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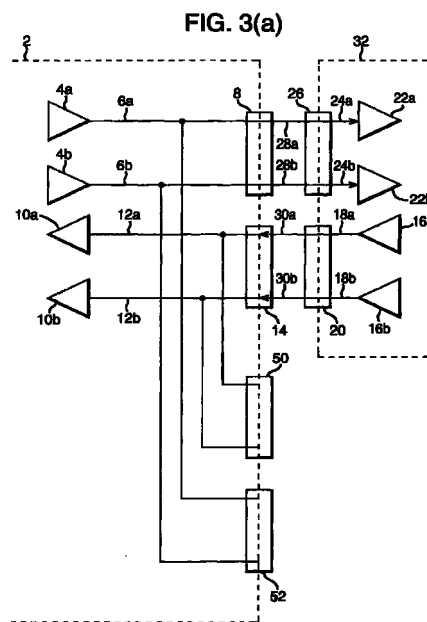
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(54) **Straight/cross connection using double connector**

(57) There is disclosed a connector arrangement having first and second adjacent connector terminals provided in first and second connector housings, a third connector terminal provided in a third connector housing adjacent the second terminal connected to the first terminal and a fourth connector terminal provided in a fourth connector housing between said second and third connector terminals and connected to the second terminal. Each of said first and third connector terminals comprise a plurality of connection points, respective ones of the plurality of connection points of the first and third connector terminals being connected. Each of said second and fourth connector terminals comprises a plurality of connection points, respective ones of the plurality of connection points of the second and fourth connector terminals being connected.



EP 1 006 625 A1

Description

Field of the Invention

[0001] The present invention relates to the provision of external connectors between equipment and particularly to such connectors where the connection between equipment may be either a straight connection or a cross connection.

Background to the Invention

[0002] In systems where separate modules are interconnected by common interface, typically external connectors are provided on each module to allow a cable to be provided to make a connection between the modules. In such systems the external connectors of each system may be similar, but the signals may need to be cross-connected rather than straight connected because the pinning of the connectors on the two modules to be interconnected is matched rather than reversed. In such situations, it is necessary to know whether the pinning of the connectors on the two modules are the same or reversed so that either a straight connector or a cross connector can be used as appropriate.

[0003] Typically such arrangements occur in network architectures, where a host may communicate with network terminals via a simple communications interface via a combined upstream and downstream link which is provided between the host equipment and network equipment via one metallic cable. Either a straight or cross-coupled cable will be used depending on the relative pinning of the connectors of the host and network equipment.

[0004] This arrangement has the disadvantage that two standard cables are required to make the necessary connections.

[0005] An alternative arrangement for providing a selection between cross or straight connection involves providing switching means in at least one of the two modules, wherein the outputs of the transmitter and the input to the receiver are swapped via a switch in dependence on whether the pinning of the connectors of the two modules is the same or reversed.

[0006] The disadvantage with this arrangement is that where a number of connections have to be made between two pieces of equipment, an array of switches is required to perform the necessary functionality, and the solution becomes expensive. It may also be possible that, as the number of necessary switches increases, the switching of the switches increases in complexity beyond a simple operation.

[0007] It is therefore an object of the present invention to provide an arrangement to select between straight connection and cross-connection between two devices which is efficient in terms of simplicity of use, cost, and space.

Summary of the Invention

[0008] According to the present invention there is provided a connector arrangement having first and second adjacent connector terminals and a third connector terminal adjacent the second terminal connected to the first terminal. Each of said first and third connector terminals may comprise a plurality of connection points, respective ones of the plurality of connection points of the first and third connector terminals being connected.

[0009] The connector arrangement may include a fourth connector terminal between said second and third connector terminals and connected to the second terminal. Each of said second and fourth connector terminals may comprise a plurality of connection points, respective ones of the plurality of connection points of the second and fourth connector terminals being connected.

[0010] The first, second, third or fourth connector terminals may be provided in first, second and third connector housings.

[0011] The first connector terminal may be connected to a transmitter and the second connector terminal connected to a receiver. The first connector terminal may be connected to a receiver and the second connector terminal connected to a transmitter.

