality of terminals 17a can be electrically connected to the sub-tuner 15.
[22] The main tuner 13 and the sub-tuner 15 can be electrically connected with each other through the interface 17. The main tuner 13 and the sub-tuner 15 can be directly connected inside the interface without a separate cable. Also, the main tuner 13 and the sub-tuner 15 can be connected to each other using cables through the plurality of terminals 17a.
[23] The main tuner 13 can select a desired channel from antenna-reception signals provided from the outside. The main tuner 13 can provide the antenna-reception signals from the outside to the sub-tuner 15. At this point, the antenna-reception signals provided from the main tuner 13 can be provided to the sub-tuner 15 through the interface 17.
[24] According to an embodiment, the antenna-reception signals provided from the main

tuner 13 can be provided to the sub-tuner 15 without separate cable connection. Accordingly, an introducing of an external noise can be prevented in comparison with a case of connection using a separate cable. Also, since a separate cable is not used, manufacturing costs can be reduced.

- [25] The sub-tuner 15 can select a channel from the antenna-reception signals provided from the main tuner 13. The channel selected by the sub-tuner 15 can be the same as or different from the channel selected by the main tuner 13. The tuner module according to an embodiment can perform a function of a dual tuner module, and can realize a PIP function, for example.
- [26] The interface 17 can output audio signals, video signals, automatic gain control signals, and address signals provided from the main tuner 13 and the sub-tuner 15.
- [27] Each of the main tuner 13 and the sub-tuner 15 can comprise a tuner unit selecting a channel, and a demodulation unit demodulating signals provided from the tuner unit. The tuner unit can comprise a mixer oscillator phase locked loop (MOPLL) circuit. The demodulation unit can comprise an orthogonal frequency division multiplexing (OFDM) demodulation circuit.
- [28] Figs. 2 and 3 are views illustrating a tuner module according to second embodiment.
- [29] Referring to Figs. 2 and 3, the tuner module comprises a printed circuit board 11, a main tuner 13, a sub-tuner 15, an interface 17, and a chassis 21.
- [30] The main tuner 13 and the sub-tuner 15 are disposed on the printed circuit board 11. For example, the interface 17 can be disposed between the main tuner 13 and the sub-tuner 15. The interface 17 can be disposed in one line or a plurality of lines.
- [31] The interface 17 is disposed on the printed circuit board 11 to electrically connect with the main tuner 13. The interface 17 can be electrically connected with the main tuner 13 through a circuit formed on the printed circuit board 11.
- [32] The chassis 21 can be disposed to surround the printed circuit board 11, the main tuner 13, the sub-tuner 15, and the interface 17. The chassis 21 can comprise a conductor. The chassis 21 can block a noise introduced from the outside.
- [33] The interface 17 can comprise terminals 23 exposed to the outside of the chassis 21. The interface 17 can provide a signal to the outside through the terminals 23. The interface 17 can output audio signals, video signals, automatic gain control signals, and address signals provided from the main tuner 13 and the sub-tuner 15.
- [34] The main tuner 13 can select a desired channel from antenna-reception signals provided from the outside. The main tuner 13 can provide the antenna-reception signals from the outside to the sub-tuner 15. At this point, the antenna-reception signals provided from the main tuner 13 can be provided to the sub-tuner 15 through the interface 17.
- [35] According to an embodiment, the antenna-reception signals provided from the main

tuner 13 can be provided to the sub-tuner 15 without separate cable connection. The sub-tuner 15 can select a channel from the antenna-reception signals provided from the main tuner 13. The channel selected by the sub-tuner 15 can be the same as or different from the channel selected by the main tuner 13. The tuner module according to an embodiment can perform a function of a dual tuner module, and can realize a PIP function, for example.

