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(71) Applicant: **FRAMATOME CONNECTORS INTERNATIONAL**
92084 Paris La Défense cedex (FR)

(72) Inventor: **Potters, Paul, Johannes, Fokke**
5618 Eindhoven (NL)

(74) Representative:
de Vries, Johannes Hendrik Fokke
De Vries & Metman
Overschiestraat 180
1062 XK Amsterdam (NL)

(54) Connector

(57) A connector comprises a housing of insulating material and a plurality of contact elements. The housing has a plurality of channels for accommodating a contact element and a reference face. Each contact element is provided with a contact end, an intermediate part with a length direction and a connection end, wherein the connection end has a connection surface for a surface mount connection to a contact pad of a printed circuit board. At at least a part of the contact elements the connection surface is movable with respect to the reference face of the housing between a mounting starting position and an end position. The connection end of the contact elements extends mainly in the length direction of the intermediate part. Each contact element with movable connection surface is mounted in the corresponding channel such that the connection end is movable mainly transverse to the length direction of the intermediate part. Each movable contact element is supported in the corresponding channel in a pivotable manner, wherein the pivot is located near the contact end of the contact element.

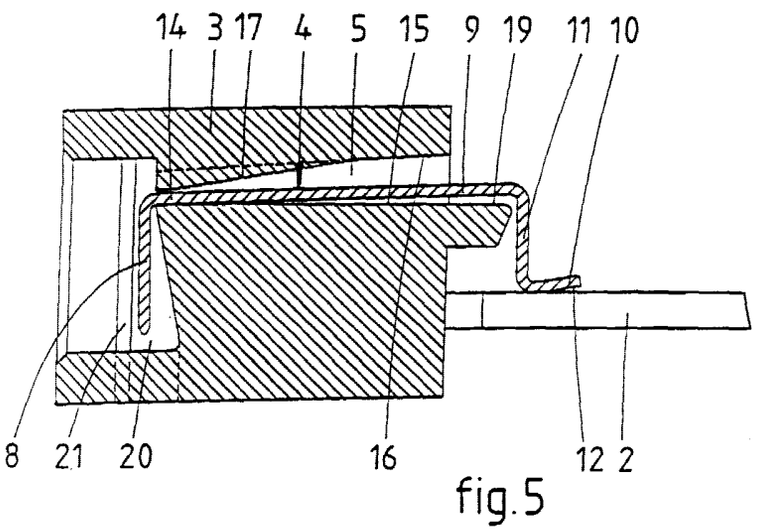

fig.5

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Description

[0001] The invention relates to a connector, comprising a housing of insulating material and a plurality of contact elements, the housing having a plurality of channels for accommodating a contact element, and a reference face, each contact element having a contact end, an intermediate part with a length direction and a connection end, wherein the connection end has a connection surface for a surface mount connection to a contact pad of a printed circuit board, wherein at at least a part of the contact elements the connection surface is movable with respect to the reference face of the housing between a mounting starting position and an end position.

[0002] A connector of this type is shown in US-A-5 788 515. In this known connector the contact elements are mounted slidably in the length direction in the channels of the housing to provide the movability of the connection surfaces. The connector is supported on the printed circuit board through the connection surfaces of the contact elements, wherein the reference face is provided by the bottom surface of the housing. The movability of the connection surfaces allows a compensation for a varying distance between the connection ends of the contact elements and the corresponding contact pads of the printed circuit board. Such varying distance is caused for example by a curvature of the printed circuit board, manufacturing tolerances in manufacturing the connector, and the like. The movability of the connection surfaces provides for a coplanarity of these connection surfaces when the connector is mounted on the printed circuit board.

[0003] Although the design of the connector of US-A-5 788 515 may provide a satisfactory solution in case of the connectors of the type described in this document, the slidable mounting of the contact elements could cause problems in other types of connectors, in particular in case of miniaturised connectors and/or connectors with butt-mount contact ends. Connectors of this latter type are used for example as input/output connector in mobile telephones.

[0004] The invention aims to provide a connector of the above-mentioned type having a design which is in particular suitable for very low connector sizes and/or for connectors with contact elements having butt-mount contact ends.

[0005] To this end the connector of the invention is characterized in that the connection end of the contact elements extends mainly in the length direction of the intermediate part, wherein each contact element with movable connection surface is mounted in the corresponding channel such that the connection end is movable mainly transverse to the length direction of the intermediate part, wherein each movable contact element is supported in the corresponding channel in a pivotable manner, wherein the pivot is located near the contact end of the contact element.

