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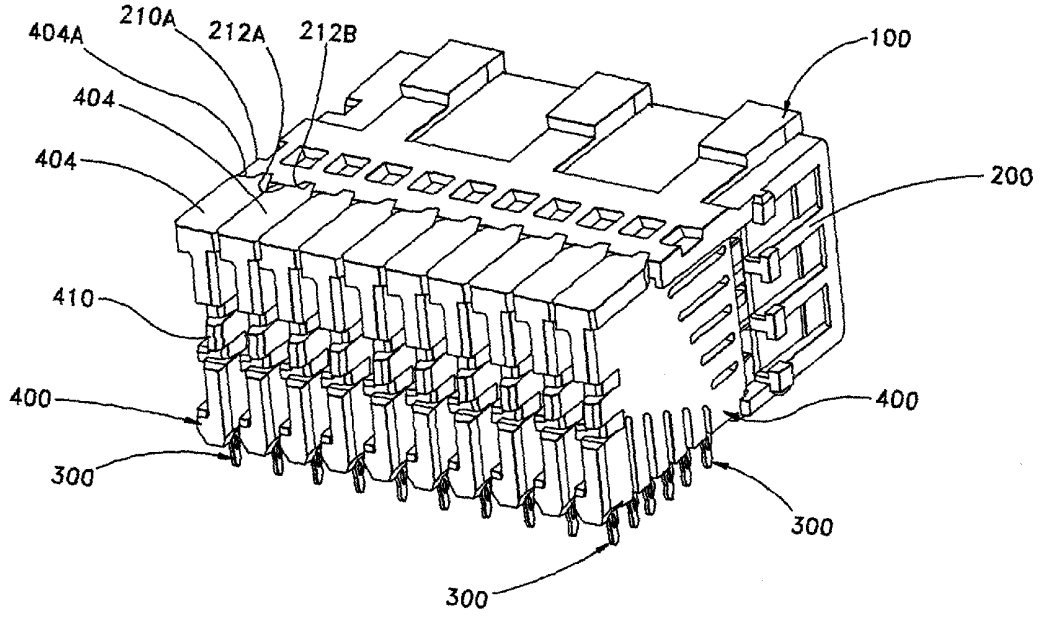
(54) Title: CONNECTOR ASSEMBLY WITH STABILIZED MODULES



(57) Abstract: A connector assembly (100) includes a housing (200) receiving electrical terminals (300) that accompany insulating modules (400). The housing has a front mating end (204) and a rear (206), and cavities (202) that receive mating ends of the terminals through the rear of the housing. The housing has a first shroud (210A) projecting in a rearward direction. The first shroud has a rear edge (212) and notches (212B) disposed along the rear edge. Each of the modules has a wedge (404B) that is interfitted in a respective one of the notches, whereby the first shroud holds the modules in straight alignments relative to the housing.

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CONNECTOR ASSEMBLY WITH STABILIZED MODULES

The invention relates to an electrical connector assembly having insulating modules that hold electrical terminals, and the modules are held in stabilized positions relative to the connector assembly.

US Patent 5,286,212 and US Patent 5,496,183 disclose embodiments of a known connector assembly. The known connector assembly has electrical terminals that accompany insulating modules. Between the modules are ground referenced shield members in the form of thin plates that are held in place by being interlocked with lateral sides of the modules.

In the known connector assembly, the terminals that accompany each insulating module have parallel pins for connection to a circuit board. The terminals have mating ends extending at right angles relative to the pins. The mating ends project from the modules and are received within cavities that extend through an insulating housing. The mating ends extend toward a mating face of the housing, and are adapted for mating connection with mating pins that can be inserted through the mating face and into the cavities.

In the known connector assembly, the modules rely on the terminals being interlocked with the housing to hold the modules side by side with one another. The modules are held somewhat infirmly by the terminals, and are easily moved from their desired alignments.

Therefore, a problem to be solved is how to hold the modules in stabilized positions such that the modules project from the housing in straight alignments.

This problem is solved by a connector assembly according to claim 1.

The invention is a connector assembly comprising electrical terminals accompanying insulating modules. The connector assembly includes a housing having a front mating end and a rear. The housing has cavities that receive mating ends of the terminals through the rear of the housing. The housing has a first shroud projecting in a rearward direction. The first shroud has a rear edge, and notches are disposed along the rear edge. Each of the modules has a forwardly projecting wedge that is interfitted with a respective one of the notches, whereby the first shroud holds the modules in straight alignments relative to the housing.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings wherein:

Figure 1 is an isometric view of a connector assembly having a housing and modules assembled to the housing;

Figure 2 is an isometric view of a housing, as shown in Fig. 1, and further disclosing a shroud on the housing;

Figure 2A is an isometric view of a front of the housing, as shown in Fig. 2;

Figure 3 is a view of electrical terminals that accompany each module, as shown in Fig. 4;

Figure 4 is an isometric view of one of the modules of the connector assembly, as shown in Fig. 1;

Figure 4A is an isometric view of the module, as shown in Fig. 3;

Figure 5 is an isometric view of the module, as shown in Fig. 3, together with a shield member, prior to being assembled in the housing; and

Figure 6 is an isometric view of the connector assembly, as shown in Fig 1, and further showing one of a

number of shield members in position for assembly laterally beside a corresponding module of the connector assembly.