- [36] Accordingly, an introducing of an external noise can be prevented in comparison with a case of connection using a separate cable. Also, since a separate cable is not used, manufacturing costs can be reduced.
- [37] Fig. 4 is a view illustrating a tuner module according to third embodiment.
- [38] Referring to Fig. 4, the tuner module comprises a printed circuit board 41, a first tuner 43, a second tuner 45, a first interface 47, and a second interface 49. The first tuner 43 and the second tuner 45 are disposed on the printed circuit board 41.
- [39] The first interface 47 is disposed on the printed circuit board 41 to electrically connect with the first tuner 43. The first interface 47 can be electrically connected with the first tuner 43 through a circuit formed on the printed circuit board 41. The first interface 47 can comprise a plurality of terminals 47a. Some of the plurality of terminals 47a can be electrically connected to the first tuner 43.
- [40] The second interface 49 is disposed on the printed circuit board 41 to electrically connect with the second tuner 45. The second interface 49 can be electrically connected with the second tuner 45 through a circuit formed on the printed circuit board 41. The second interface 49 can comprise a plurality of terminals 49a. Some of the plurality of terminals 49a can be electrically connected to the second tuner 45.
- [41] The first tuner 43 and the second tuner 45 can be electrically connected to each other through the first interface 47 and the second interface 49. The first interface 47 and the second interface 49 can be directly connected without a separate cable through a circuit formed on the printed circuit board 41. Also, the terminals 47a formed on the first interface 47 and the terminals 49a formed on the second interface 49 can be connected using a cable.
- [42] The first tuner 43 can select a desired channel from antenna-reception signals provided from the outside. The first tuner 43 can provide the antenna-reception signals from the outside to the second tuner 45. At this point, the antenna-reception signals provided from the first tuner 43 can be provided to the second tuner 45 through the first interface 47 and the second interface 49.
- [43] According to an embodiment, the antenna-reception signals provided from the first tuner 43 can be provided to the second tuner 45 without separate cable connection. Accordingly, an introducing of an external noise can be prevented in comparison with a case of connection using a separate cable. Also, since a separate cable is not used,

manufacturing costs can be reduced.

- [44] The second tuner 45 can select a channel from the antenna-reception signals provided from the first tuner 43. The channel selected by the second tuner 45 can be the same as or different from the channel selected by the first tuner 43. The tuner module according to the embodiment can perform a function of a dual tuner module, and can realize a PIP function, for example.
- [45] The first interface 47 and the second interface 49 can output audio signals, video signals, automatic gain control signals, and address signals provided from the first tuner 43 and the second tuner 45.
- [46] A chassis can be provided to surround the printed circuit board 41, the first tuner 43, the second tuner 45, the first interface 47, and the second interface 49. The chassis can comprise a conductor and block a noise introduced from the outside.
- [47] According to an embodiment, the tuner module can be divided into a first region and a second region. The first region comprises the first tuner 43 and the first interface 47. The second region comprises the second tuner 45 and the second interface 49. Accordingly, the tuner module according to the embodiment can be applied to a dual tuner module comprising two tuners, and can be applied to a single tuner module comprising only one tuner.
- [48] In the case where the tuner module is applied to a single tuner module, a tuner module comprising both the first region and the second region can be used. And a tuner module divided to comprise only the first region or a tuner module divided to comprise only the second region can be used. As described above, the tuner module according to the embodiment can be applied to the dual tuner module and the single tuner module in common.
- [49] Fig. 5 is a view illustrating a tuner module according to fourth embodiment.
- [50] Referring to Fig. 5, the tuner module comprises a printed circuit board 51, a main tuner 53, a sub-tuner 55, and an interface 57. The main tuner 53 and the sub-tuner 55 are disposed on the printed circuit board 51.
- [51] The interface 57 is disposed on the printed circuit board 51 to electrically connect with the main tuner 53. Also, the interface 57 is disposed on the printed circuit board 51 to electrically connect with the sub tuner 55.
- [52] The main tuner 53 and the sub tuner 55 can be electrically connected to each other through the interface 57. The main tuner 53 and the sub tuner 55 can be directly connected to each other without a separate cable inside the interface 57.
- [53] The main tuner 53 can select a desired channel from antenna-reception signals provided from the outside. The main tuner 53 can provide the antenna-reception signals from the outside to the sub-tuner 55. At this point, the antenna-reception signals provided from the main tuner 53 can be provided to the sub-tuner 55 through

the interface 57.

