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(54) **Electrical connector for printed circuit board.**

(57) A disengageable electrical connector for connecting a printed circuit board 504 to a back plane 502. A block 501 has a plurality of connections 510, 511 embedded in it, arranged in a plurality of tiers. This block is bolted at 503 to the back plane to form pressure contact with contacts 507, 508. A retaining bar 509 is fixed to the block 501 by bolts 512, with spacers 514 defining a fixed gap, so that the card 504 can be slid into the gap to form sliding contact with contacts 505, 506.

This arrangement avoids the use of connector pins on the back plane (as with known edge-on and plug-on connectors), which are difficult to repair or replace, but allows the card to be easily removed, unlike the known pressure-pressure connectors.

The retaining bar may be a connection block similar to block 501.

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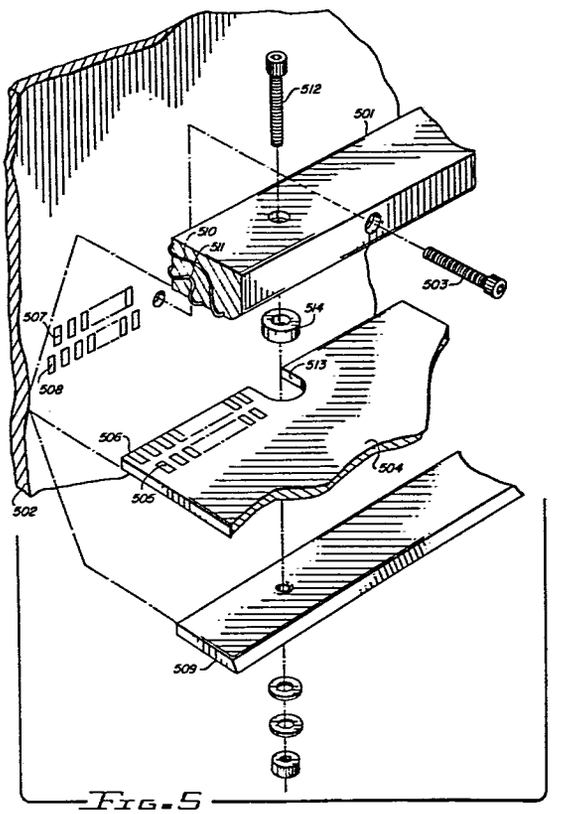

FIG. 5

ELECTRICAL CONNECTOR FOR PRINTED CIRCUIT BOARD

This invention relates to electrical connectors for printed circuit boards, for connecting a printed circuit board or card to a back plane.

Various types of connectors for this purpose are known. The most common is the edge-on connector. The edge of the card has two rows of contacts, on the top and bottom surfaces, formed on it, and the connector is a long block having a slot with two rows of contacts inside it which make connections to the contacts on the card when the card is pushed into the slot. The connector is bolted onto the back plane, with its contacts extending through the back plane as connection pins which are connected to the back plane by soldering each pin to its respective location on the back plane. The pins of the various connectors soldered to the back plane are then interconnected by individual wires. The resulting wiring on the back plane is often quite congested.

It is observed that the edge-on connector requires an edge of the associated printed circuit card to serve as a male type connector, with the edge-on connector serving as the female connector.

The edge-on connector, while quite popular, has several drawbacks. First, repair or replacement of a damaged connector pin can be a very difficult and time consuming task, due to the often congested wiring on the back plane. In addition, the fact that the individual pins of the edge-on connector are soldered in place on the back plane further complicates this task.

A second drawback of the edge-on connector is the fact that any one edge-on connector type is restricted to accomodating printed wiring cards of a fixed thickness. A variation in the thickness of a printed wiring card, as a result in a variation of the number of individual layers of printed wire runs on the printed wiring card, requires edge-on connectors of varying sizes.

Another known connector is the plug-on connector. This consists of two parts: a male portion mounted on the card, and a female portion mounted on the back plane. The male portion has one or more rows of L-shape pins in a mounting block, with one end of each pin sticking through the card and the other ends of the pins projecting from the block. The female portion has a set of sockets to receive the projecting pins of the male portion, the sockets having extensions which pass back through the back plane as connection pins like those of the edge-on connector.

This connector suffers from the same disadvantages as the edge-on connector with respect to repair or replacement of the connection pins. In addition, the plug-on connector involves two portions, and is therefore more expensive than the edge-on connector.