An embodiment of a connector assembly 100 is shown in Fig. 1. The connector assembly 100 has a housing 200 and multiple modules 400 that assemble to the housing 200, and that project from the housing 200 in a rearward direction. As shown in Figs. 2 and 2A, the housing 200 is made of insulating material, and is of unitary molded construction. Multiple terminal receiving cavities 202 extend through the housing 200 from a front mating end 204 of the housing 200 to a rear 206 of the housing 200. The cavities 202 are arranged in columns. Alternating with the columns of cavities 202 are columns of ground terminal receiving passages 208. The passages 208 extend from the front mating end 204 to the rear 206.

As disclosed in Figs. 2A and 5, the housing 200 has a bipartite shroud 210 with a first shroud 210A and a second shroud 210B that are spaced apart in a direction transverse to the rearward direction. The first shroud 210A of the bipartite shroud 210 is deeper in the rearward direction than the second shroud 210B that is more shallow. The first and second shrouds 210A and 210B have corresponding, spaced-apart rear edges 212. Because the first shroud 210A of the bipartite shroud 210 is deeper than the second shroud 210B, the first and second rear edges 212 are offset from each other in a rearward direction. Each of the rear edges 212 has an alternating series of flat portions 212A and truncated V-shaped notches 212B, which engage respective modules 400. As shown in Fig. 2A, the notches 212B in the first shroud 210A are aligned with module receiving tracks 214, in the form of grooves, for example, for receiving top edges of the modules 400. Fig 5 discloses that the second shroud 210B has shield member

receiving tracks 216, in the form of slots, for example, aligned with the notches 212B.

Fig. 3 discloses an array of terminals 300 that accompany each module 400. The terminals 300 are joined to a removable lead frame 302, and are stamped from a strip of metal. The terminals 300 are sheared along their edges that are formed by stamping. The removable lead frame 302 partially encircles the terminals 300. The terminals 300 are joined side to side by the removable lead frame 302. The terminals 300 have parallel pins 300A at first ends. The terminals 300 extend at right angles relative to the pins 300A to mating ends 304.

According to an embodiment, each mating end 304 is an electrical receptacle defined between a pair of resilient spring fingers 304A and 304B. One of the fingers 304A of each pair has its unsheared surface turned ninety degrees to face a sheared edge of the other finger 304B of the pair. Some of the mating ends 304 have rearward projecting barbs 306.

With reference to Figs. 4 and 4A, the terminals 300 accompany each module 400. Each module 400 has an insulating body 402. The insulating body 402 is overmolded, by a known molding process, onto the terminals 300, without being overmolded onto the pins 304A, the mating ends 304 and the lead frame 302. Following the overmolding process, the lead frame 302 is severed and removed from the terminals 300.

The terminals 300 project from a bottom of the insulating body 402, and have the parallel pins 300A for connection to a circuit board. According to an embodiment, the pins 300A are slit to enable narrowing of the pins for compliant fit within apertures of a circuit board.

The mating ends 304 of the terminals 300 project from the insulating body 402 of the module 400. When the module 400 is assembled to the housing 200, the mating ends 304 are received within the cavities 202 that extend through the insulating housing 200. The barbs 306 on some of the mating ends 304 impinge against the interiors of respective cavities 202 to hold the mating ends 304 in the respective cavities 202.

With further reference to Figs. 4 and 4A, each module 400 has a pair of spaced-apart alignment blocks 404 on the insulating body 402. A top alignment block 404 of the pair is along a top 406 of the module 400, and is spaced-apart from a bottom alignment block 404 of the pair that is along a bottom 408 of the module 400. The alignment block 404 along the bottom 408 of the module 400 is relatively closer to the front of the module 400 than the other alignment block 404. The alignment block 404 along the top 406 of the module 400 is relatively farther rearward from the front of the module 400. Accordingly, the alignment blocks 404 are offset from each other in a rearward direction. A front edge of each alignment block 404 has a flat surface 404A beside a forwardly projecting, truncated wedge 404B.

Each module 400 has opposite lateral sides 406 and 408. The lateral side 406 has stand off ribs 406A. The lateral side 408 has air receiving recesses 408A extending between the lengths of the terminals 300, providing a composite dielectric, in part, insulating material, and in part, air, between the terminals 300. The composite dielectric is of lower dielectric constant than that of the insulating body 402 without the air receiving recesses 408A. The alignment blocks 404 project outward laterally from both of the lateral sides 406 and 408. The insulating

body 402 has a latch member 410 on a rear 412 of the module 400.

As further disclosed by Figs. 1, 5 and 6, each module 400 is assembled with the housing 200. The rear edges 212 of the shroud 210 engage each of the modules 400, which holds each of the modules 400 in a stabilized position and in straight alignment relative to the housing 200. Specifically, the rear edges 212 of the first and second shrouds 210A, 210B, being offset relative to each other in a rearward direction, engage the alignment blocks 404 of each module, and align each module 400 in the rearward direction. The rear edges 212, being spaced apart in a vertical direction, engage the alignment blocks 404 of each module 400, and align each module 400 in the vertical direction that is transverse to the rearward direction. Thus, the modules 400 are aligned to project or extend straight from the housing 200 to position the terminals 300 along precise centerline spacings for connection with a corresponding precise pattern of terminal locations on a circuit board. The top alignment blocks 404 of the modules 400 abut one another side to side, which braces the modules 400 against one another.