[0012] The connector arrangement may be connected to another connector arrangement having the same connector terminal layout by a straight-wired cable connected to the first and second terminals. The connector arrangement may be connected to another connector arrangement having a reversed connector terminal layout by a straight-wired cable connected to the second and third terminals.

[0013] In use the connector arrangement may be connected to another connector arrangement having a reversed connector terminal layout by a straight-wired cable connected to the third and fourth terminals.

Brief Description of the Drawings

[0014]

Figure 1 illustrates a conventional cross-connector arrangement;

Figure 2 illustrates a conventional straight-connector arrangement; and

Figures 3(a) and 3(b) illustrate straight and cross-connector arrangements according to the invention.

Description of Preferred Embodiment

[0015] Figure 1 illustrates connection between host equipment and network equipment where connector pinning on both equipment is the same, and a cross-connection is required.

[0016] The host equipment 2 includes a pair of downstream transmitters 4a and 4b having outputs 6a

and 6b terminating in a connector 8. The host equipment 2 also includes a pair of upstream receivers 10a and 10b having inputs 12a and 12b received from a connector 14. The network equipment 32 includes a pair of upstream transmitters 16a and 16b having outputs 18a and 18b terminating in a connector 20. The network equipment 32 also includes a pair of downstream receivers 22a and 22b having inputs 24a and 24b from a connector 26.

[0017] In operation, it is required to connect the outputs of the downstream transmitters 4a and 4b to the inputs of the downstream receivers 22a and 22b by making a connection between the connectors 8 and 26. Similarly it is required to make a connection between the upstream transmitters 16a and 16b and the upstream receivers 10a and 10b by making a connection between the connectors 20 and 14. It can therefore be seen that a cross-connector must be provided between the connectors 8 and 14 of the host equipment and the connectors 20 and 26 of the network equipment.

[0018] The cross connector comprises connections 28a and 28b between the connectors 8 and 26 connecting the outputs of the downstream transmitters to the inputs of the downstream receivers. The cross connector also comprises connections 30a and 30b between the connectors 20 and 14 connecting the outputs of the upstream transmitters to the inputs of the upstream receivers.

[0019] Figure 2 illustrates connection between host equipment and network equipment where connector pinning on both equipment is adapted for cross-connection, and a straight-connection can be used. The same reference numerals are used in Figure 2 to illustrate elements corresponding to elements in Figure 1.

[0020] As can be seen in Figure 2, a straight connection is possible between the connectors 8 and 26 and the connectors 14 and 20.

[0021] From a comparison of Figures 1 and 2 it can be understood that depending on the relative pinning of the connectors in the host and network equipment either a straight or a cross connection is required. Cabling provides the connections 28 and 30, and thus either a straight wired cable or a cross-wired cable is used depending on the pinning arrangement. It will be appreciated that the cabling providing the connections 28 and 30 will be provided with end connectors to interface with the connectors 8, 14, 26, and 20 of the equipment.

[0022] Referring to Figure 3 there is shown an improved arrangement for providing the necessary functionality to select between cross or straight connection between equipment. As far as possible, like reference numerals are used in Figure 3 to refer to elements shown in previous Figures.

[0023] The arrangement of the downstream transmitters and upstream receivers of the host equipment in Figures 3(a) and 3(b) is identical to that shown in both

Figures 1 and 2. In addition the host equipment comprises two further connectors 50 and 52.

[0024] The network equipment 32 of Figure 3(a) corresponds to the arrangement of Figure 2, and the network equipment 32 of Figure 3(b) corresponds to the arrangement of Figure 1.

[0025] Referring to either of Figures 3(a) or 3(b), it can be seen that the connector 52 is provided, in addition to the connector 8, to terminate the outputs 6a and 6b of the downstream transmitters 3a and 3b. Thus the outputs 6a and 6b of the downstream transmitters may be accessed either from the connector 8 or the connector 52.

[0026] It can also be seen from referring to either of Figures 3(a) or 3(b) that the connector 50 is connected, in addition to the connector 14, to the inputs 12a and 12b of the upstream receivers 10a and 10b. Thus the inputs 12a and 12b to the upstream receivers may be provided either from the connector 14 or the connector 50.

[0027] In operation, if the pinning of the connectors of the host and network equipment is the same, then the network equipment is connected to the connectors 8 and 14 by a straight wire connector as shown in Figure 3(a) to achieve straight connection. If the pinning of the host and network equipment is crossed, then the network equipment is connected to the connectors 50 and 52 by the same straight wire connector as shown in Figure 3(b).

