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(71) Applicant(s):
Tyco Electronics UK Ltd
(Incorporated in the United Kingdom)
Faraday Road, Dorcan, SWINDON,
Wiltshire, SN3 5HH, United Kingdom

(72) Inventor(s):
John Marsh

(74) Agent and/or Address for Service:
Baron & Warren
19 South End, Kensington, LONDON,
W8 5BU, United Kingdom

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US 5890935 A1

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(54) Abstract Title: **Electrical connector module with terminal position assurance member**

(57) An electrical connector module 2 comprises a housing 4 and a terminal position assurance member 22 hingedly attached to the housing and moveable to secure at least one terminal (7, Fig. 6b) within the housing. The terminal position assurance member comprises first stacking means 36, 56 that may engage with second stacking means (38, 58, Fig. 3b) of a like electrical connector module to stack the modules together when the terminal position assurance member is in its securing position.

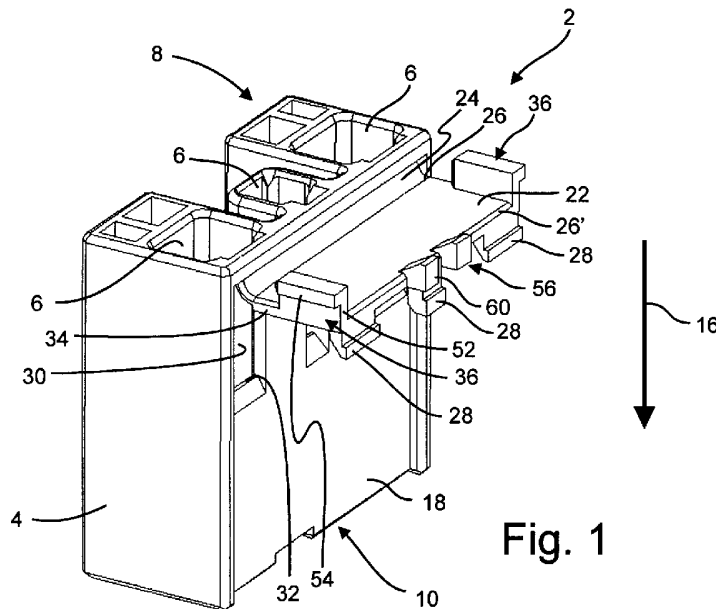
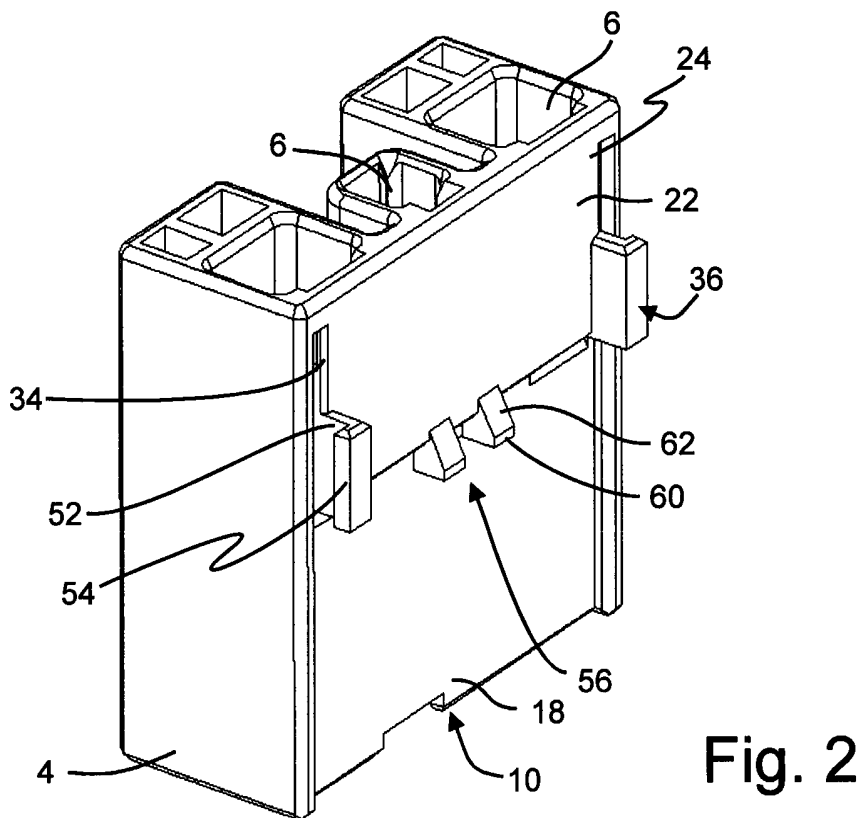
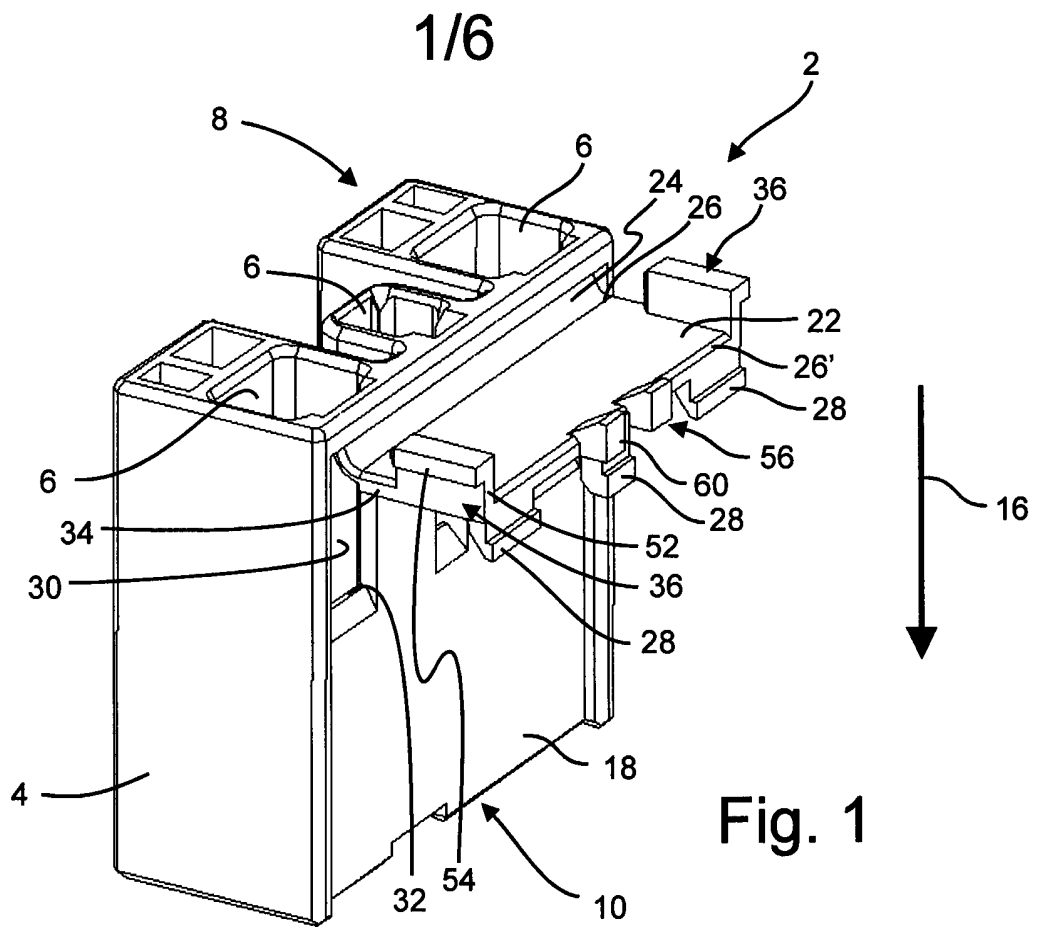