The flat portions 212A of the rear edges 212, as well as the truncated V-shaped notches 212B of the rear edges 212, interfit with each of the modules 400. Specifically, the flat portions 212A interfit with the flat surfaces 404A on the alignment blocks 404 of the modules 400. The truncated V-shaped notches 212B interfit with the forwardly projecting truncated wedges 404B on the alignment blocks 404 of the modules 400. Each alignment block 404 has a three point support provided by the flat surfaces 404A and the wedge 404B being interfitted with the rear edges 212. Thus, the first and second shrouds 210A, 210B interfit with

each of the modules 400, whereby the shroud 210 holds the modules 400 in stabilized positions.

As shown in Fig. 5, a ground referenced shield member 500 is received along the lateral side 408 and under the top alignment block 404. A clip 502 is on a rear 504 of the shield member 500. The clip 502 has a loop that receives and latches to the latch member 410. The clip 502 latches to the latch member 410 to hold the shield member 500 in position. Fig. 5 shows that each shield member 500 can be assembled to a module 400, prior to being assembled to the housing 200 together with the module 400.

Fig. 6 discloses the shield member 500 of unitary metal plate construction, with unitary, parallel ground pins 504. According to an embodiment, the ground pins 504 are slit to enable narrowing of the ground pins 504 for compliant fit within apertures of a circuit board. The shield member 500 has unitary ground terminals 506 extending at right angles relative to the ground pins 504. When the shield member 500 is assembled to the housing 200, the ground contacts 506 are received along the passages 208 of the housing 200.

Fig. 6 shows that each shield member 500 is constructed and arranged for assembly to a connector assembly 100. The connector assembly 100 has unshielded modules 400 assembled to the housing 200. To convert the unshielded modules 400 to shielded modules 400, each shield member 500 is easily inserted in a lateral space beside each module 400 of the connector assembly 200. Further, each shield member 500 is removable from the connector assembly 100 for repair and replacement without having to disturb the modules 400 that remain assembled to the housing 200.

Each shield member is easily latched and unlatched with a module 400. The latch 410 and the clip 502 are in view for easy manipulation, to latch them together, or to separate them. Specifically, the latches 410 for holding the shield members 500 are in view on rears 412 of the modules 400, rather than being hidden from view by being on lateral sides 406 and 408 of the modules 400.

CLAIMS

1. A connector assembly (100) comprising electrical terminals (300) accompanying insulating modules (400), a housing (200) having a front mating end (204) and a rear (206), the housing having cavities (202) receiving mating ends of the terminals through the rear of the housing, the housing having a first shroud (210A) projecting in a rearward direction, the first shroud having a rear edge (212), characterized in that:

notches (212B) are disposed along the rear edge of the first shroud, and each of the modules has a forwardly projecting wedge (404B) that is interfitted with a respective one of the notches, whereby the first shroud holds the modules in straight alignments relative to the housing.

2. The connector assembly as recited in claim 1, wherein the housing includes a second shroud (210B) projecting in a rearward direction, the second shroud has a rear edge (212) and notches (212B) along the rear edge, and each of the modules has a forwardly projecting wedge (404B) that is interfitted in a respective one of the notches along the rear edge of the second shroud.

3. The connector assembly as recited in claim 2, wherein the rear edges (212) of the first and second shrouds (210A, 210B) are spaced-apart from each other in a direction transverse to the rearward direction.

4. The connector assembly as recited in claim 2, wherein the rear edges (212) of the first and second

shrouds (210A, 210B) are offset from each other in the rearward direction.

5. The connector assembly as recited in claim 1, wherein the rear edge (212) of the first shroud (210A) has flat portions (212A) disposed in an alternating series with the notches (212B).

6. The connector assembly as recited in claim 1, wherein each of the modules (400) includes an alignment block (404), and the wedge (404B) of each said module projects forwardly from the alignment block of each said module.

7. The connector assembly as recited in claim 6, wherein the alignment blocks (404) on the modules laterally abut one another.

8. The connector assembly as recited in claim 1, further comprising shield members (500) extending laterally beside the modules, and latch clips (502) holding the shield members being in view on rears of the modules, rather than being hidden from view by being on lateral sides of the modules.