The problem of repairing or replacing damaged connector pins has been overcome by a further known type of connector, the pressure-pressure connector. This comprises a single block containing a row of U-shaped connectors placed with the major axis of the U extending along the diagonal of the cross-section of the block and the two bottom corners of the U exposed at two adjacent side faces of the block. The card and the back plane are each formed with a row of connection points, and the connector block is bolted to the card and to the back plane to bring the exposed corners of the U's in contact with the connection points.

As this system does not involve the provision of any pins on the back plane, the risk of pin damage and the consequent difficulty of pin repair which existed with the edge-on and plug-on connectors no longer exists. However, since the pressure-pressure connector has to be bolted rigidly to both the card and the back plane, removal of the card from the back plane becomes difficult.

The object of the present invention is to provide a connector in which the use of connection pins on the back plane is avoided yet the card can be removed easily from the connector.

Accordingly the present invention provides a disengageable electrical connector for connecting a set of contacts on a printed wiring card to a corresponding set of contacts on a back plane, characterized in that it comprises a connector block of rectangular section having a plurality of connections embedded in it and each having two exposed portions, one on each of two adjacent faces of the block, means for fixing the block with one of said adjacent faces to the back plane to form pressure contact therewith, and retaining means spaced adjacent to the other of said adjacent faces to form a slot into which the printed wiring card can be slid to form sliding contact with the block.

Three known connectors and two connectors embodying the present invention will now be described, by way of exmaple, with reference to the drawings in which:

Figure 1 is a perspective view of a known edge-on connector and an associated printed wiring card.

Figure 2 is a side view of the edge-on connector of Figure 1 fixed to a back plane.

Figure 3 is a side view of a known plug-on type connector fixed to a printed wiring card adjacent to a back plane.

Figure 4 is a side view of a known pressure-pressure type connector fixed to a printed wiring card and a back plane.

Figure 5 is a perspective view of a connector embodying the present invention fixed to a back plane and providing electrical connections to one side of a printed wiring card.

Figure 6 is a perspective view of a connector embodying the present invention fixed to a back plane and providing electrical connections to both sides of a printed wiring card.

Figure 7 shows a portion of an edge of printed wiring card with a double tier of offset electrical connections.

Figure 1 shows a conventional edge connector. A card 102 has an edge 101 with contacts 103 arranged along it on

both sides. The edge 101 fits in a housing 104 having a slot 106 with contacts shown generally as 105 in the slot. Figure 2 is an end, partially sectional view of the housing 104. The long sides 201 of the housing have contacts 203 fixed in them, and these contacts extend through the rear of the housing and the back plane 204 to project as connection pins 202. The housing is bolted to the back plane by nuts and bolts 205 at its ends.

The edge-on connector can provide connections to one or both sides of a card, and the pins 203 can be made individually removable from the housing 201 for repair and replacement. The sliding contact interface between the connector and the card allows the card to be installed or removed quickly and relatively easily.

Figure 3 is a cross-section of a plug-in connector. The male portion 301 is mounted on the card 302, and contains two rows of connecting pins 305. The female portion 303 is mounted on the back plane 306, and the sockets which receive the pins 305 extend through the back plane as connection pins 304, analogous to the connection pins of the edge-on connector. The plug-on connector is typically restricted to being mounted on one side of the card 302. The use of individual connection pins, in place of the linear portion of the card edge with the edge-on connector, and the possibility of using a plurality of rows of pins, allows a higher density of connections per linear cm than the edge-on connector. It is however more expensive than the edge-on connector, as it involves two separate parts 301 and 303.

Figure 4 is a cross-section of a pressure-pressure connector. The block 406 contains a row of U-shaped connectors 403 which contact connection points 404 on the card 401 and 405 on the back plane 402. The block 406 is bolted rigidly to both the card 401 and the back plane 402 by bolts 407, 408 to ensure good electrical contacts.

Figure 5 is a partial view of a connector embodying the invention. Connector 501 is fixed to back plane 502 by

a bolt 503, and connects points 505, 506, etc., on printed wiring card 504 with points 507, 508, etc., respectively on back panel 502. A connector retaining bar 509 functions to aid in retaining printed wiring card 504 in position adjacent to connector 501, and is secured in place by a bolt 512 passing through connector 501 and retaining bar 509, and through a slot 513 in printed wiring board 504. A spacer 514 defines the desired distance between connector 501 and retaining bar 509 for the appropriate thickness of printed wiring board 504.