[0006] In this manner a connector is obtained, wherein the contact end of the contact element will substantially not move during movement of the connection end. The correct contact position of the contact end is guaranteed while coplanarity of the connection surfaces is guaranteed by means of the movability of the connection ends. Pivoting of the contact element around a pivot near the contact end will result in a substantially stationary contact end while the connection end can move along a relatively large distance.

[0007] The invention will be further explained by reference to the drawings in which an embodiment of the connector of the invention is schematically shown.

[0008] Fig. 1 shows a top view of an embodiment of the connector of the invention as mounted on a printed circuit board.

[0009] Fig. 2 is a front view of the connector of fig. 1.

[0010] Fig. 3 shows a cross-section according to the line III-III in fig. 2 before mounting the connector on the printed circuit board.

[0011] Fig. 4 shows a side view of the connector of fig. 1 before mounting the connector on the printed circuit board.

[0012] Fig. 5 and 6 are a cross-section and side view corresponding to figs. 3 and 4, respectively, after mounting the connector on the printed circuit board.

[0013] Figs. 1 and 2 show top and front views of a connector 1 mounted on a printed circuit board 2. The connector 1 comprises a housing 3 of insulating material and a plurality of contact elements 4. As can be seen in figs. 2 and 3, the housing 3 is provided with a plurality of channels 5 for accommodating a contact element 4. At opposite sides the housing 3 is provided with a mounting part 6 which can be made of metal for example. The mounting parts 6 have a lower mounting face 7 which is attached to the upper surface of the printed circuit board as shown in the drawings to fix the connector on the printed circuit board. The mounting faces 7 of the mounting parts 6 determine a reference face of the housing 3.

[0014] Each contact element comprises a contact end 8, an intermediate part 9 and a connection end 10, wherein a bent section 11 is provided between the intermediate part 9 and the connection end 10. The connection end 10 is provided with a connection surface 12 which is adapted to be connected to a contact pad 13 of the printed circuit board 2 by means of a surface mount technique. It is noted that as shown in figs. 3-6, in particular, the connection end 10 extends mainly in the length direction of the intermediate part 9, wherein however the connection surface 12 is not parallel to the contact pad 13.

[0015] In the connector shown in the drawings, the connection surfaces 12 of the connection ends 10 are movable mainly transverse to the length direction of the intermediate part 9, wherein this movability of the connection surfaces is obtained by supporting the contact elements 4 in a pivotable manner in the corresponding channels 5. The pivot 14 of the contact element 4 is lo-

cated near the contact end 8. In this manner the stroke of the connection surface 12 is relatively large, whereas the contact end 8 is substantially stationary. In the embodiment shown the pivotable support of the contact elements 4 is obtained by a special design of the channels 5 of the housing 3. As can be seen in figs. 3 and 5 showing cross-sections before and after mounting the connector 1 on the printed circuit board 2, respectively, each channel 5 is provided with a bottom wall 15 and a top wall 16, wherein the top wall 16 is provided with a ledge 17 extending obliquely downwardly from the connection end 10 towards the contact end 8. The height of the channel 5 at the connection end 10 is much larger than the height or thickness of the contact element 4, while the height of the channel near the contact end 8 substantially corresponds to the thickness of the contact element. In this manner the narrow passage of the channel 5 near the contact end 8 determines the pivot 14 of the contact element, while the size of the passage at the connection end 10 allows upward pivoting of the contact element. Moreover, the contact elements 4 are freely pivotable without deformation of the contact elements.

[0016] The bottom walls 15 of the channels 5 determine a common reference plane for supporting the contact elements 4 before mounting the connector 1 on the printed circuit board, wherein at the side of the housing 3 near the connection ends 10 the housing 3 is provided with an extension 18 having an upper surface 19 coplanar with the bottom walls 15 of the channels 5. In the embodiment shown, the contact end 8 and the bent section 11 both extend mainly transverse to the length direction of the intermediate part 9, wherein the length of this intermediate part is slightly larger than the overall length of the bottom wall 15 and the joining upper surface part of the extension 18. In this manner a little clearance in the length direction of the intermediate part 9 is provided for the contact elements 4 as shown by a double arrow in fig. 3.