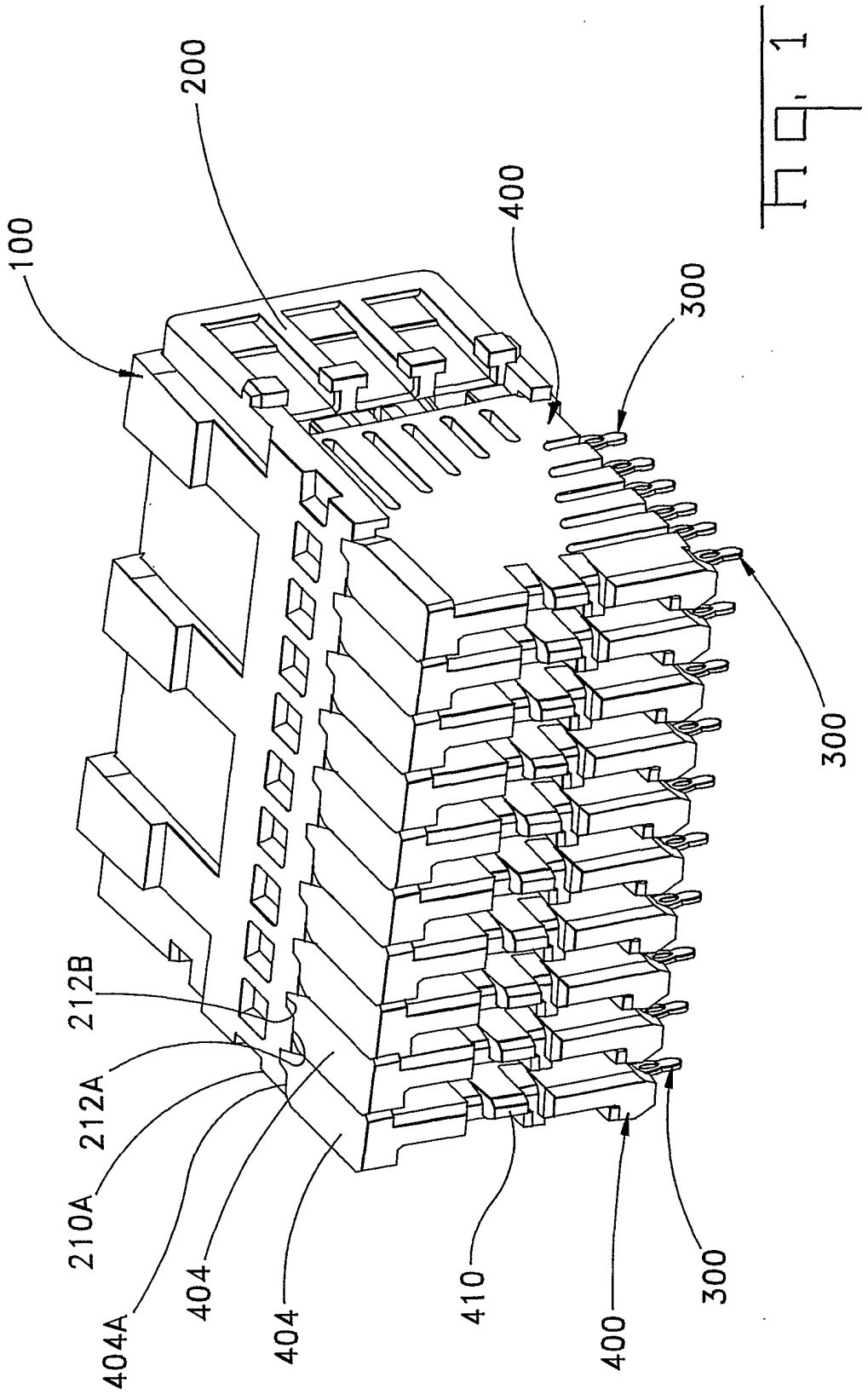
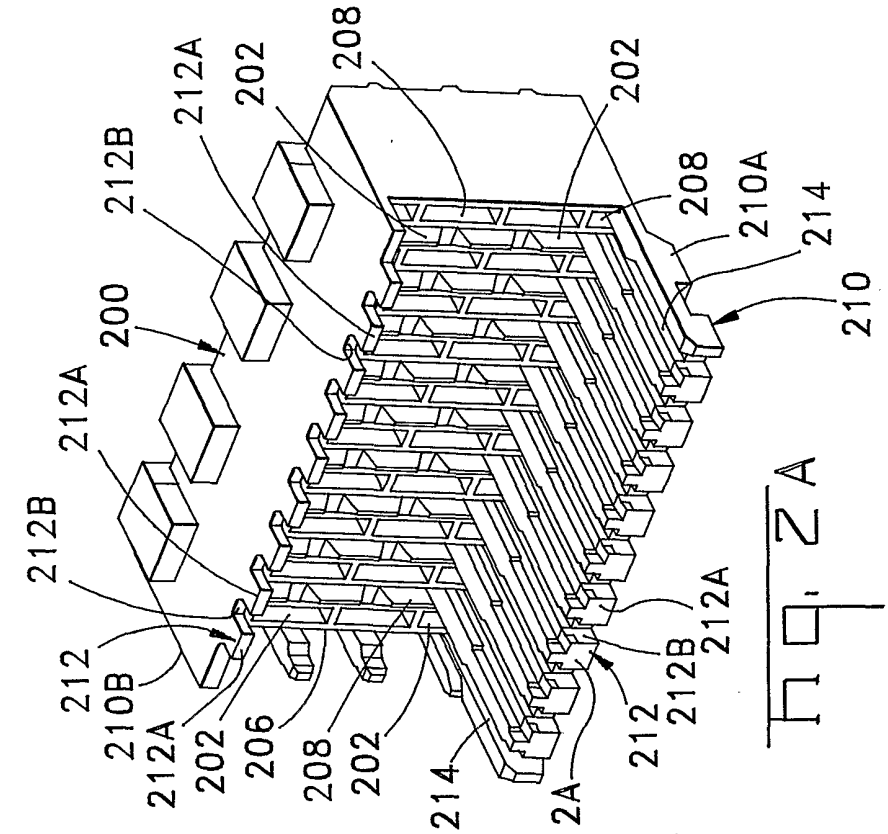