[0028] Alternatively, the network equipment of Figure 3(a) could be connected to the connectors 50 and 52 using a cross connection to achieve straight connection, and the network equipment of Figure 3(b) could be connected to the connectors 8 and 14 by the same cross-connector to achieve cross-connection.

[0029] This arrangement can be applied to any system that communicates to a system that has a similar interface of which it is not known if the connector on the other side is straight or cross connected. Typically this means that the arrangement can be used for any communication path that combines the upstream and downstream communication paths in one cable. Examples of these are the RS-232 interface and the ATM-25 interface. The arrangement is low cost, and easy to operate.

[0030] It will be appreciated that in the limits the invention may be used for upstream and downstream communication arrangements having a single channel in each direction, or having multiple channels in each direction.

[0031] It will also be appreciated that the invention may be implemented in either or both of two or more pieces of equipment which are provided with a similar communication link.

Claims

1. A connector arrangement having first and second adjacent connector terminals and a third connector

terminal adjacent the second terminal connected to the first terminal.

fourth terminals.

2. The connector arrangement of claim 1 further including a fourth connector terminal between said second and third connector terminals and connected to the second terminal. 5
3. The connector arrangement of claim 1 or claim 2 in which each of said first and third connector terminals comprise a plurality of connection points, respective ones of the plurality of connection points of the first and third connector terminals being connected. 10
4. The connector arrangement of claim 2 or claim 3 in which each of said second and fourth connector terminals comprises a plurality of connection points, respective ones of the plurality of connection points of the second and fourth connector terminals being connected. 15 20
5. The connector arrangement of any preceding claim wherein the first, second and third connector terminals are provided in first, second and third connector housings. 25
6. The connector arrangement of any one of claims 2 to 5 wherein the fourth connector terminal is provided in a fourth connector housing. 30
7. The connector arrangement of any preceding claim in which the first connector terminal is connected to a transmitter and the second connector terminal is connected to a receiver. 35
8. The connector arrangement of any preceding claim in which the first connector terminal is connected to a receiver and the second connector terminal is connected to a transmitter. 40
9. The connector arrangement of any preceding claim wherein the connector arrangement is connected to another connector arrangement having the same connector terminal layout by a straight-wired cable connected to the first and second terminals. 45
10. The connector arrangement of any preceding claim wherein the connector arrangement is connected to another connector arrangement having a reversed connector terminal layout by a straight-wired cable connected to the second and third terminals. 50
11. The connector arrangement of any one of claims 2 to 10 wherein in use the connector arrangement is connected to another connector arrangement having a reversed connector terminal layout by a straight-wired cable connected to the third and 55