Fig. 1



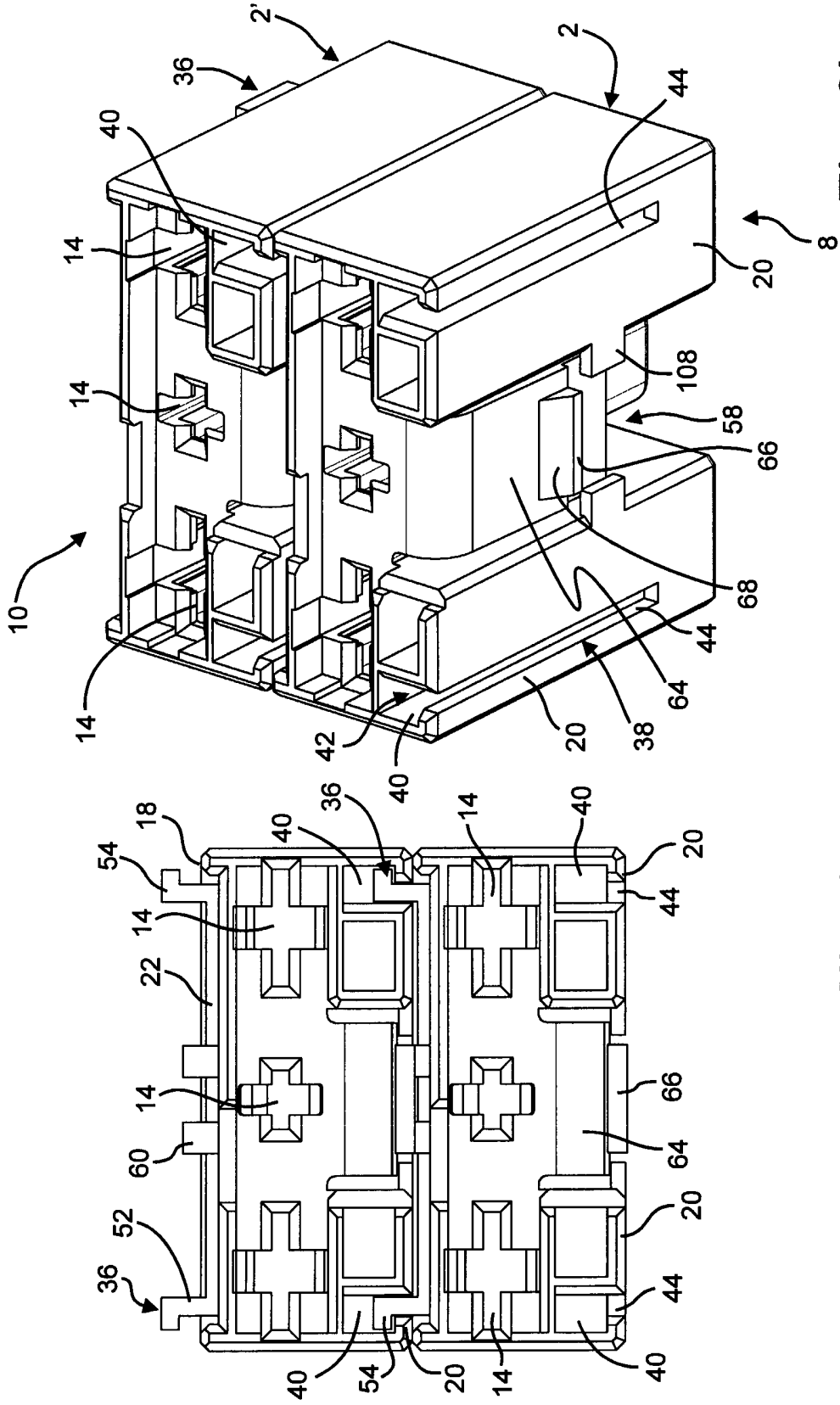


Fig. 3b

Fig. 3a

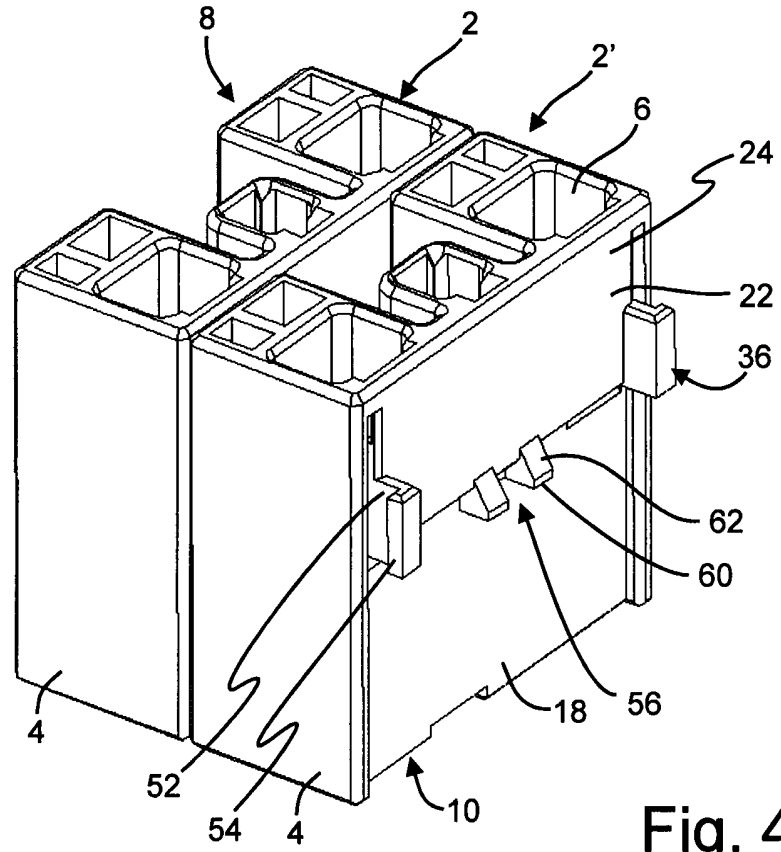


Fig. 4

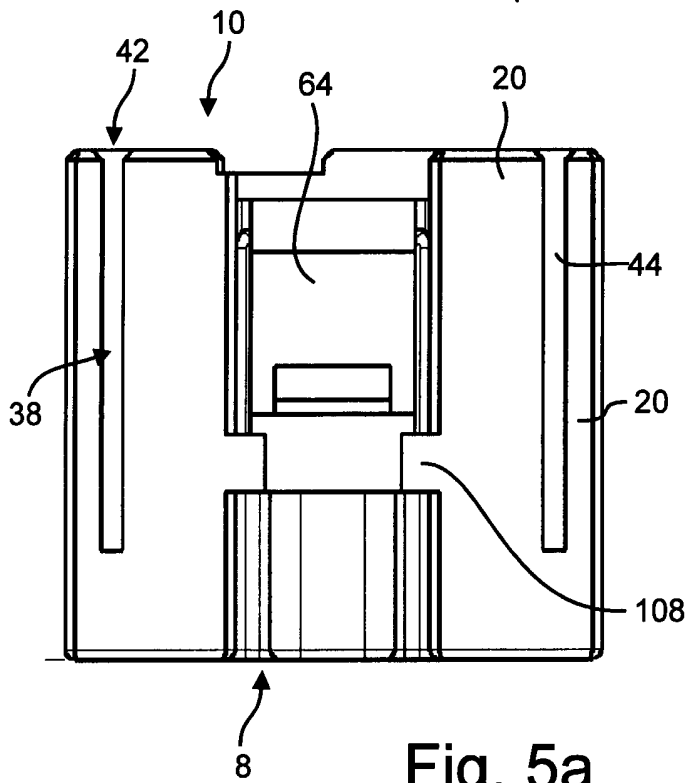


Fig. 5a

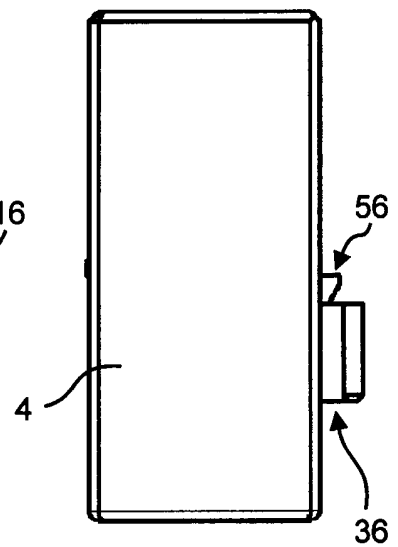


Fig. 5b