Fig. 1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212A
212B
200
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210B
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214
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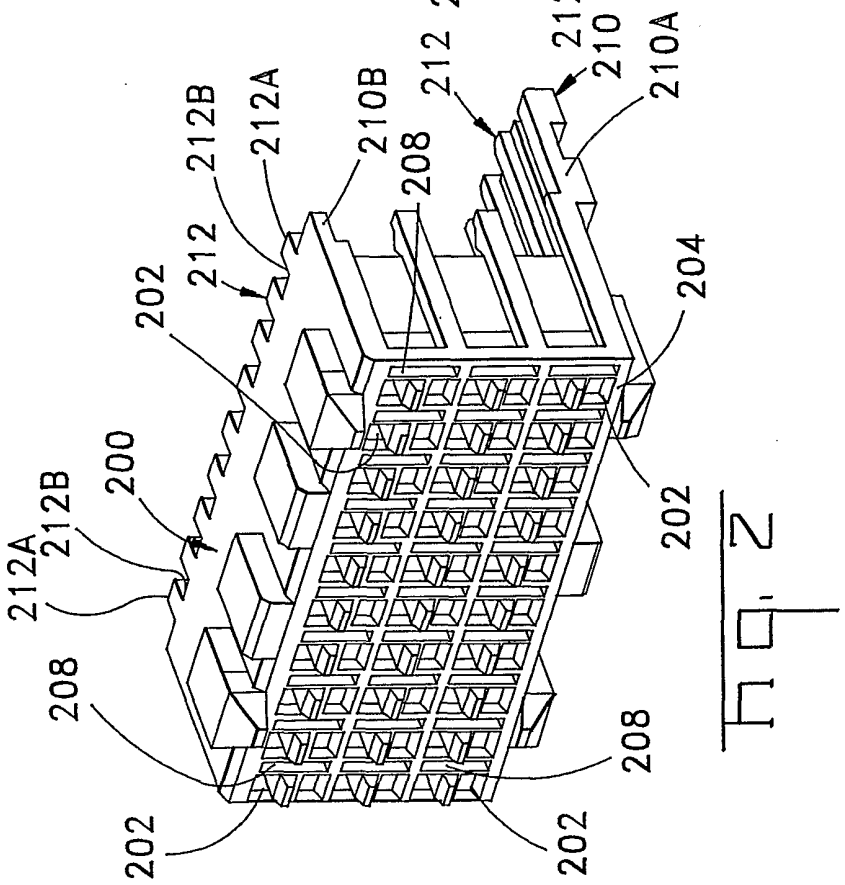
210A

Fig. 2A


212
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204
202
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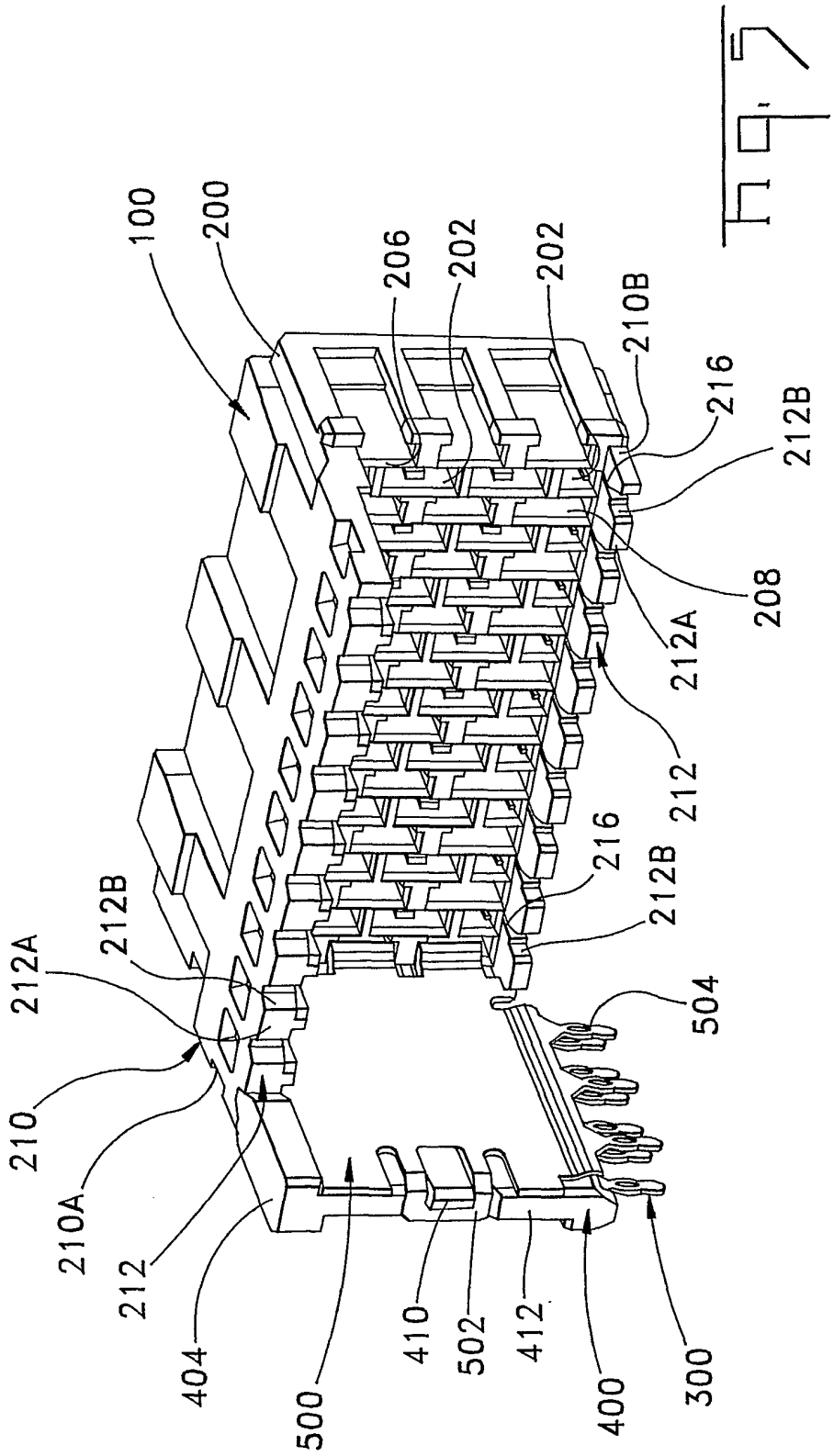
212A
212B