- [54] According to an embodiment, the antenna-reception signals provided from the main tuner 53 can be provided to the sub-tuner 55 without separate cable connection. Accordingly, an introducing of an external noise can be prevented in comparison with a case of using a separate cable. Also, since a separate cable is not used, manufacturing costs can be reduced.
- [55] The sub-tuner 55 can select a channel from the antenna-reception signals provided from the main tuner 53. The channel selected by the sub-tuner 55 can be the same as or different from the channel selected by the main tuner 53. The tuner module according to an embodiment can perform a function of a dual tuner module, and can realize a PIP function, for example.
- [56] The interface 57 can output audio signals, video signals, automatic gain control signals, and address signals provided from the main tuner 53 and the sub-tuner 55.
- [57] The main tuner 53 can comprise a first part 53a, a second part 53b, and a third part 53c. The sub tuner 55 can comprise a first part 55a, a second part 55b, and a third part 55c. The parts 53a, 53b, and 53c forming the main tuner 53, and the parts 55a, 55b, and 55c forming the sub-tuner 55 can be arranged in a mirror type with respect to the interface 57.
- [58] Through this arrangement of the parts, the output direction of signals provided from the main tuner 53 and the output direction of signals provided from the sub-tuner 55 can be directed to a region where the interface 57 is located. Accordingly, the design of signal lines can be simplified, and the size of the printed circuit board 51 can be reduced.
- [59] Fig. 6 is a block diagram of a tuner module according to fifth embodiment.
- [60] Referring to Fig. 6, the tuner module comprises an antenna connection terminal 61, a main tuner 63, a sub-tuner 65, and an interface 67. The antenna connection terminal 61 receives antenna-reception signals from the outside. Each of the main tuner 63 and the sub-tuner 65 can comprise a mixer oscillator phase locked loop (MOPLL) and an intermediate frequency integrated circuit (IF IC). The main tuner 63 and the sub-tuner 65 can be electrically connected to each other through the interface 67.
- [61] Fig. 7 is a view illustrating a tuner module according to sixth embodiment.
- [62] Referring to Fig. 7, the tuner module comprises an antenna connection terminal 71, a main tuner 73, a sub-tuner 75, and an interface 77. The antenna connection terminal 71 receives antenna-reception signals from the outside. The main tuner 73 and the sub-tuner 75 can be electrically connected to each other through the interface 77. The interface 77 can output audio signals, video signals, automatic gain control signals, and address signals provided from the main tuner 73 and the sub-tuner 75. The parts forming the main tuner 73, and the parts forming the sub-tuner 75 can be arranged in a

mirror type with respect to the interface 77.

[63] Any reference in this specification to "one embodiment", "an embodiment", "example embodiment" etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is comprised in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

[64] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Industrial Applicability

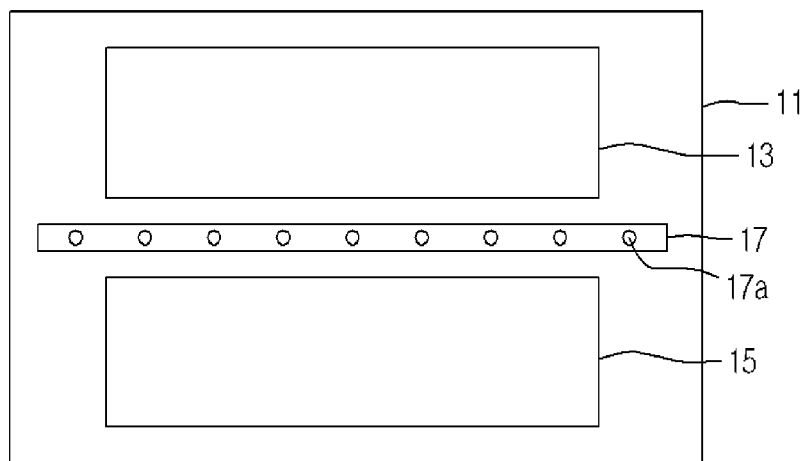
[65] The tuner module according to the embodiment can prevent an introducing of an external noise and reduce manufacturing costs.