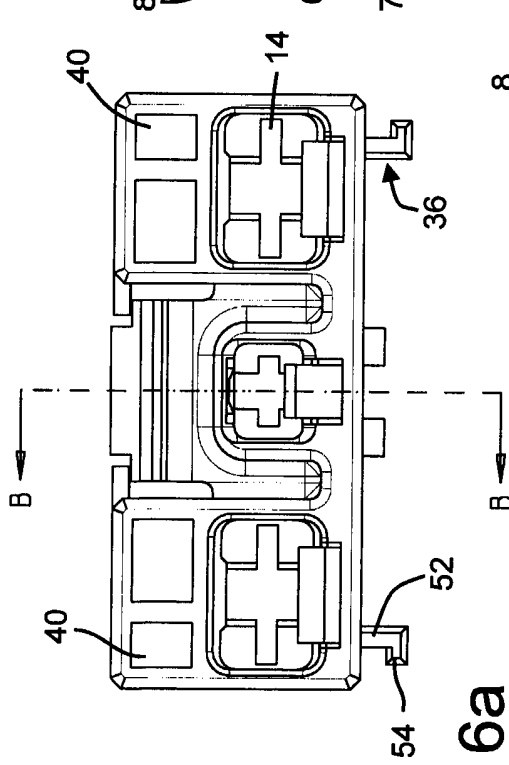


Fig. 6a

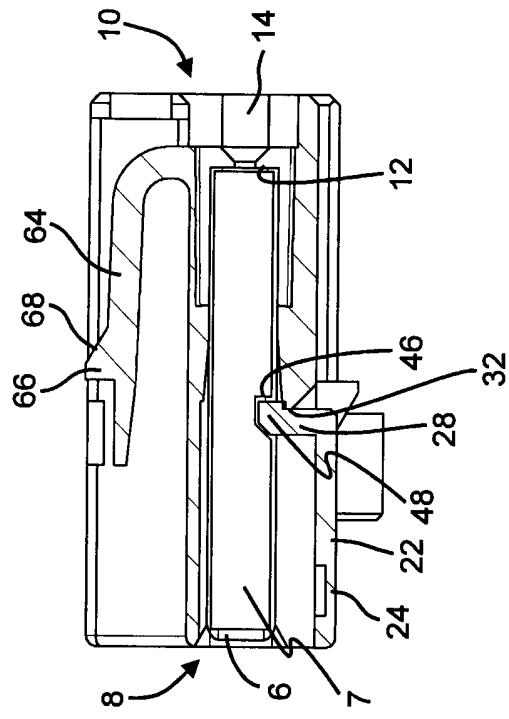


Fig. 6b

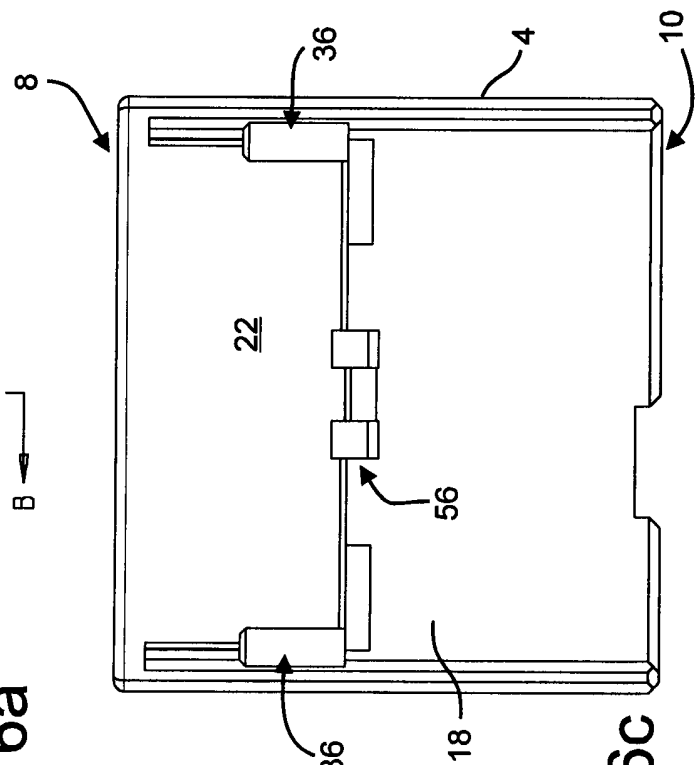


Fig. 6c

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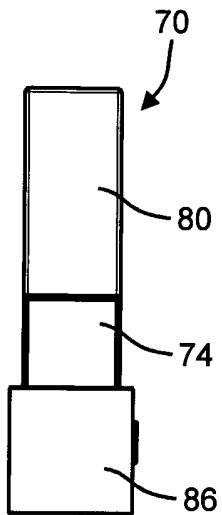