[0017] As shown in fig. 4, the distance d between the reference face 7 and the lower end of the connection surface 12 allows to absorb any curvature of the printed circuit board between the two mounting parts 6 and any manufacturing tolerances resulting in a varying level of the connection surfaces 12 when they are supported by the bottom walls 15 of the channels 5. In fig. 5 and 6 the contact element 4 is shown with lifted connection surface 12, wherein the distance along which the connection surface is lifted depends on the curvature and manufacturing tolerances. Although the connection surface 12 of the connection elements 4 may have moved, the pivot movement of the contact elements 4 will not cause a significant movement of the contact ends 8 in the length direction, so that an accurate butt-mount contacting with the contact elements of a connector inserted into the connector 1 shown is guaranteed.

[0018] As can be seen in figs. 2, 3 and 5, the housing 3 is provided with a plurality of chambers 20 at the front side, wherein these chambers 20 are separated from each other by intermediate ribs 21 of insulating material. The width of a chamber 20 between the ribs 21 corresponds to the width of the contact end, so that rotation of the contact elements 4 is prevented.

[0019] The invention is not restricted to the above described embodiment which can be varied in a number of ways within the scope of the claims.

Claims

1. Connector, comprising a housing of insulating material and a plurality of contact elements, the housing having a plurality of channels for accommodating a contact element and a reference face, each contact element having a contact end, an intermediate part with a length direction and a connection end, wherein the connection end has a connection surface for a surface mount connection to a contact pad of a printed circuit board, wherein at at least a part of the contact elements the connection surface is movable with respect to the reference face of the housing between a mounting starting position and an end position, characterized in that the connection end of the contact elements extends mainly in the length direction of the intermediate part, wherein each contact element with movable connection surface is mounted in the corresponding channel such that the connection end is movable mainly transverse to the length direction of the intermediate part, wherein each movable contact element is supported in the corresponding channel in a pivotable manner, wherein the pivot is located near the contact end of the contact element.

2. Connector according to claim 1, wherein each channel is provided with bottom and top walls, wherein the bottom walls of the channels determine a common reference plane for supporting the contact elements before mounting on a printed circuit board, wherein the top walls are made such that the height of a channel near the contact end of the contact element substantially corresponds with the height of the contact element to determine the pivot of the contact element, while the height of a channel near the connection end of the contact element is greater than the height of the contact element to allow pivoting of the contact element towards the top wall.

3. Connector according to claim 2, wherein at least a part of the top wall of a channel extends obliquely downwardly from the connection end towards the contact end of the corresponding contact element.

4. Connector according to claim 2 or 3, wherein the housing is provided with an extension at the side of the connection ends of the contact elements, said

extension having an upper surface, wherein the bottom walls of the channels are in a common plane with the upper surface, wherein the contact end of each contact element extends mainly transverse to the length direction of the intermediate part and a bent section enclosing an angle with the length direction of the intermediate part is provided between the intermediate part and the connection end, wherein the length of the intermediate part between the contact end and the bent section is larger than the overall length of the bottom wall and the joining upper surface part of the extension.

5. Connector according to any one of the preceding claims, wherein the housing is provided with a mounting part at two opposite sides, the two mounting parts having a lower mounting face determining the reference face of the housing.

6. Connector according to any one of the preceding claims, wherein the housing is provided with chambers at a front end, each chamber receiving the contact end of a contact element, wherein successive chambers are separated by intermediate ribs of insulating material, wherein the width of a chamber between the ribs corresponds to the width of the contact end.