Claims

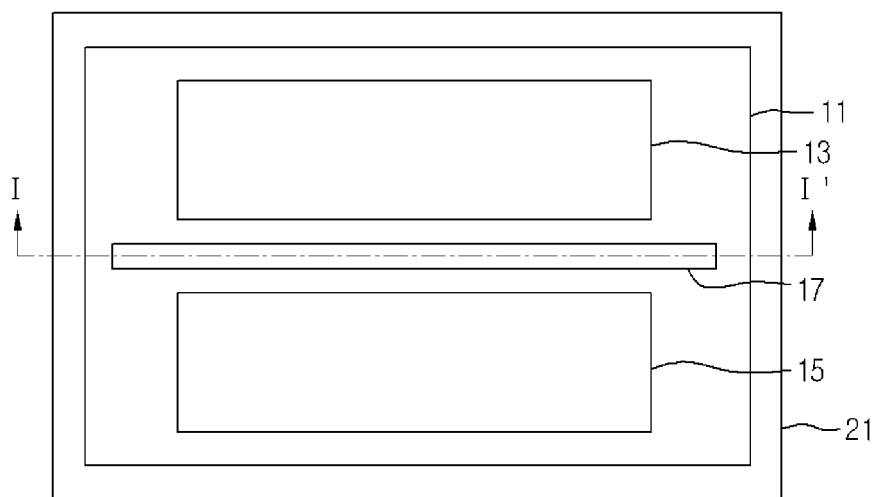
- [1] A tuner module comprising:
 - a printed circuit board;
 - a main tuner on the printed circuit board;
 - a sub-tuner on the printed circuit board; and
 - an interface on the printed circuit board, the interface being electrically connected with the main tuner and the sub-tuner.
- [2] The tuner module according to claim 1, comprising a chassis disposed to surround the printed circuit board, the main tuner, the sub-tuner, and the interface.
- [3] The tuner module according to claim 1, wherein the interface is disposed in one line or a plurality of lines.
- [4] The tuner module according to claim 1, wherein the interface is disposed between the main tuner and the sub-tuner.
- [5] The tuner module according to claim 1, wherein the interface comprises terminals electrically connected to the main tuner, and terminals electrically connected to the sub-tuner.
- [6] The tuner module according to claim 1, wherein the interface provides antenna-reception signals from the main tuner to the sub-tuner.
- [7] The tuner module according to claim 1, wherein the interface is electrically connected to the main tuner and the sub-tuner through a circuit on the printed circuit board.
- [8] The tuner module according to claim 1, wherein each of the main tuner and the sub-tuner comprises a tuner unit selecting a channel and a demodulation unit demodulating signals provided from the tuner unit.
- [9] The tuner module according to claim 8, wherein the tuner unit comprises a mixer oscillator phase locked loop circuit.
- [10] The tuner module according to claim 2, wherein the interface comprises terminals exposed to an outside of the chassis, and provides signals through the exposed terminals.
- [11] The tuner module according to claim 1, wherein parts forming the main tuner and parts forming the sub-tuner are disposed in a mirror type with respect to the interface.
- [12] A tuner module comprising:
 - a printed circuit board;
 - an interface on the printed circuit board; and
 - a first tuner on the printed circuit board, the first tuner being electrically

- connected with the interface through a circuit on the printed circuit board.
- [13] The tuner module according to claim 12, comprising a second tuner on the printed circuit board, the second tuner being electrically connected with the interface through a circuit on the printed circuit board.
- [14] The tuner module according to claim 12, comprising a chassis disposed to surround the printed circuit board, the interface, and the first tuner.
- [15] The tuner module according to claim 13, wherein the interface is disposed in one line or a plurality of lines between the first tuner and the second tuner.
- [16] The tuner module according to claim 13, wherein the interface provides antenna-reception signals from the first tuner to the second tuner.
- [17] The tuner module according to claim 13, wherein each of the first tuner and the second tuner comprises a tuner unit selecting a channel and a demodulation unit demodulating signals provided from the tuner unit.
- [18] The tuner module according to claim 13, wherein the interface comprises a first interface electrically connected with the first tuner, and a second interface electrically connected with the second tuner.
- [19] The tuner module according to claim 14, wherein the interface comprises terminals exposed to an outside of the chassis, and provides signals through the exposed terminals.
- [20] The tuner module according to claim 13, wherein parts forming the first tuner and parts forming the second tuner are disposed in a mirror type with respect to the interface.