Fig. 7a

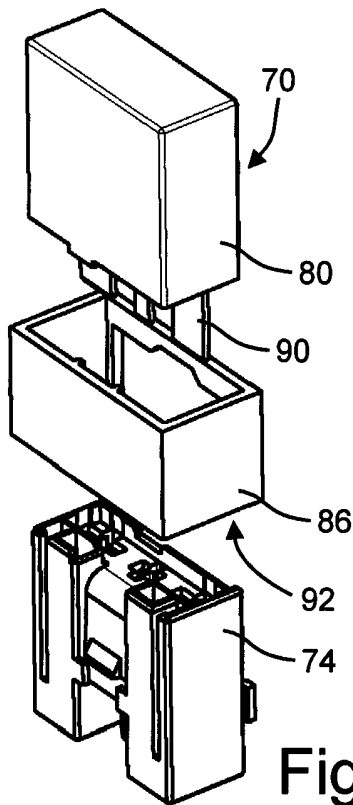


Fig. 7b

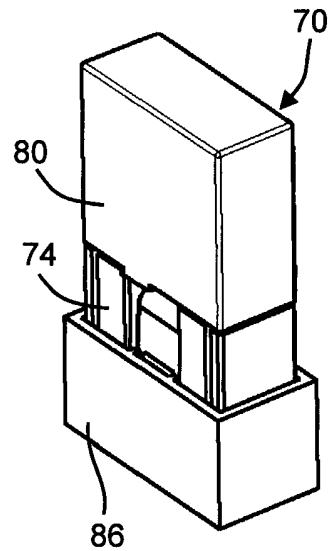


Fig. 7c

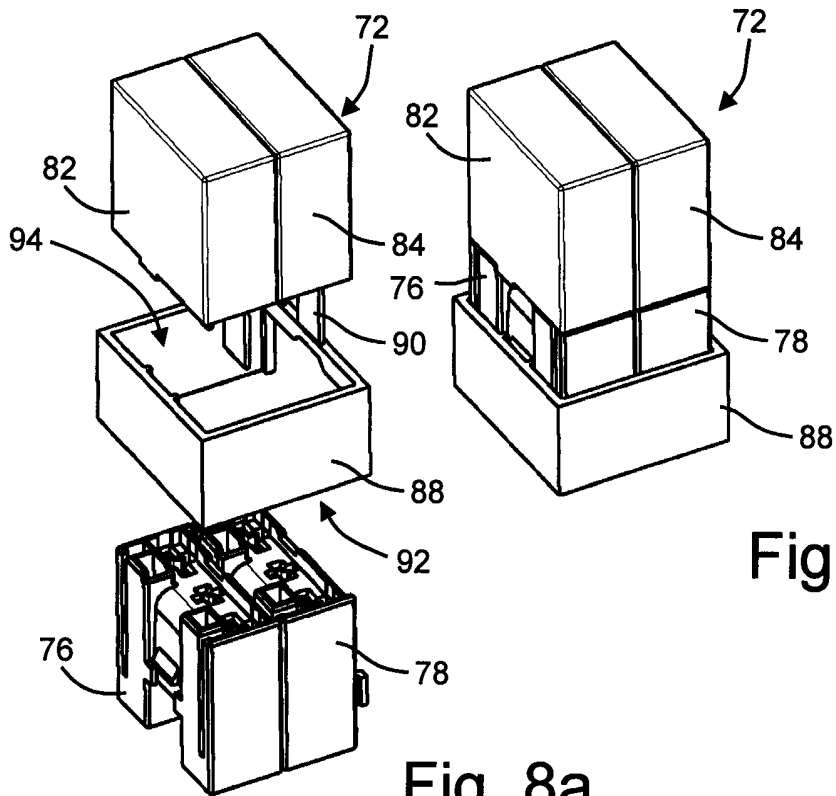


Fig. 8a

Fig. 8b

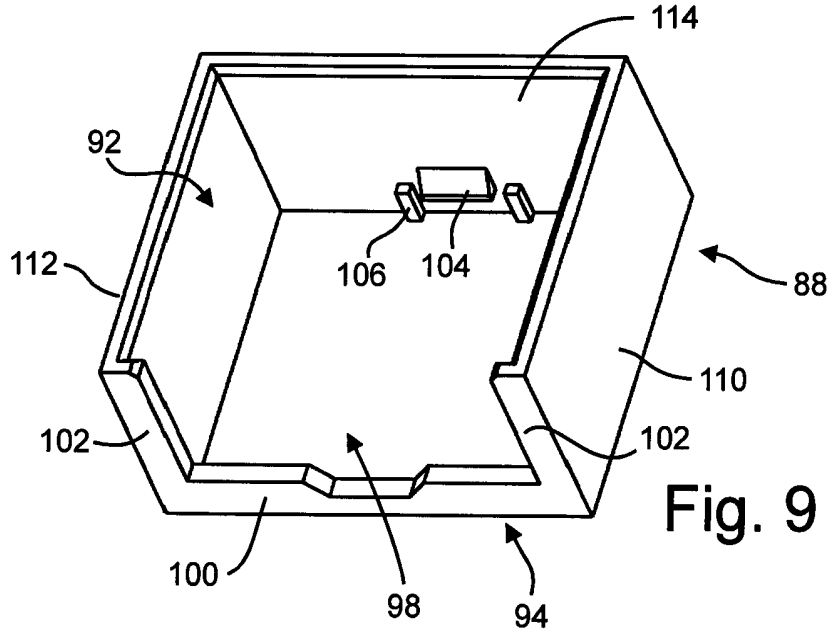


Fig. 9

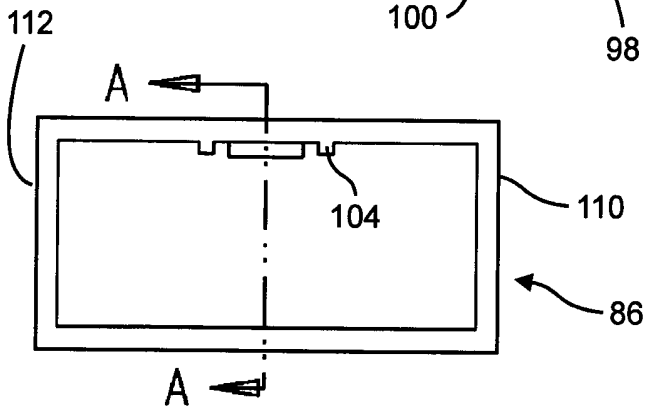


Fig. 10a

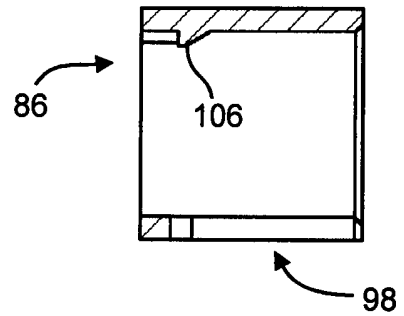


Fig. 10b

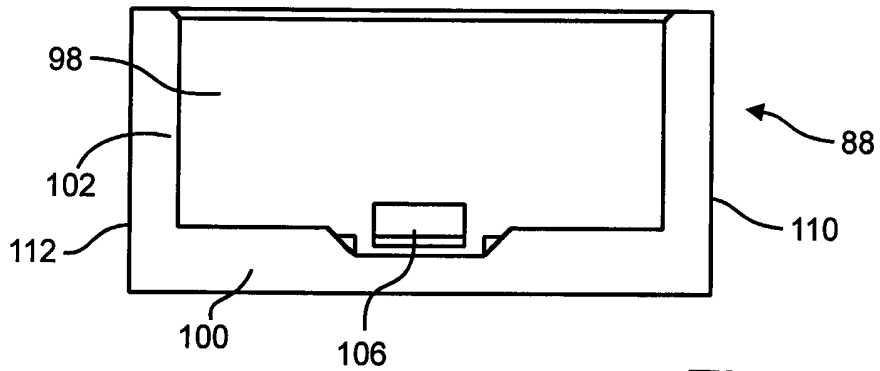


Fig. 11

ELECTRICAL CONNECTOR MODULE

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an electrical connector module and in particular to an electrical connector module for holding and connecting electronic components such as relays in a vehicle, e.g. an automobile.