Fig. 2


100
200
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202
202
210B
216
212B
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212A
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216
212B
212B
212A
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210
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212
404
500
410
502
412
400
300

FIG. 5

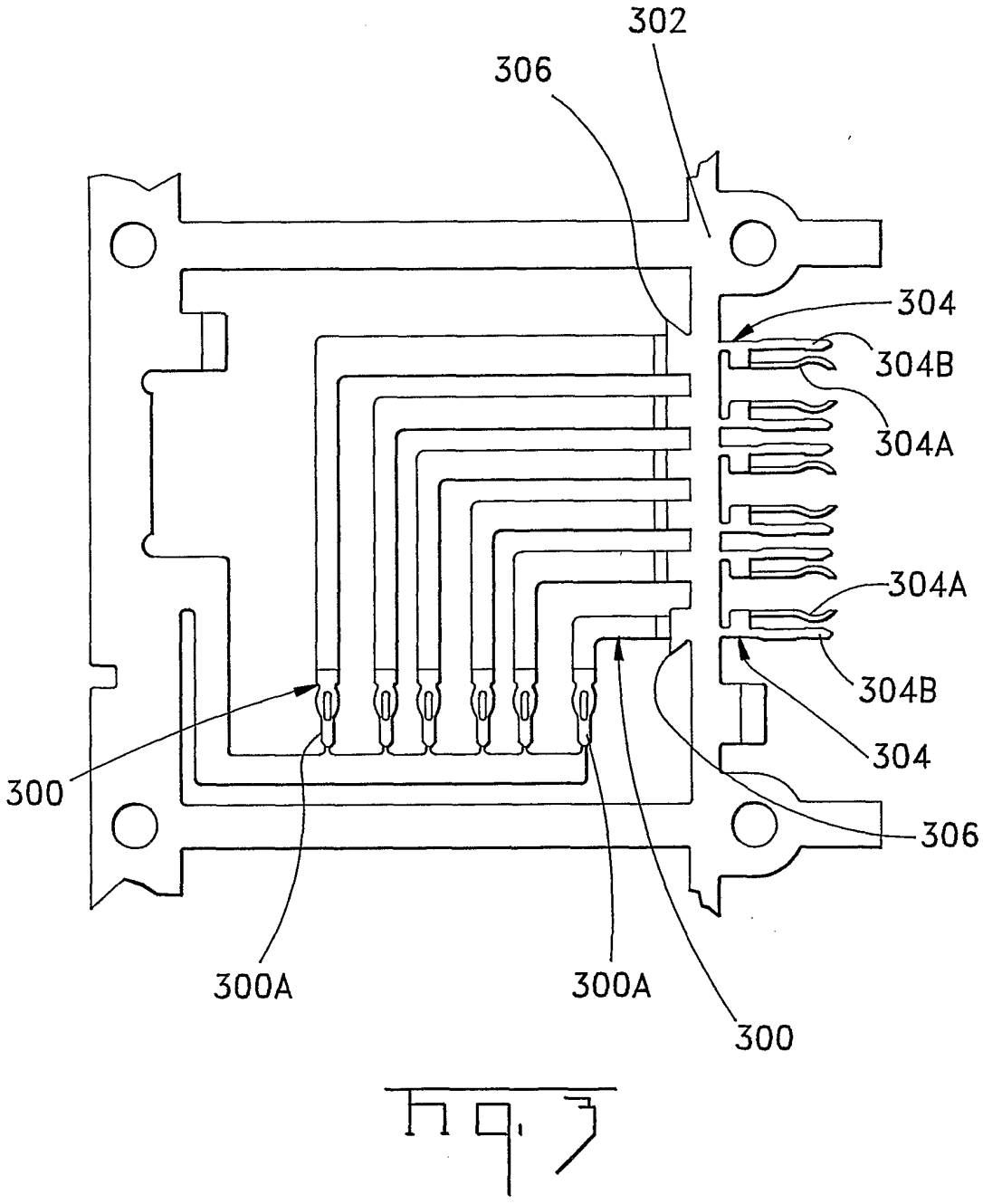
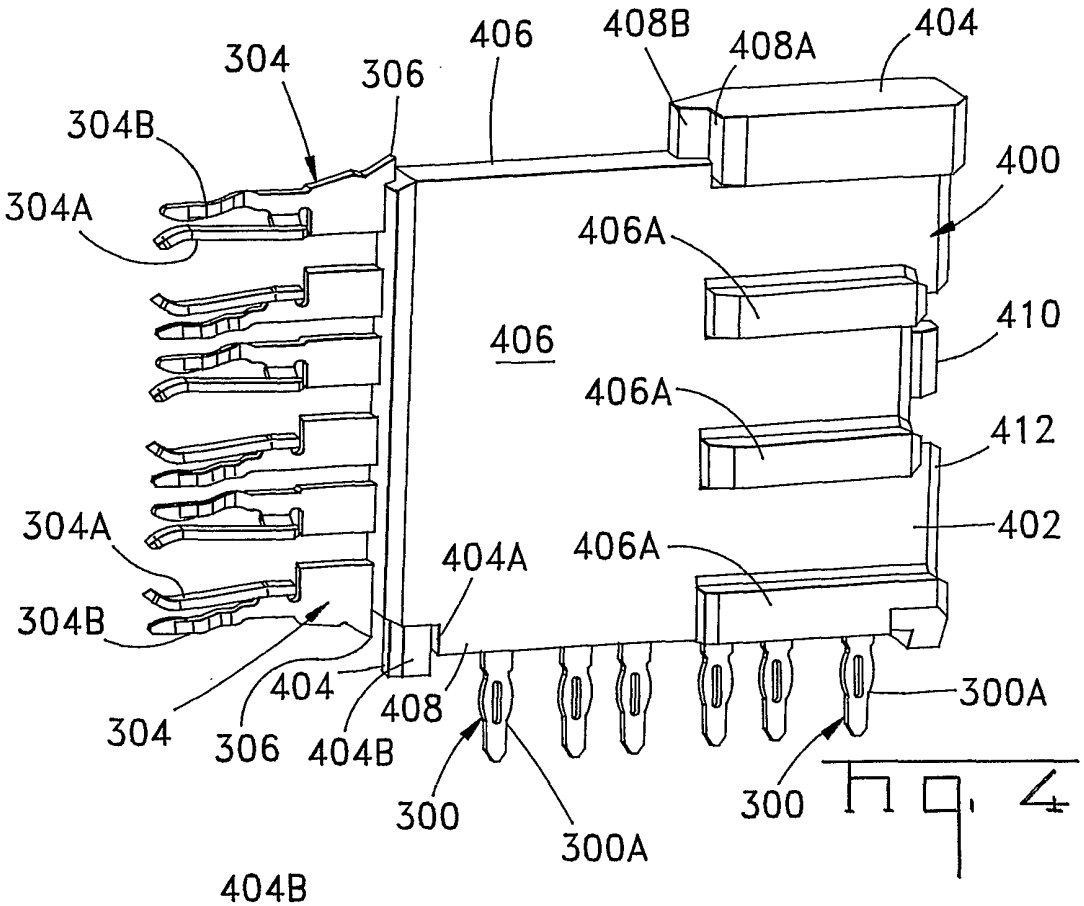