Several points may be noted regarding this connector. First, the connection interface between connector 501 and printed wiring card 504 is a sliding interface, i.e., electrical connections are made between connector 501 and printed wiring card 504 when printed wiring card 504 is slid into place between connector 501 and connector retaining bar 509, thereby bringing connection pins 501 and 511 of connector 501 into electrical contact with the desired connection points 505 and 506 on printed wiring card 504.

Second, the electrical connection interface between connector 501 and back panel 502 is a pressure interface, i.e., the back panel terminal points 507 and 508 and connection pins 510 and 511 of connector 501 are held in pressure contact by the bolt 503. Consequently, connector 501 furnishes an electrical interface between printed wiring card 504 and back panel 502 without the necessity of connector 501 connection pins being soldered to back panel 502. By so providing for a pressure interface with the back panel, the very difficult practical problem of dealing with the ramifications of damaged connector pins on the back panel has been eliminated.

Also, connector 501 is physically fixed to only the back plane and the associated retaining means, retaining bar 509. Connector 501, while providing a sliding interface to printed wiring card 504, does not require a physical mounting to printed wiring card 504, as was required with the

pressure-pressure connector illustrated in Figure 4. Consequently, printed wiring card 504 is easily removable from connector 501.

Figure 6 shows a second connector embodying the present invention and providing electrical connections to both sides of the printed wiring card. The card 601 has connector blocks 603 and 604 positioned on opposite sides adjacent to back panel 602.

The present connectors offer the capability of providing electrical connections to either or both sides of a card, independently of the thickness of the card. The feature is particularly significant where the thickness of the printed wiring cards may vary due to differing numbers of layers of printed wiring present on printed wiring cards. With the present connectors, variations in board thicknesses do not seriously affect the use of the connector, as would be the case with the edge-on connector. On the contrary, the same connector can be used, with adjustment of only the connector-to-connector distance to reflect the change in thickness of the printed wiring card. This function is accomplished by the spacers 609 which define the desired distance between connectors 603 and 604 for the appropriate thickness of printed wiring board 601. Consequently, the same connector can be used, to provide electrical connections to one or both sides of printed wiring cards of varying thicknesses.

The present connectors can also accomodate offset multiple tiers of electrical contacts on the sliding electrical contact interface with the printed wiring card.

Figure 5 shows connector employing an offset double tier 510 and 511 of electrical contacts. Figure 6 shows a connector employing offset double tiers of connections 605, 606 and 607, 608 to provide electrical connections to both sides of printed wiring board 601. The offset between adjacent tiers of electrical connection points is preferably half the distance between adjacent electrical connection

points, as shown in Figure 7, which illustrates a portion of one edge of a printed wiring board for use with the present connectors.

The connective elements 510 and 511 shown in Figure 5 between the printed wiring card 504 and the back plane 502 are preferably solid metal connectors.

CLAIMS

1. A disengageable electrical connector for connecting a set of contacts (505,506) on a printed wiring card (504; 601) to a corresponding set of contacts (507, 508) on a back plane (502; 602), characterized in that it comprises a connector block (501;603, 604) of rectangular section having a plurality of connections (510,511, 605,606) embedded in it and each having two exposed portions, one on each of two adjacent faces of the block, means (503) for fixing the block with one of said adjacent faces to the back plane to form pressure contact therewith, and retaining means (509; 604) spaced adjacent to the other of said adjacent faces to form a slot into which the printed wiring card can be slid to form sliding contact with the block.
2. A connector according to Claim 1, characterized in that the connections in the connector block are arranged in a plurality of tiers.
3. A connector according to either of Claims 1 and 2, characterized in that the retaining means is a bar (509) fixed to the block by spacers (514).
4. A connector according to either of Claims 1 and 2, characterized in that the retaining means is a block (604) as defined in the parent claim.