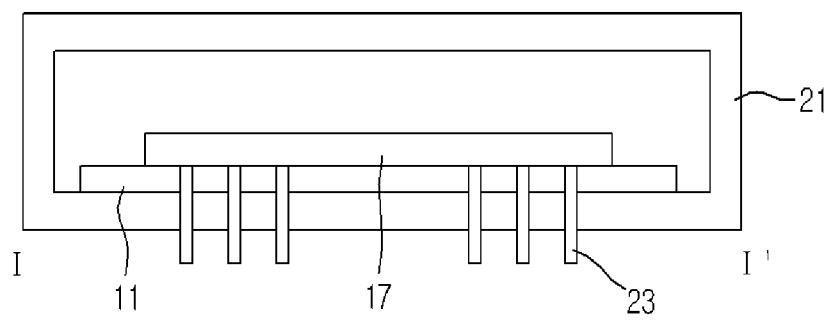
[Fig. 1]



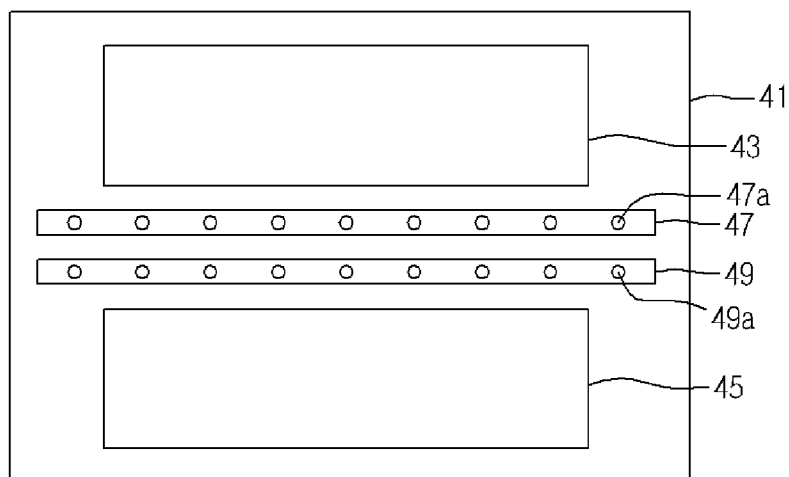
[Fig. 2]



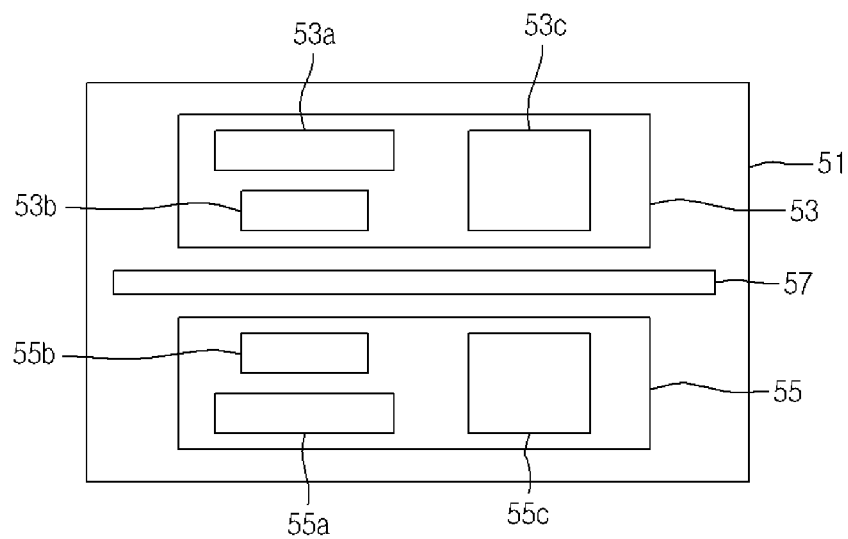
[Fig. 3]