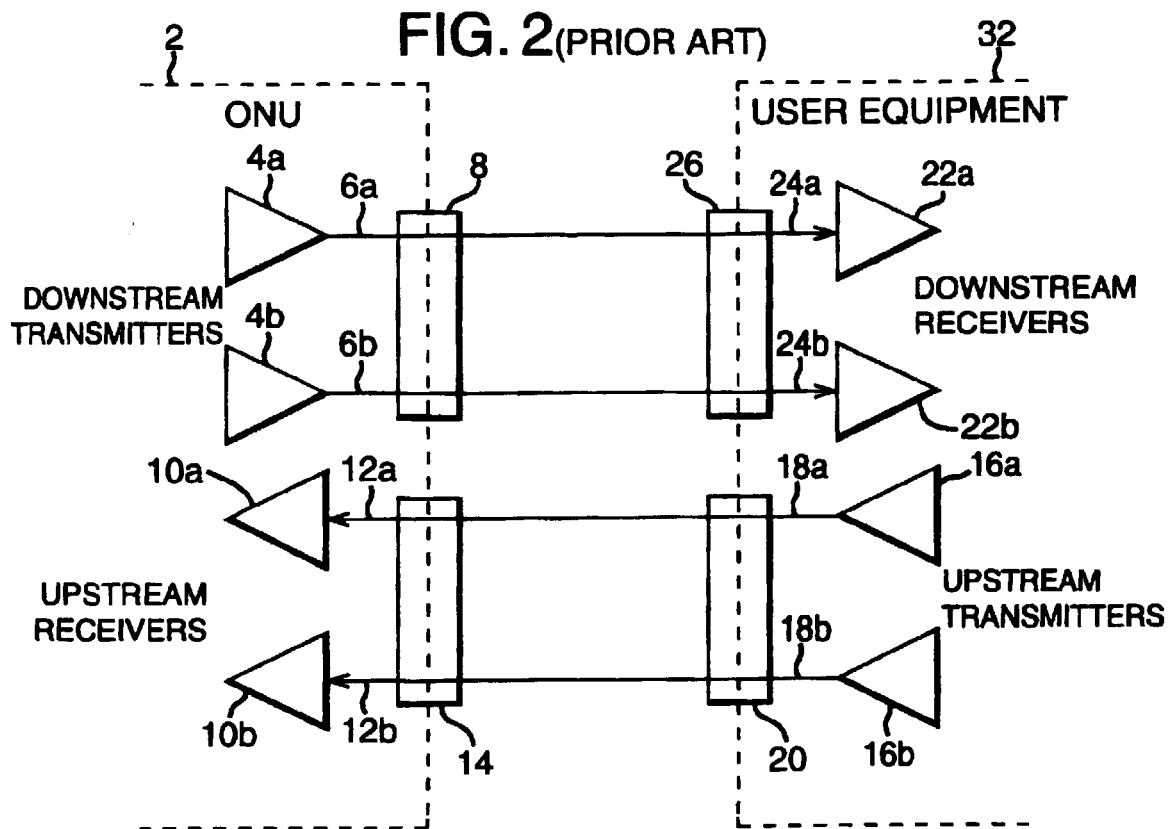
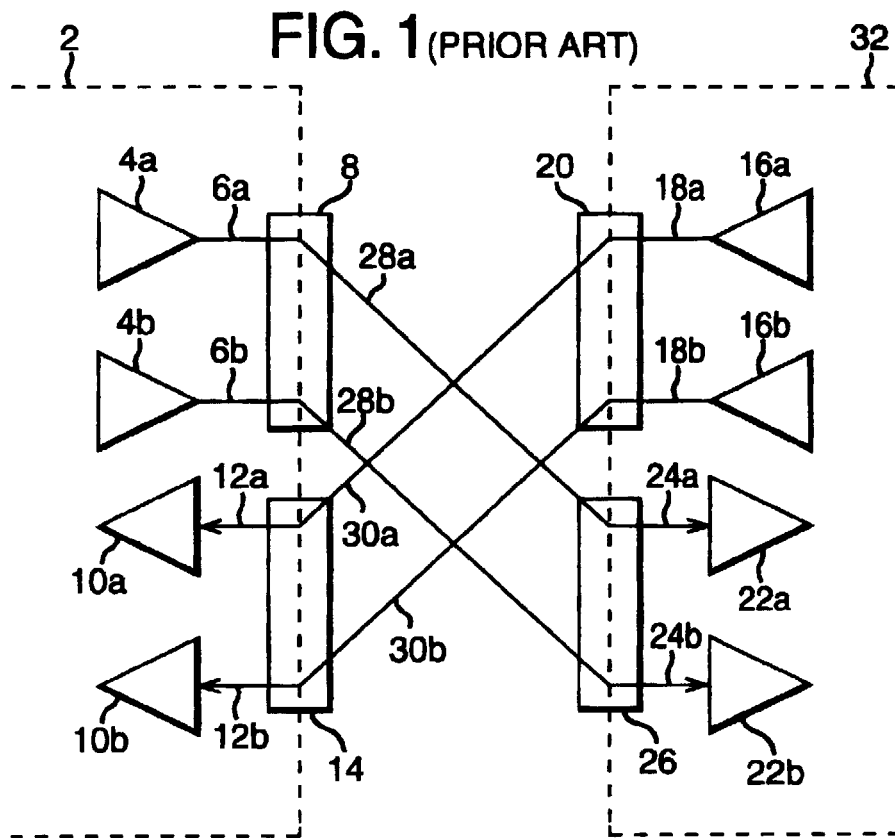


FIG. 3(a)