Fig. 3


304
306
406
408B
408A
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304B
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304A
406A
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410
406A
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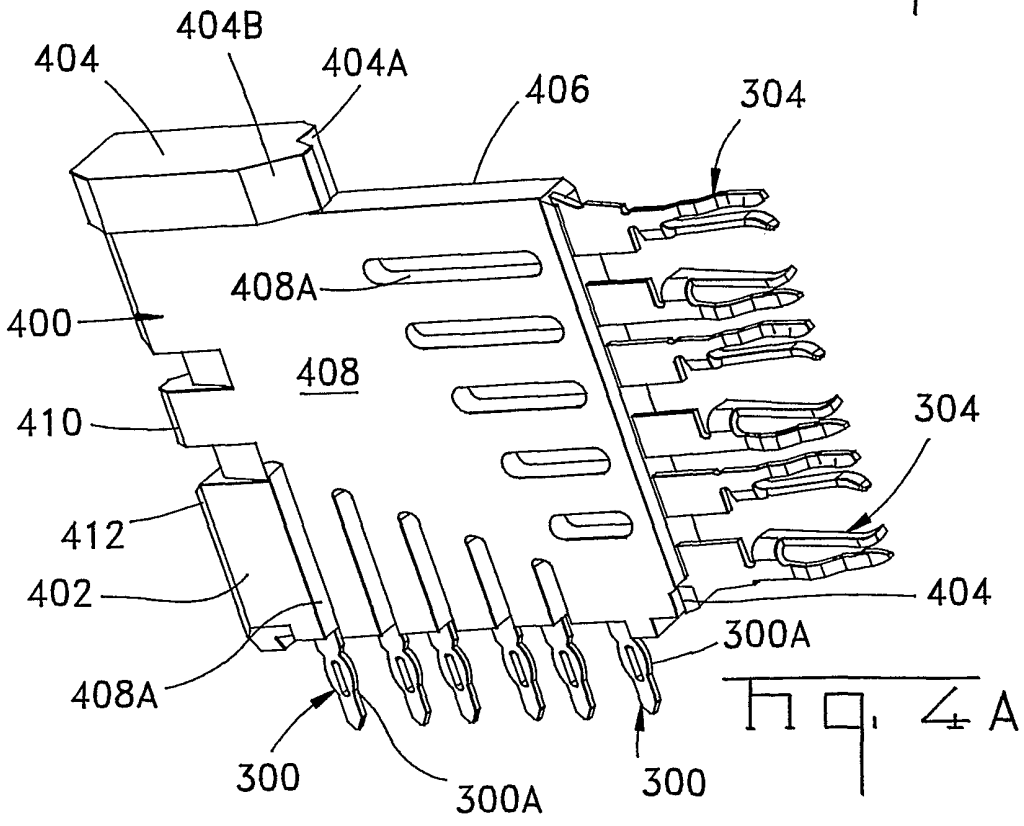
306
404B
300
300A
300
300A