[0002] Electronic components for vehicles such as relays and fuses are generally connected to electrical connectors or electrical connector modules, which in turn are appropriately mounted to the vehicle. Typically, multiple electrical connector modules are attached to a carrier base, which is mounted to the vehicle, to form a connector assembly to which plural electronic components can be detachably connected. The connector assembly thus functions as a central connection box or a bus bar which can be tailored to the specific requirements of each vehicle. For instance, if modifications of the vehicle's electrical system are required, new electronic components can be easily added and connected to respective assembled electrical connector modules. Alternatively, the arrangement of electronic components can be altered or defective electronic components can be easily replaced. Each electrical connector of the connector module assembly also provides a mechanical connection for the electronic component so that the electronic component is plugged into the electrical connector module and fixed by appropriate fixing means.

[0003] An electric connection box in which cassettes can be attached to sidewalls of a casing is for instance described in US 6,196,882. To this end, the casing includes

first retaining portions for retaining the respective cassettes, which in turn have second retaining portions for engagement with the first retaining portions of the casing. The cassettes can be of different kinds and comprise relay holders or fuse holders which also provide respective electrical connections.

[0004] Another electrical connection box is described in EP 1 182 737. The electrical connection box comprises a first shell and a second shell mounted to the first shell. The first shell is provided with connector mounts for receiving connectors, fuse mounts for receiving fuses and relay mounts for receiving relays. The electrical connection box contains a bus bar stack which includes a connector circuitry module containing connector-connecting circuits, a fuse circuitry module containing fuse-connecting circuits, and a relay circuitry module containing relay-connecting circuits.

[0005] A modular electrical connector assembly for use with the wiring systems of vehicles is described in US 5,295,870. The assembly includes a plurality of modular blocks, each having one or more tapering mortises formed on the sides thereof and a plurality of separately formed tubular, singled walled, double tenon wedges which are insertable into the mortises to assemble the blocks together. Each modular block of the assembly also has socket means formed on a top surface thereof for insertion of an electrical connection element.

[0006] A relay box having a carrier plate and a plug-in module is disclosed in EP 1 233 437. A conductor to be switched is brought into electrical contact with a relay through the plug-in module and a plug contact arranged in the plug-in module. The relay is plugged both into the plug-in

module and into the carrier plate of the relay box through plug contacts.

[0007] A modular connection assembly for a vehicle is also disclosed in DE 103 09 965. The assembly comprises holding means, which can be fixed to the vehicle, and electrical connector modules. The holding means and the electrical connector modules each has first engagement means and second engagement means which are complementarily formed with respect to the first engagement means to allow various different assemblies of electrical connector modules to be fitted together and to facilitate their attachment to the vehicle using the holding means.

[0008] In some electrical applications, such as automotive application, it is essential to ensure that electrical terminals, which are accommodated in the respective connector modules, are properly fixed and aligned. The fixation and alignment of the terminals must be rigid and reliable to withstand the mechanical impact which the connector modules are exposed to during normal operation of a vehicle. Terminal position assurance members (TPA) have therefore typically been employed. These members ensure that the connector or module cannot be properly assembled unless all terminals are properly inserted in the connector housing. An example of an electrical connector having a TPA is described in US 6,024,605. The TPA is formed as a cover of the connector housing which is integrally attached to the connector by a hinge. The cover can only be completely closed when the terminals are properly inserted. Otherwise, the cover remains at least partially opened. If the terminals are not properly inserted and the cover can not be completely closed, the incompletely closed cover prevents an insertion of the connec-

tor into a mating connector to ensure that connectors with improperly inserted terminals cannot be employed.

[0009] As the cover of the electrical connector in US 6,024,605 prevents mating with a corresponding mating connector when the terminals are incorrectly inserted, the misarrangement of the terminals will be finally observed upon establishment of an electrical connection with the mating connector. It is, however, desired to ensure that a misarrangement of terminals can be detected prior to mating. In the case of modular connection assemblies as described above, it would be of great advantage if connector modules with misaligned or incorrectly inserted terminals can be identified before assembling to form the connection assembly. This would prevent the incorporation of defective connector modules which would be costly to remove at a later point.

SUMMARY OF THE INVENTION

[0010] It is therefore an object of the invention to provide an electrical connector module which ensures that all terminals are correctly inserted when the connector modules are assembled.

[0011] This and other objects of the invention which are apparent from the following description of the invention are solved by the electrical connector module according to claim 1 and the electrical connector assembly according to claim 11.

[0012] According to the invention, an electrical connector module comprises a module housing, a terminal position assurance member (TPA) for securing at least one terminal arranged within the module housing, the TPA being movably connected to

the module housing so as to be moveable into a securing position to secure the at least one terminal, and first stacking means for engaging with second stacking means of another electrical connector module to laterally attach the electrical connector module to the other electrical connector module, the first stacking means being arranged on the TPA, whereby the first and second stacking means can be brought into engagement when the TPA is in its securing position.

[0013] The TPA of the electrical connector module assumes two functions. One is to secure the terminals within the module housing and to ensure that they are correctly arranged. To this end, the TPA can be moved into a securing position only when the terminals are correctly inserted. If at least one of the terminals is not correctly arranged, the TPA cannot be moved into its securing position. The other function is to provide first stacking means for an attachment of other, preferably like, electrical connector modules to form a connector assembly of laterally stacked electrical connector modules. A lateral stacking of electrical connector modules is, however, only possible if the TPA is in its securing position. If the TPA is not in its securing position, the first stacking means are misplaced and cannot engage with the second stacking means of the other electrical connector module. Hence, if terminals of the electrical connector module are misarranged, the TPA cannot be moved into its securing position and, consequently, the electrical connector module cannot be attached to another like electrical connector module. Electrical connector modules having misarranged terminals can therefore be easily identified so that they will not assemble with other electrical connector modules to form a connector assembly.

[0014] In connection with the invention, lateral attachment means are provided so that the electrical connector modules are attached to each other in a direction lateral with respect to a mating direction of the terminals so that the electrical connector modules are arranged side-by-side.

[0015] In one embodiment, the TPA is connected to the module housing by a hinge which allows an integral moulding of module housing and TPA.