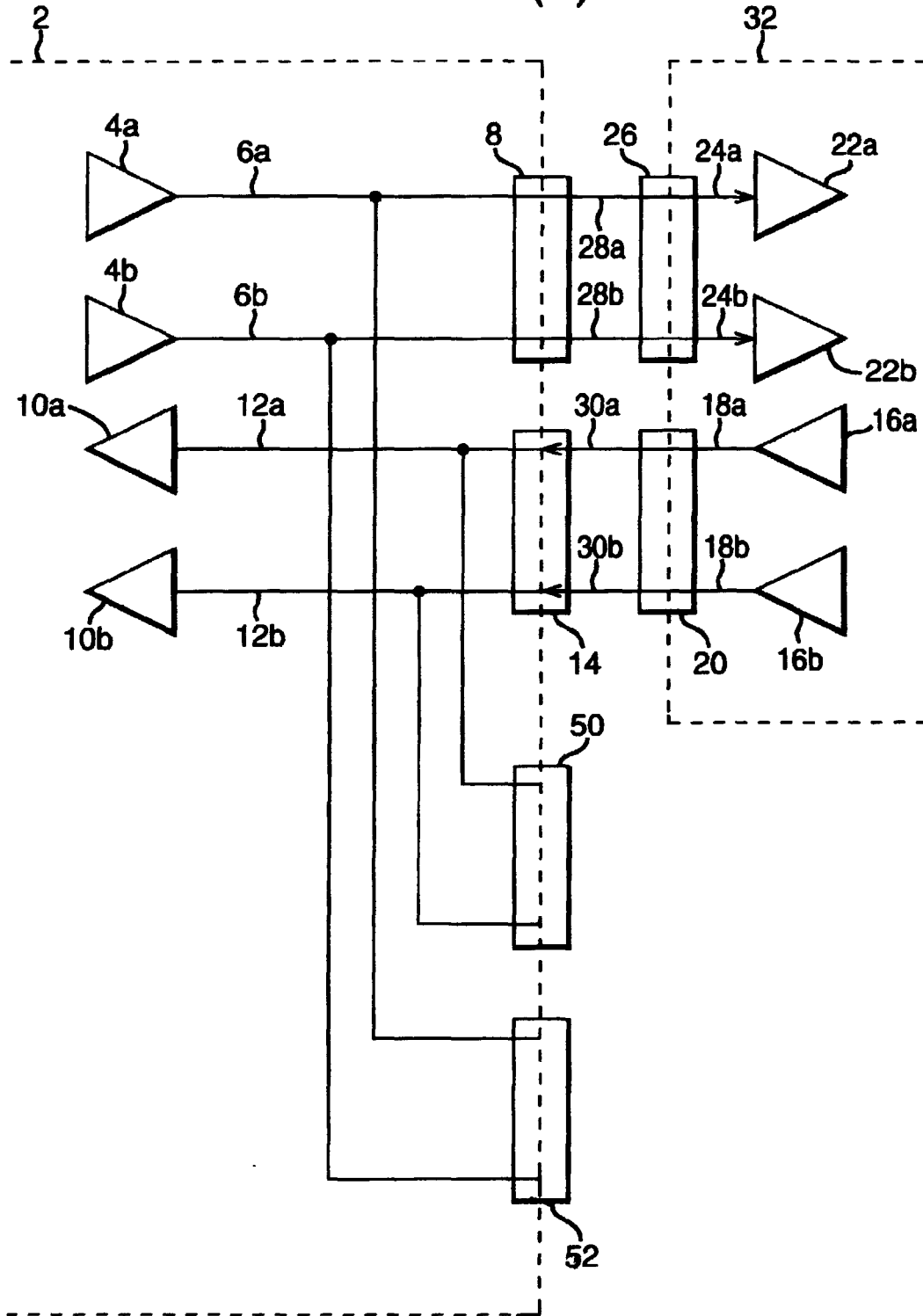
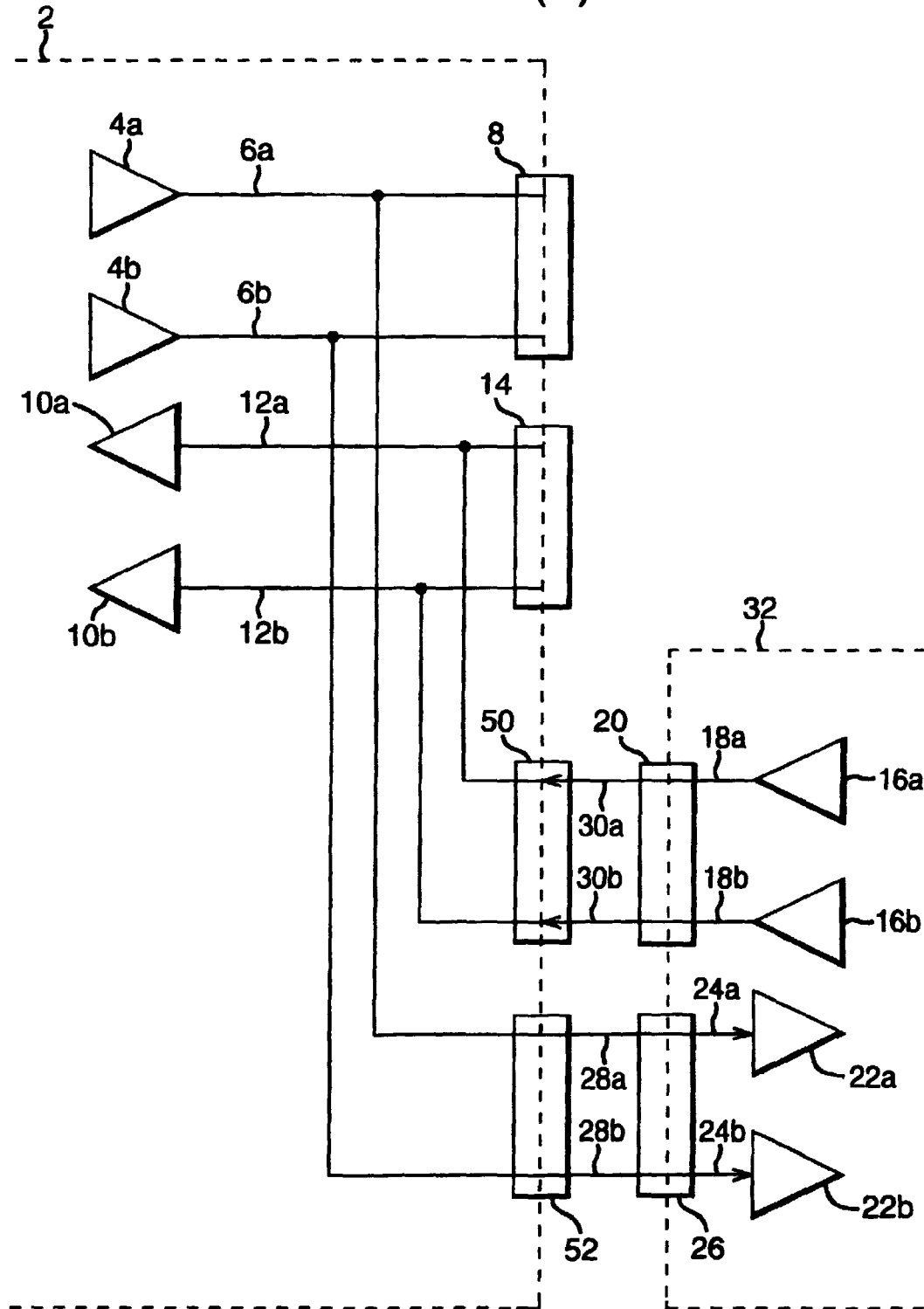


FIG. 3(b)





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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 9990

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 98 48487 A (MINITRONICS PTY LTD ;SHANNON HAROLD JOHN (AU); URBANCZYK JANUSZ (A) 29 October 1998 * page 1, line 18 - page 2, line 8; figures 5C,5D *	1-11	H01R27/00
A	GB 2 292 485 A (MCDONELL MICHAEL WILLIAM) 21 February 1996 * page 1, line 3 - line 28; figure 2 *	1-11	
A	US 5 666 408 A (LAO KENNETH Q) 9 September 1997 * column 3, line 56 - column 4, line 11; figures 4,5 *	1-11	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 April 1999	Examiner Criqui, J-J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 30 9990

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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29-04-1999

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