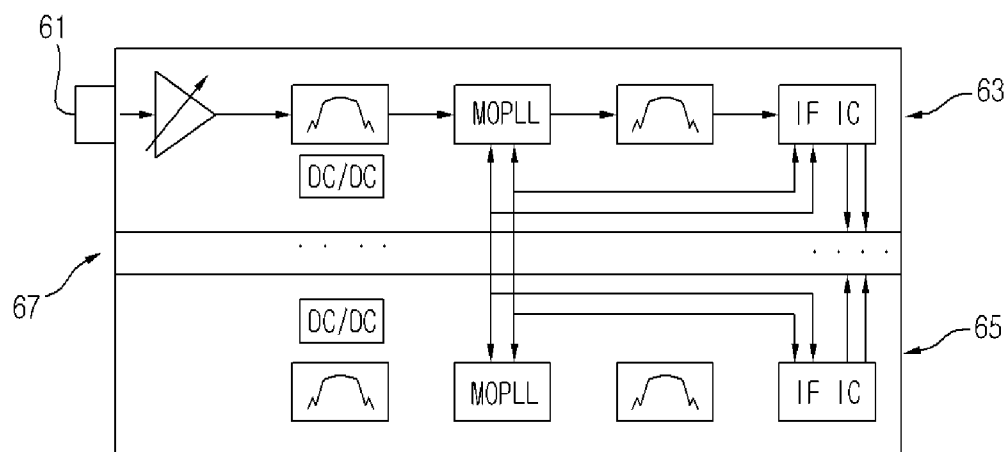
[Fig. 4]



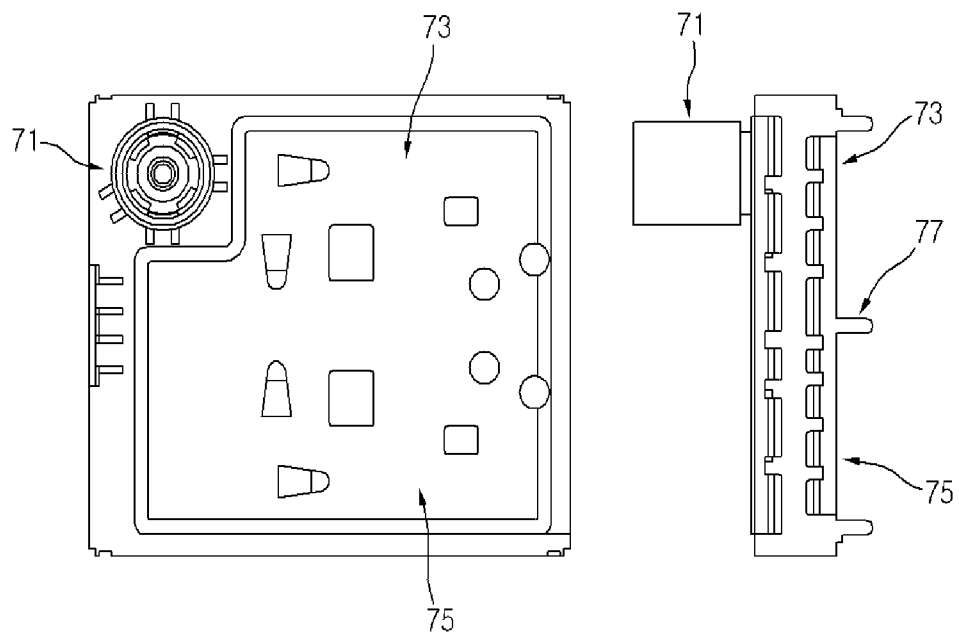
[Fig. 5]



[Fig. 6]



[Fig. 7]



A. CLASSIFICATION OF SUBJECT MATTER***H04N 5/50(2006.01)i***

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04N

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

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

eKIPASS(KIPO intranet) : tuner; main tuner; sub tuner; interface; PCB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6404309 B1 (HALL et al) 11 June 2002. See abstract; Claims 1-6.	1, 12
Y	KR 2007/0016459 (RYU JONG GI et al) 08 February 2007. See abstract; Claim 1, 3; Fig 2.	1, 12
Y	US 2007/0082637 A1 (NAM CHANG KAP) 12 April 2007. See abstract; Claim 1, 4, 11; Fig 2.	1, 12
A	KR 2006/0039785 (KWON KI HO) 09 May 2006. See abstract; Claims 1-5; Fig 3, 4.	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

03 DECEMBER 2008 (03.12.2008)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2008/003617

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6404309	11.06.2002	CN 1225157 C	26.10.2005
		CN 1335746 A	13.02.2002
		EP 1162869 A3	02.04.2008
		EP 1162869 A2	12.12.2001
		JP 2002-057589 A	22.02.2002
		KR 10-2001-0111017	15.12.2001
		PA 01005823 A	10.11.2004
KR 2007/0016459	08.02.2007	None	
US 2007-082637 A1	12.04.2007	None	
KR 20060039785 A	09.05.2006	None	