Fig. 4


404B
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300A
300

Fig. 4A

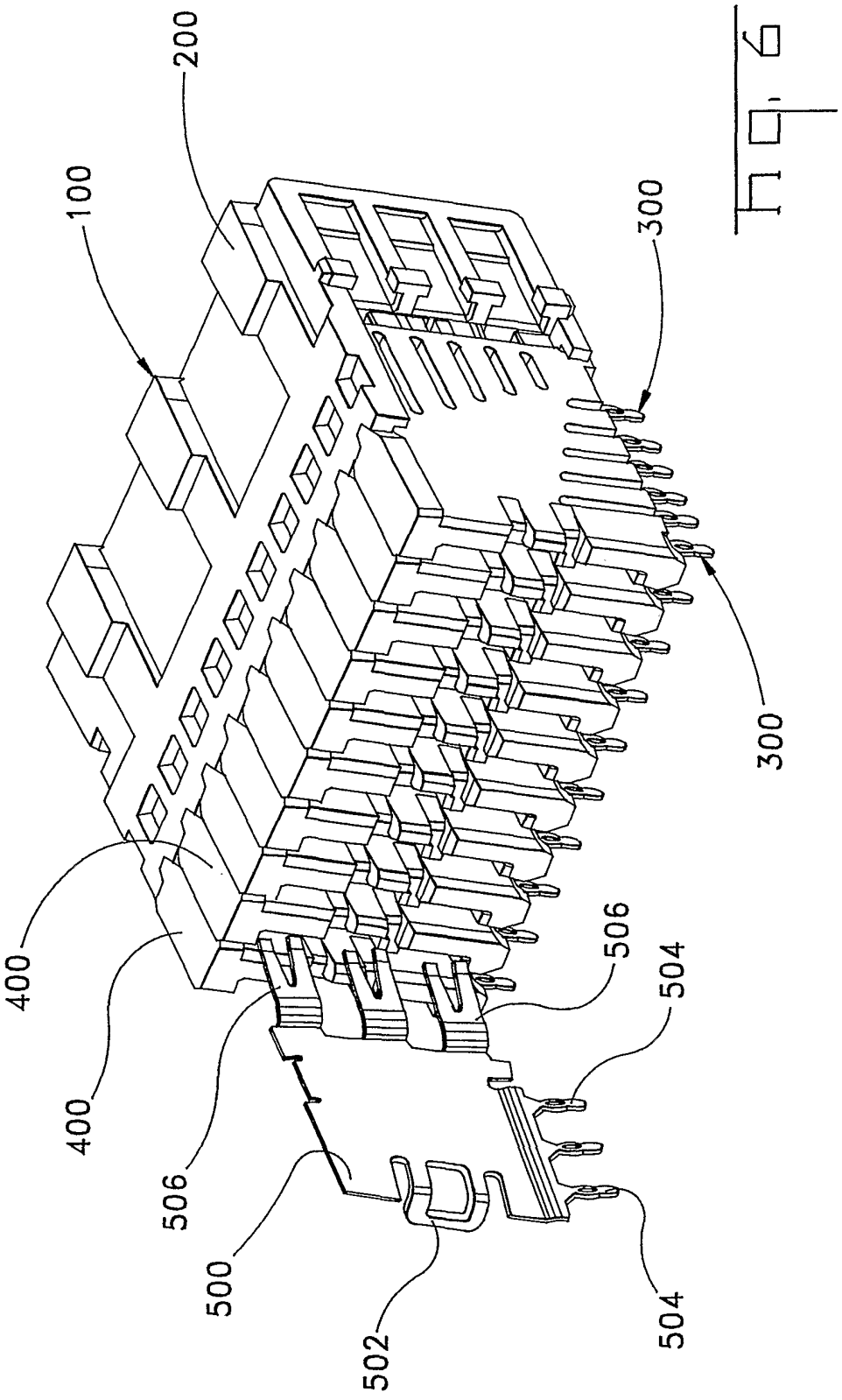

Fig. 6

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/US 01/12231

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01R12/20

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01R

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 665 612 A (ROBINSON NUGENT INC) 2 August 1995 (1995-08-02) column 7, line 15 -column 10, line 6	1-8
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A	WO 99 09616 A (BERG TECH INC ;SHUEY JOSEPH B (US); STONER STUART C (US)) 25 February 1999 (1999-02-25) page 6, line 2 -page 14, line 18	1-8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
1 August 2001	10/08/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Demol, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intl ional Application No
PCT/US 01/12231

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