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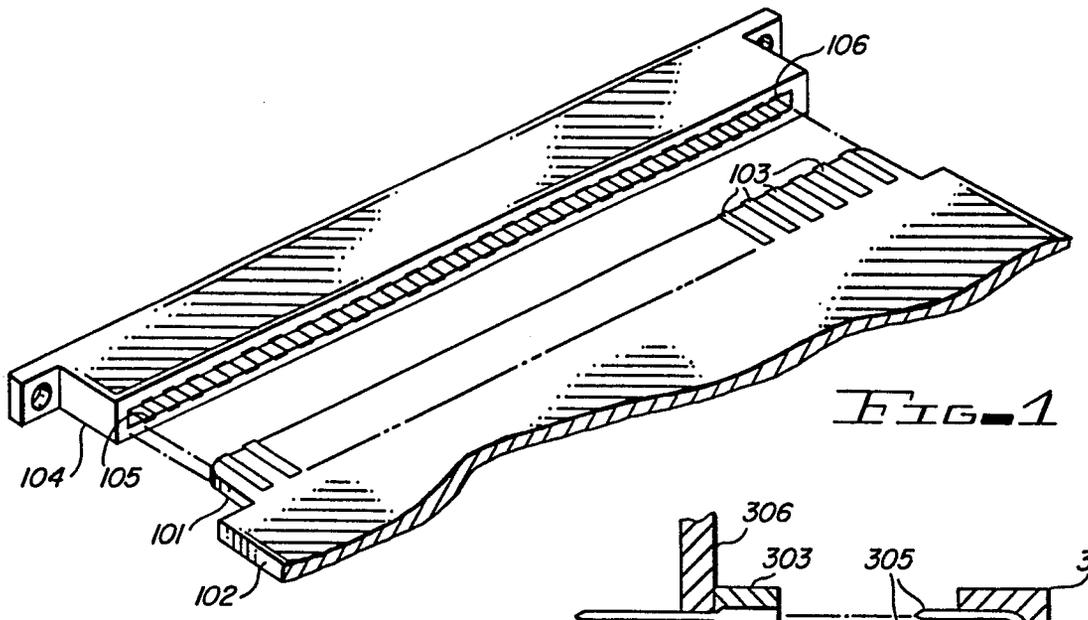