[0016] In another embodiment of the invention, the TPA comprises securing means for locking the TPA in its securing position. The TPA is thereby mechanically fixed so that the TPA provides for a stable connection between assembled electrical connector modules by using the first stacking means.

[0017] In a yet further embodiment, the electrical connector module comprises second stacking means provided for engaging with first stacking means of another like electrical connector module. The first and second stacking means are preferably complementarily formed with respect to each other. As each electrical connector module may comprise first and second stacking means, multiple electrical connector modules can be attached to each other allowing the formation of large connector assemblies. In another embodiment of the invention, the module housing comprises first and second housing walls, whereby the TPA is connected to the module housing on the first housing wall and the second stacking means is formed on the second housing wall. Preferably, the first and second housings walls are arranged on opposite sides of the housing so that rows of laterally attached or stacked electrical connector modules can be formed.

[0018] In another embodiment of the invention, the first stacking means comprises first guiding means for engaging

with second guiding means of the second stacking means of the other electrical connector module. The first and second guiding means are in particular for a mutual alignment of attached electrical connector modules and will preferably provide a main mechanical connection between the electrical connector modules. In a yet further embodiment of the invention, the first stacking means comprises first locking means cooperating with second locking means of the second stacking means of the other electrical connector module to lock the electrical connector module to the other electrical connector module.

[0019] In a further embodiment, at least one contact opening aligned with the at least one terminal is provided in the module housing for allowing insertion of an electrical component contact for establishing electrical contact with the at least one terminal.

[0020] The object of the invention is also solved by an electrical connector assembly comprising a reception frame and at least one of the above described electrical connector modules accommodated in the reception frame.

[0021] In an embodiment of the invention, the reception frame comprises a fixing means in engagement with at least one of the first or second stacking means of the electrical connector module to fix the electrical connector module in the reception frame. In particular, the fixing means can be in engagement with the second locking means of the second stacking means of the electrical connector module. Preferably, the electrical connector assembly further comprises at least one electronic component having at least one electrical contact received by the terminal of the at least one electrical connector module.

[0022] In a yet further embodiment of the invention, the electrical connector assembly can comprise first and second electrical connector modules laterally attached to each other by engagement of the first stacking means of the first electrical connector module with the second stacking means of the second electrical connector module, the first and second electrical connector modules being accommodated in the reception frame.

[0023] All aspects and advantages outlined above with respect to the electrical connector module apply mutatis mutandis to the connector assembly and are therefore not reiterated here to avoid superfluous repetitions. It will be appreciated by those skilled in the art that the embodiments set-forth above can be appropriately combined to obtain further embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Having described some of the main features of the invention, a more detailed description of the invention, from which further features will come apparent, is set-forth in the remainder of the specification in conjunction with the accompanying drawings which show in:

[0025] Figure 1 an electrical connector module shown from an insertion end with a TPA in an opened position;

[0026] Figure 2 an electrical connector module shown from an insertion end with a TPA in its securing position;

[0027] Figures 3a and 3b two laterally attached electrical connector modules shown from their mating ends;

[0028] Figure 4 two laterally attached electrical connector modules shown from their insertion ends;

[0029] Figures 5a and 5b views of different sidewalls of the electrical connector module;

[0030] Figure 6a a view of the insertion end of the electrical connector module, Figure 6b an cross-section of the electrical connector module along the line B-B shown in Figure 6a and Figure 6c a view of a sidewall of the module housing to which the TPA is attached;

[0031] Figures 7a, 7b and 7c a side view, an exploded view and a view of an electrical connector assembly with a connected relay inserted into a reception frame;

[0032] Figures 8a and 8b an exploded view and a view of another electrical connector assembly;

[0033] Figure 9 a perspective view of a reception frame;

[0034] Figure 10a a plan view of a reception frame and Figure 10b a cross-section of the reception frame along line A-A in Figure 10a; and

[0035] Figure 11 a further plan view of a reception frame.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0036] Reference will now be made in detail to the presently preferred embodiment of the invention illustrated in the Figures. Each Figure is provided by way of explanation of the invention, and is not meant as a limitation of the invention. For example, features illustrated or described as part of one Figure can be used on or in conjunction with

other Figure to yield a further embodiment. It is intended that the present invention includes such modifications and variations.

[0037] Figure 1 shows an electrical connector module (connector module) 2 comprising a module housing 4. The module housing 4 is provided for accommodating three connector terminals 7 (shown in Figure 6b), which are placed in elongated cavities 6 formed side-by-side in module housing 4. Each cavity 6 extends from an insertion end 8 to a mating end 10 of module housing 4, the mating end 10 being arranged opposite the insertion end 8. The cavities 6 have a substantially quadrilateral cross-section and are open at the insertion end 8 of the module housing 4. For assembling the connector module, terminals 7 will be inserted into the respective cavities 6 from the insertion end 8 until they abut on an internal shoulder 12 shown in Figure 6b. At the mating end 10 each cavity 6 is terminated with a cross-like contact opening 14 through which an electrical contact of an electrical component (shown in Figures 7b and 8a) can be inserted into each terminal. The mating direction, which extends from the insertion end 8 to the mating end 10 and which is indicated in Figure 1 by arrow 16, runs parallel to the extension of the terminals 7 and cavities 6, respectively.

[0038] The module housing 4 comprises a first housing wall 18 and a second housing wall 20, both walls being arranged on opposite sides of the module housing 4. The second housing wall 20 is more clearly shown in Figure 3b. Integrally attached to the first housing wall 18 is a cover 22 which serves as a terminal position assurance member (TPA). The cover 22 has a substantially rectangular shape and is connected to the first housing wall 18 by a hinge 24 extending along one of the long sides 26 of cover 22. Cover 22 is

shown in Figure 1 in an angled or opened position in which cover 22 is folded away from the first housing wall 18. The hinge 24 enables cover 22 to be flapped into a closed or securing position shown in Figure 2 in which the cover 22 is arranged parallel to the first housing wall 18. Cover 22 comprises an internal and an external surface. The internal surface faces the module housing 4 when cover 22 is in its securing position. The external surface is arranged opposite to the internal surface on an outer side of cover 22. Module housing 4, hinge 24 and cover 22 are integrally moulded. As shown in Figure 6b, hinge 24 is formed as a flexible joint between cover 22 and module housing 4 having a reduced thickness with respect cover 22.

[0039] On the long side 26' of cover 22 opposite the long side 26, at which hinge 24 is arranged, latches 28 are formed which project above the internal surface of cover 22 and which point towards module housing 4. When cover 22 is in its securing position, latches 28 pass through elongated openings 30 formed on the first housing wall 18. Each elongated opening 30 provides lateral access to a respective cavity 6. The latches 28 snap over respective edges 32 of the openings 30 and mechanically fix the cover 22 in its securing position so that latches 28 form securing means for locking the cover 22 in its securing position. The cover 22 is then attached to the module housing 4 along its two long sides 26 and 26' by hinge 24 and latches 28, respectively, which provide sufficient mechanical stability for stacking two connector modules together as set-forth below.