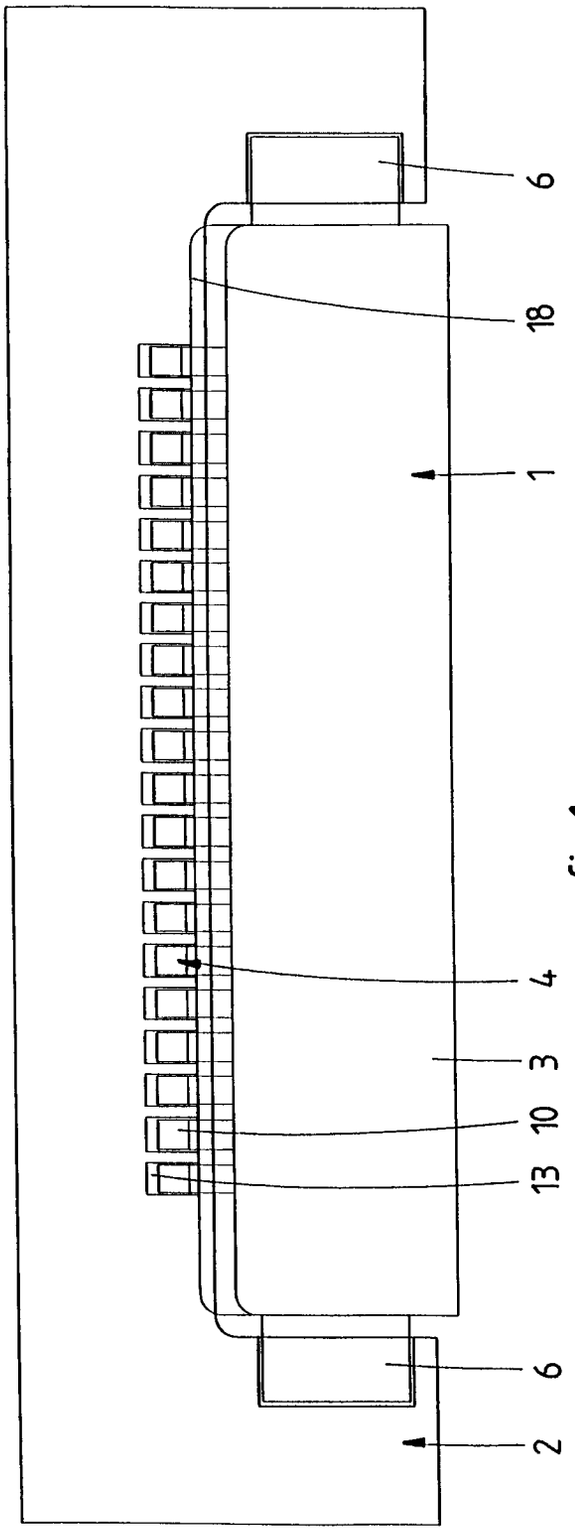

fig.1

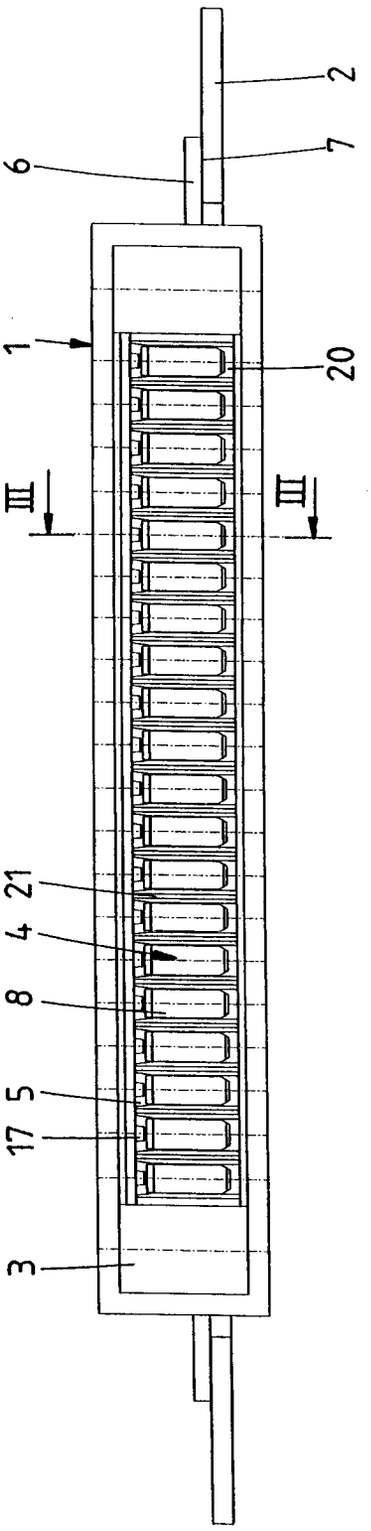

fig.2

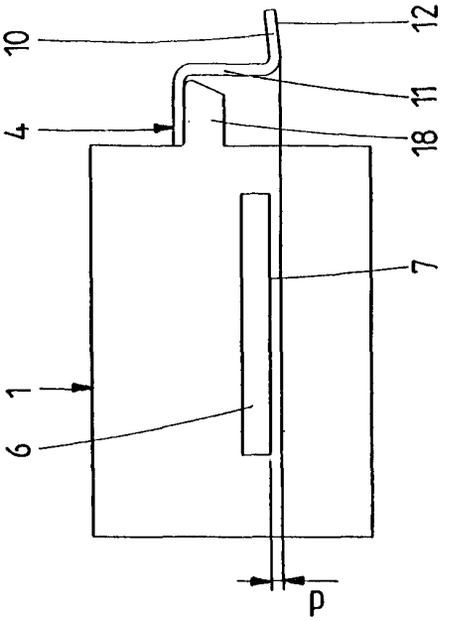

fig.4

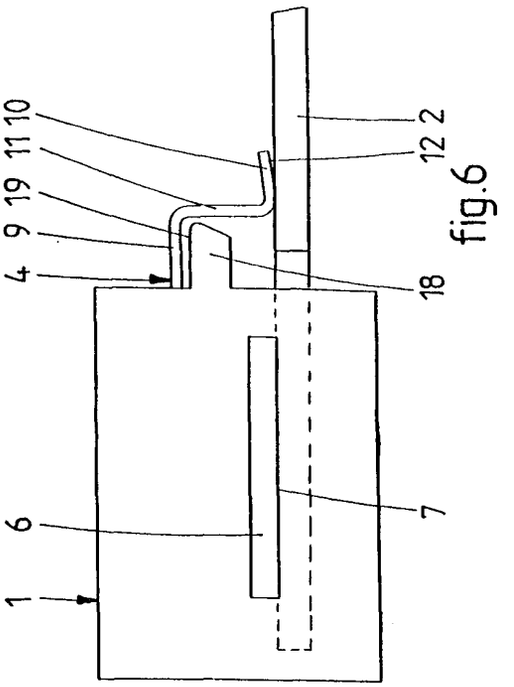

fig.6

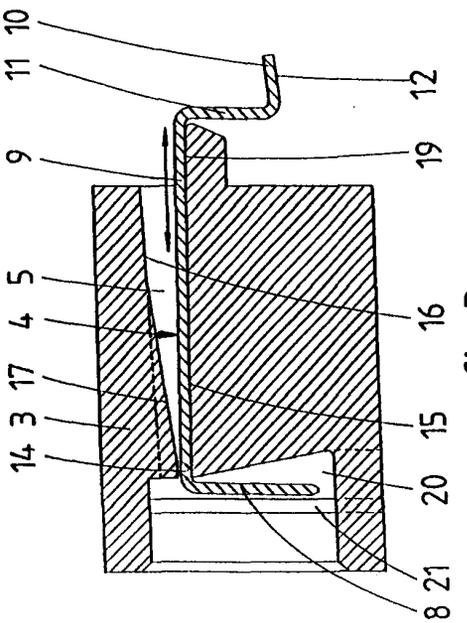

fig.3

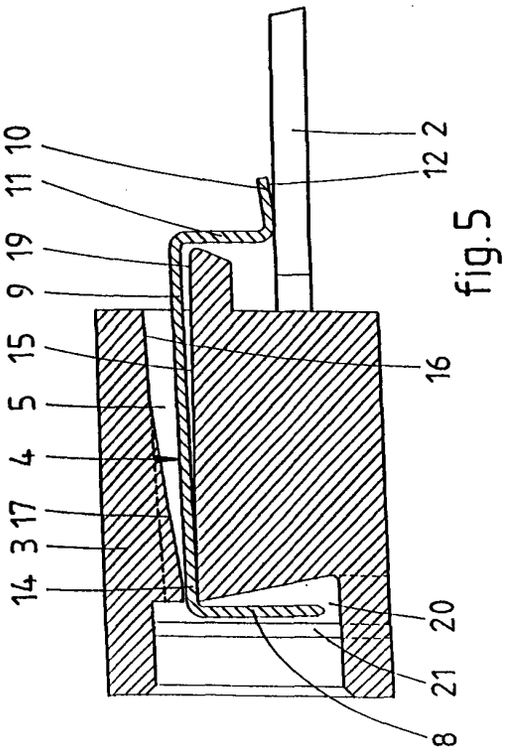

fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 3981

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X A	US 5 244 412 A (HATCH DAVID ET AL) 14 September 1993 (1993-09-14) * column 7, line 58 - column 8, line 2; figure 1 *	1,2 5	H01R12/36 H01R12/20
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 January 2001	Tappeiner, R

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