Fig-1

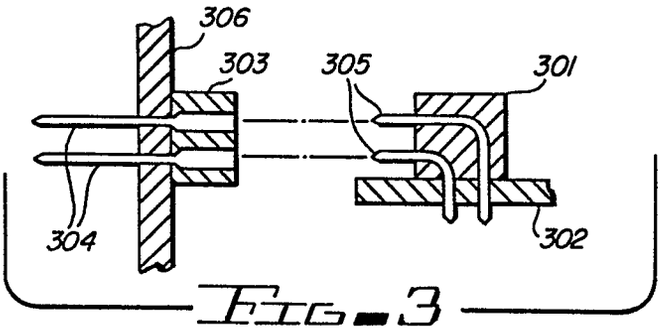

Fig-3

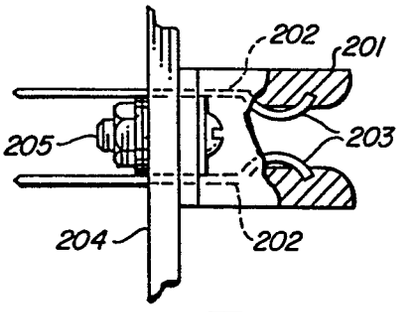

Fig-2

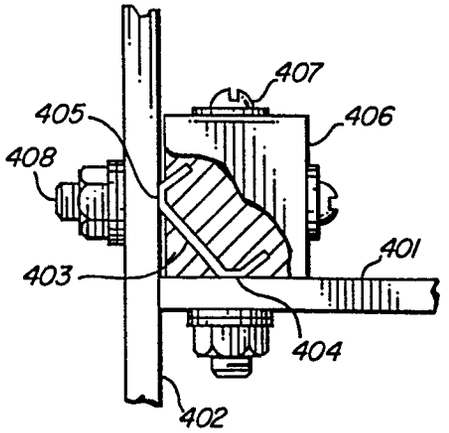

Fig-4

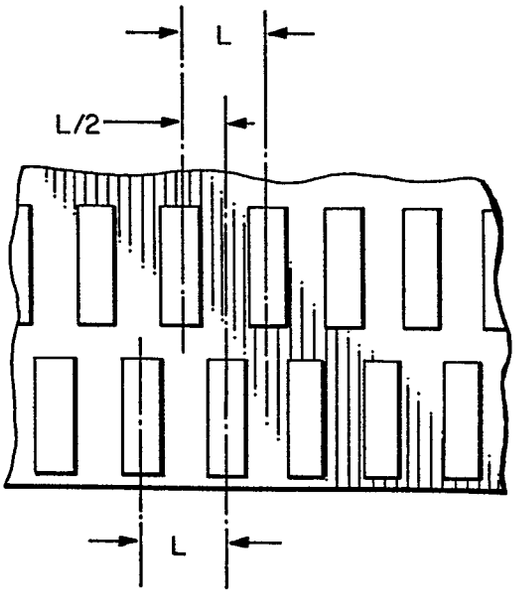

Fig-7

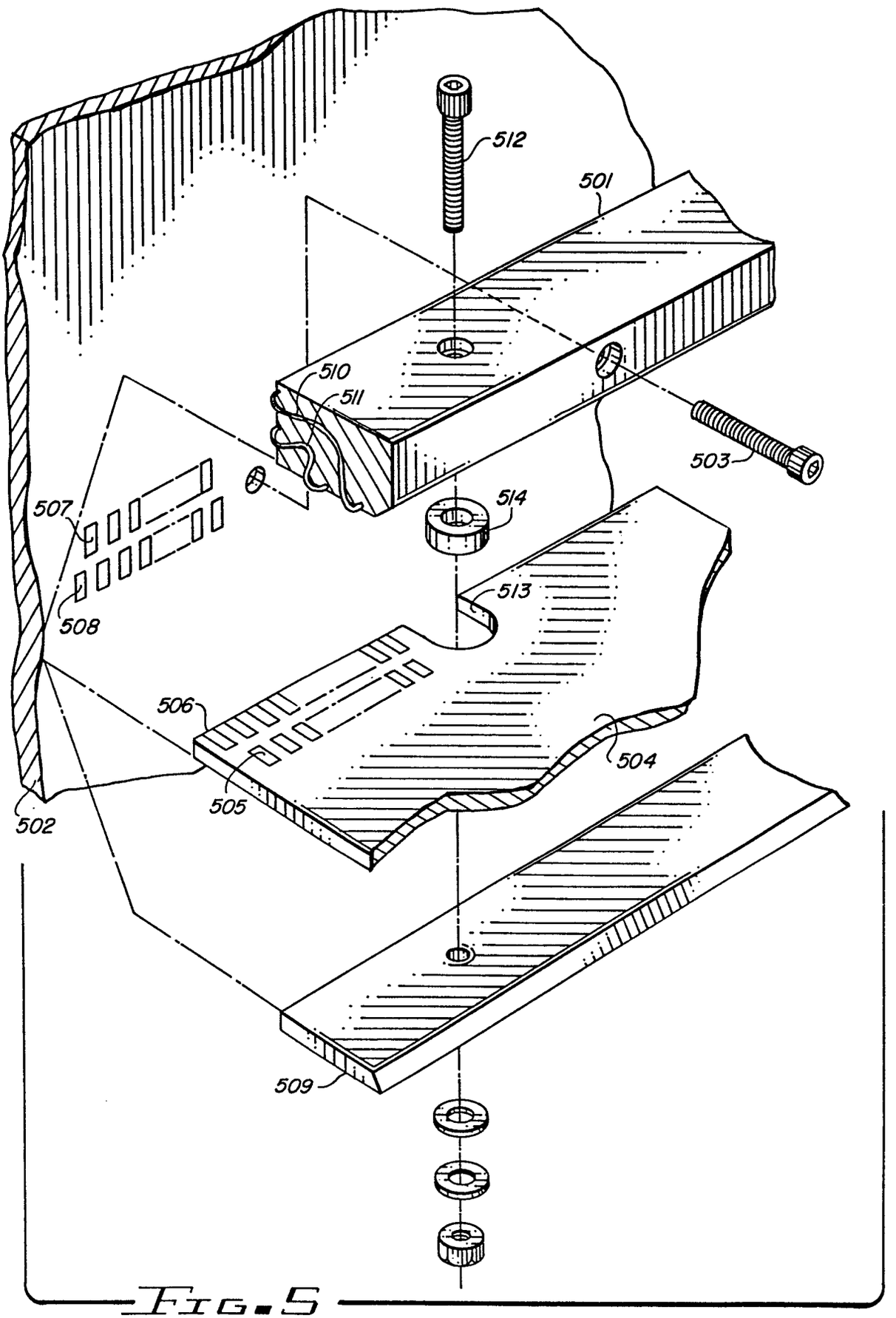

FIG. 5

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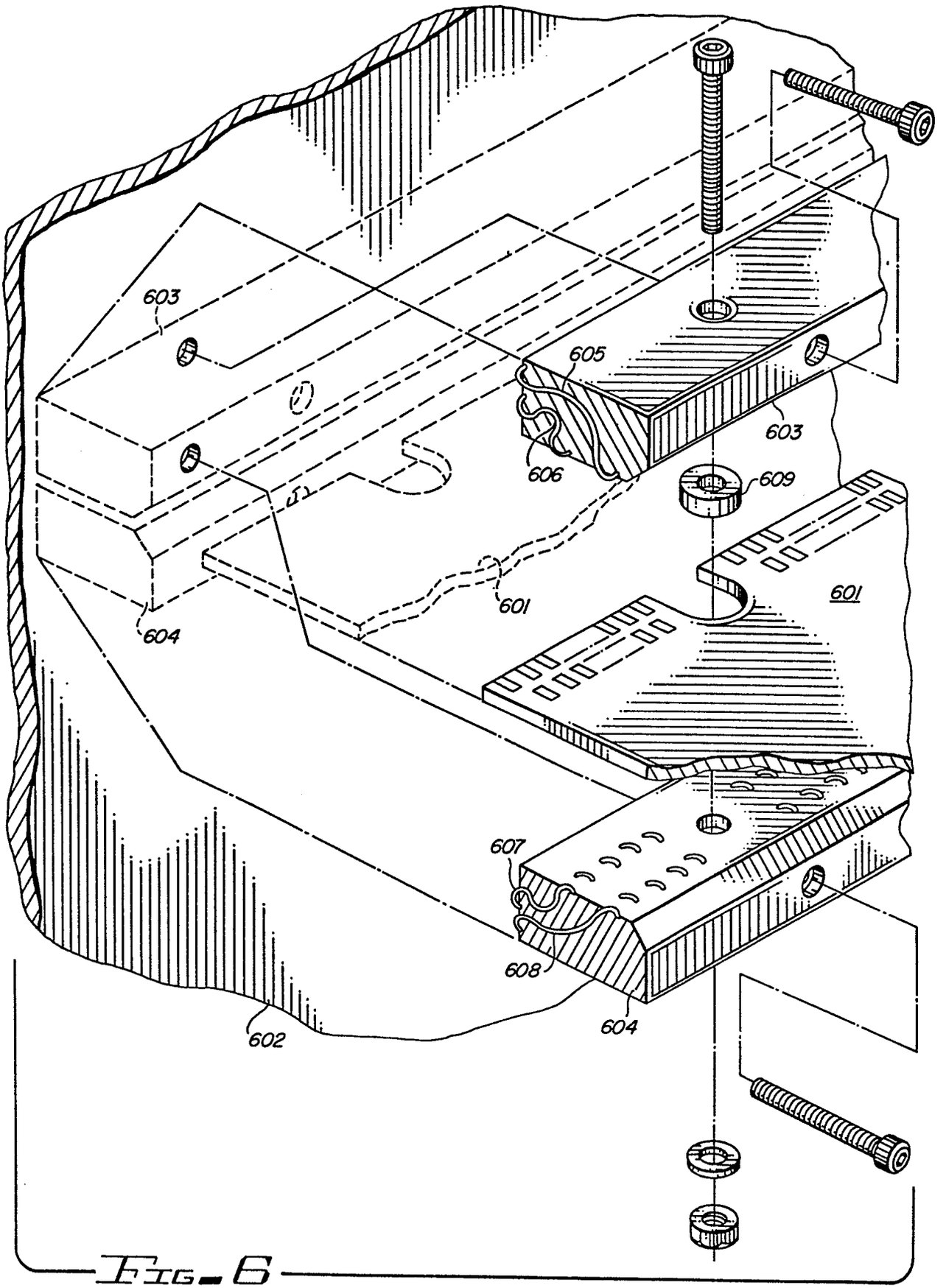

FIG. 6

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European Patent Office

Application number

EP 82 30 3511

EUROPEAN SEARCH REPORT

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. ³)
X	FR-A-1 324 810 (BROWN ENGINEERING) * Figures 1,2; page 1, column 2, line 32 - page 2, column 1, line 24 *	1	H 01 R 23/72
X	US-A-3 290 636 (NORTHERN ELECTRIC) * Figures 8-10; column 3, lines 25-49 *	1	
A	FR-A-2 156 574 (TELEDYNE) * Figures 6,8; page 6, line 10 - page 7, line 8 *	1	
A	US-A-3 762 040 (WESTERN ELECTRIC) * Figure 1; column 2, line 44 - column 3, line 2 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	US-A-2 942 229 (RCA) * Figure 1; column 2, lines 3-37 *	1	H 01 R 13/00 H 01 R 23/00
A	US-A-3 795 037 (I.C.L.) * Figure 9; column 3, lines 2-24 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-10-1982	WAERN G.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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