[0040] As becomes more apparent from Figure 6b, latches 28 partially extend into respective cavities 6 for securing the terminals. To this end, each terminal 7 comprises an indentation 46 cooperating with a respective nose 48 of each latch

28. The indentations of the terminals are shaped substantially complementarily with the shape of the latch's nose 48 so that latch 28 can only slip into the indentation 46 when the terminal 7 is correctly placed in the cavity 6. If one of the terminals is misarranged, for instance when that terminal is not fully inserted into its cavity 6, the indentation 46 of this terminal is misplaced with respect to latch 28 so that nose 48 of latch 28 cannot match with the indentation. Consequently, latch 28 cannot snap behind edge 32 so that cover 22 cannot be completely closed. Cover 22 is therefore not secured and fixed in its securing position and is angled with respect to the first housing wall 18.

[0041] On each of the short sides 34 of cover 22, first guiding means 36 are formed. In this particular embodiment, the shape of the first guiding means 36 resembles that of an L standing up-side down and projecting outwardly from the external surface of cover 22. A first leg 52 of each first guiding means 36 is attached along a respective short side 34 of cover 22 and projects perpendicularly from the outer surface of the cover. A second or free leg 54 of each first guiding means 36 is outwardly angled with respect to the first leg 52.

[0042] The first guiding means 36 cooperate with second guiding means 38 as set-forth below. The second guiding means 38 are formed on the second housing wall 20 and comprises cavities 40 extending parallel to the terminal's cavities 6 on each side of housing wall 20. Each cavity 40 has an access opening 42 at the mating end 10. Oblong slots 44 providing a lateral access to the cavities 40 are formed in the second housing wall 20. The slots 44 extend from the access opening 42 and terminate in spaced relation to the mating end 8. The width of the slots 44 is narrower than the

width of the cavities 40 so that the second housing wall 20 partially covers the cavities 40 as shown in Figures 3a and 3b.

[0043] With reference to Figures 3a and 3b, the stacking of two connector modules is described. For illustration purposes only, the following description makes reference to an engagement of a first connector module 2 comprising first guiding means 36 and a second connector module 2' comprising second guiding means 38 complementary to the first guiding means. It will however be appreciated by those skilled in the art, that each connector module comprises first and second guiding means so that a plurality of connector modules can be consecutively stacked to each other to form a row of laterally stacked connector modules. The connector modules will be laterally stacked to each other which means that the stacked connector modules will be arranged relative to each other in a direction perpendicular to the mating direction.

[0044] In order to stack the first and the second connector module 2 and 2' together cover 22 of the first connector housing must be in its securing position as shown in Figure 2. Then, the first housing wall 18 of the first connector module 2 is brought in contact with the second housing wall 20 of the second connector module 2' so that the first guiding means 36 are arranged directly in front of the access opening 42 of cavities 40 of the second connector module 2'. In this initial position the connector modules are staggered with respect to each other. Upon relative movement of both modules parallel to the extension of the cavities 40, the first guiding means 36 are inserted into respective cavities 40 so that the second legs 54 of the first guiding means 36 slide behind second housing wall 20. In other words, if the second connector module 2 is kept fixed, the first connector

module 2 is moved in the mating direction 16. As the width of the slots 44 substantially corresponds to the thickness of the first legs 52, first legs sliding without play in slots 44 so that first and second connector module cannot be twisted with respect to each other or moved in a direction perpendicular to the extension of the slots 44. Both modules are also aligned with respect to each other by the engagement of legs 52 and slots 44. The fixing of cover 22 along its two long sides 26, 26' provides sufficient mechanical stability for keeping cover 22 in place upon stacking.

[0045] If cover 22 is not completely closed due to a misarranged terminal, cover 22 is slightly angled with respect to the first housing wall 18. Consequently, first guiding means 36 are angled with respect to the second guiding means 38 so that the two connector modules cannot slide relative to each other along and parallel to their housing walls 18, 20. A connector module having a misaligned terminal is thus easily identifiable upon stacking.

[0046] In order to lock both connector modules together, the first connector module 2 comprises a first locking means 56 arranged on long side 26' of cover 22 as for instance shown in Figure 1. Correspondingly, second connector module 2' comprises second locking means 58 arranged on the second housing wall 20 as illustrated in Figure 3b. The first locking means 56 comprises a locking projection 60 having an outwardly directed first inclined face 62. With reference to Figures 3b and 6b, the second locking means 58 is arranged in a recess formed on the second housing wall 20 and comprises a deflectable locking latch 64 integrally attached at a bottom of the recess at the mating end 10. A projection 66 comprising a second inclined face 68 is arranged on a free end of locking latch 64. First and second inclined faces 62, 68

abut each other when the connector modules are in an intermediate position during stacking. Upon a further relative movement of the connector modules, locking latch 64 is inwardly deflected towards the module housing through engagement of the first and second inclined faces 62, 68 until locking projection 66 passes projection 60. Locking latch 64 is then released and projection 66 of locking latch 64 snaps behind locking projection 60. At the same time, leading edges of the first guiding means 36 abut respective ends of the slots 44 to prevent further relative movement of the connector modules. Both connector modules are thus fixed relative to each other. In the stacked arrangement, the mating ends 10 of the modules 2, 2' are arranged in a common plane to form a common mating end. As each of the modules 2, 2' comprises first and second stacking means at opposite sides of their housings, further modules can be consecutively attached at the respective sides of the thus formed assembly.

[0047] In this particular embodiment, a middle cavity 6 of module housing 4 is smaller than the outer cavities 6 as illustrated in Figure 6a. It will be appreciated by those skilled in the art that all cavities can be of same size and that two, four or more cavities can be provided in each connector module. The number and size of the cavities depends on the type of electronic component for which the respective connector module is designed. It is also possible to stack different types of connector modules together.

[0048] The arrangement of the first stacking means on cover or TPA 22 not only ensures that the terminals are correctly arranged in the module housing before the connector module is stacked with other connector modules, but the arrangement also enables a simple tool coring for moulding the

connector housing. The module housing is preferably moulded with the cover in its opened position.

[0049] An electrical connector assembly (or connector assembly) 70 comprising one connector module is shown in Figures 7a to 7c while a connector assembly 72 with two connector modules is shown in Figures 8a and 8b. Each connector assembly 70, 72 comprises respective connector modules 74, 76, 78, respective electronic components 80, 82, 84 and a reception frame 86, 88. For the purpose of illustration only, electronic components 80, 82 and 84 are in-line relays having flat electrical contacts 90 which are arranged in-line. The arrangement of the electrical contacts 90 corresponds to the arrangement of the contact openings 14 of the respective connector modules.

[0050] With reference to Figures 9 to 11, the reception frames 86 and 88 are explained in detail. Figures 9 and 11 show a double-module reception frame 88 for accommodating two connector modules while Figures 10a and 10b represent a single-module frame 86 for accommodating a single connector module. Figure 10b is a cross-sectional view of the reception frame shown in Figure 10a along the line A-A.

[0051] The reception frames 86 and 88 have a box-like shape with a first opening 92 and a second opening 94 arranged opposite the first opening 92. The cross-section of the reception frame 88 and the size of the openings 92, 94 are such that two connector modules stacked to each other can penetrate the reception frame 88. The dimensions of the single-connector module frame 86 are adapted for accommodating a single connector module. The connector modules are inserted from the first opening 92 as illustrated in Figures 7b and 8a, respectively. In one of the four side walls of the reception frames 86, 88, a cut-out 98 is formed at the first

opening 92 leaving only a slender web 100 spanning between the side walls 110,112 adjacent to cut-out 98. In addition to that, narrow bars 102 remain at the sidewalls 110, 112. On an inner side of a side wall 114 arranged opposite the cut-out 98 a resting projection 104 is formed for cooperating with the locking latch 64 of one of the connector modules upon insertion. Stop blocks 106 are also formed on the inner side of side wall 114 at which corresponding stop projections 108 arranged on the second housing wall 20 of the connector module come to rest when the connector module is inserted into the reception frame 88. Resting projection 104 and stop blocks 106 form, in this particular embodiment, the fixing means of the reception frame. In addition to the engagement of the locking latch 64 with the resting projection 104, the second legs 54 of the first guiding means 36 of the other connector modules meshes with the bars 102 to further fasten the stacked connector modules to the reception frame 88.

[0052] The first guiding means 36 and the second locking means 58 of a connector module thus do not only contribute to a firm connection between stacked connector modules but also provide a fixation of the connector modules to the reception frame 88. In case of a single connector module being inserted into a single-module frame as shown in Figure 7b, the first guiding means 36 and the second locking means 58 of this connector module are in engagement with bars 102 and resting projection 104, respectively. If two or more modules are stacked together, two-module or respective multiple-module reception frames are used. In this case, the free second locking means at one end of the stacked connector modules and the free first guiding means at the opposite end of the stacked connector modules provide for a fixation of the stacked connector modules to the reception frame. The first guiding means and the second locking means have therefore two

functions. It will be appreciated by those skilled in the art that it is also possible that the first locking means and the second guiding means could additionally or alternatively cooperate with respective means of the reception frame so that, generally speaking, the first and second stacking means can serve as means for stacking two modules together and to fix a module or stacked modules to a reception frame.

Parts List

2, 2'	electrical connector module
4	module housing
6	cavities
8	insertion end
7	terminal
10	mating end
12	internal shoulder
14	cross-like contact opening
16	mating direction
18	first housing wall
20	second housing wall
22	cover / TPA
24	hinge
26, 26'	long side
28	latches
30	elongated opening
32	edge
34	short side
36	first guiding means
38	second guiding means
40	cavity of second guiding means
42	access opening
44	slot
46	indentation
48	nose of latch 28
52	first leg
54	second leg
56	first locking means
58	second locking means
60	locking projection
62	first inclined face
64	locking latch
66	projection

68	second inclined face
70, 72	connector assembly
74, 76, 78	connector modules
80, 82, 84	electrical components
86, 88	reception frames
90	electrical contacts
92	first opening
94	second opening
98	cut-out
100	web
102	bars
104	resting projection
106	stop blocks
108	stop projections
110, 112, 114	side walls

Claims

1. Electrical connector module comprising

a module housing,

a terminal position assurance member for securing at least one terminal arranged within the module housing, the terminal position assurance member being movably connected to the module housing so as to be moveable into a securing position to secure the at least one terminal, and

first stacking means for engaging with second stacking means of another electrical connector module to laterally attach the electrical connector module to the other electrical connector module, the first stacking means being arranged on the terminal position assurance member, whereby the first and second stacking means can be brought into engagement when the terminal position assurance member is in its securing position.

2. Electrical connector module according to claim 1, characterised in that the terminal position assurance member is connected to the module housing by a hinge.
3. Electrical connector module according to claim 1 or 2, characterised in that the terminal position assurance member comprises securing means for locking the terminal position assurance member in its securing position.

4. Electrical connector module according to any of the preceding claims characterised in that the electrical connector module comprises second stacking means provided for engaging with first stacking means of another like electrical connector module.
5. Electrical connector module according to claim 4, characterised in that the module housing comprises first and second housing walls, whereby the terminal position assurance member is connected to the module housing on the first housing wall and the second stacking means is formed on the second housing wall.
6. Electrical connector module according to claim 5, characterised in that the first and second housings walls are arranged on opposite sides of the module housing.
7. Electrical connector module according to any of the preceding claims characterised in that the first stacking means comprises first guiding means for engaging with second guiding means of the second stacking means of the other electrical connector module.
8. Electrical connector module according to any of the preceding claims, characterised in that the first stacking means comprises first locking means cooperating with second locking means of the second stacking means of the other electrical connector module to lock the electrical connector module to the other electrical connector module.

9. Electrical connector module according to any of the preceding claims, characterised in that at least one contact opening aligned with the at least one terminal is provided in the module housing for allowing insertion of an electrical component contact for establishing electrical contact with the at least one terminal.
10. Electrical connector module according to any of the preceding claims characterised in that the terminal position assurance member and the module housing are integrally moulded.
11. Electrical connector assembly comprising
 - a reception frame comprising, and
 - at least one electrical connector module according to any of the preceding claims, the electrical connector modules being accommodated in the reception frame.
12. Electrical connector assembly according to claim 11, characterised in that the reception frame comprises a fixing means being in engagement with at least one of the first or second stacking means of the electrical connector module to fix the electrical connector module in the reception frame.
13. Electrical connector assembly according to claim 12, characterised in that the fixing means is in engagement with the second locking means of the second stacking means of the electrical connector module.

14. Electrical connector assembly according to any of the claims 11 to 13, characterised in that it further comprises at least one electronic component having at least one electrical contact received by the terminal of the at least one electrical connector modules.
15. Electrical connector assembly according to any of the claims 11 to 14, characterised in that the assembly comprises a first and second electrical connector modules laterally attached to each other by engagement of the first stacking means of the first electrical connector module with the second stacking means of the second electrical connector module, the first and second electrical connector modules being accommodated in the reception frame.
16. An electrical connector module substantially as herein described with reference to the accompanying figures 1 to 6.
17. An electrical connector assembly substantially as herein described with reference to the accompanying figures 1 to 11.



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Application No: GB0501758.7

Examiner: Mr Nick Smith

Claims searched: 1-17

Date of search: 8 April 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	1, 11	US 6024605 A1 (BECK Jr. et al) See Figs. 1,6 and col. 3 lines 30-64
A	1, 11	US 5890935 A1 (PILL) See Figs. 1-4 and col. 3 lines 40-54
A	1	DE 19946470 C1 (CAUWENBERGE) 31.05.01 (See Figs. 1,2 and WPI Abstract Accession No. 2001-317966/34)
A	1	DE 19613051 C1 (EPE) 17.07.97 (See Figs. 1,2 and WPI Abstract Accession No. 1997-343168/32)
A	1	DE 10309965 A1 (BAUMANN et al) 16.09.04 (See Fig. 1 and WPI Abstract Accession No. 2004-670019/66)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

H2E

Worldwide search of patent documents classified in the following areas of the IPC⁰⁷

H01B

The following online and other databases have been used in the preparation of this search report

Online: EPODOC, PAJ, WPI