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H1R RBE RBK

(56) Documents Cited
GB 1343868 A **GB 1156434 A** **EP 0124029 A**
WO 81/03734 A **US 5179503 A** **US 4933808 A**
US 4872102 A **US 4764847 A** **US 3909679 A**

(58) Field of Search
UK CL (Edition R) **H1R RBK RBM**
INT CL⁷ **H05K**

(54) Abstract Title
Assembly for electrical/electronic components

(57) An assembly for electrical/electronic components 10 has one or more component carriers 6 arranged to mate with a receiving station 3 provided in a heatsink body 2 and be in thermal communication contact with the heatsink body. Electrical or electronic components 10 are carried by the component carrier and an electrical contact arrangement 11,13 for a respective component/component carrier sub-assembly, is configured for connection to an electric/electronic circuit 14. The circuit 14 may be operable in different modes depending on the nature and/or arrangement of the components 10.

FIGURE 1

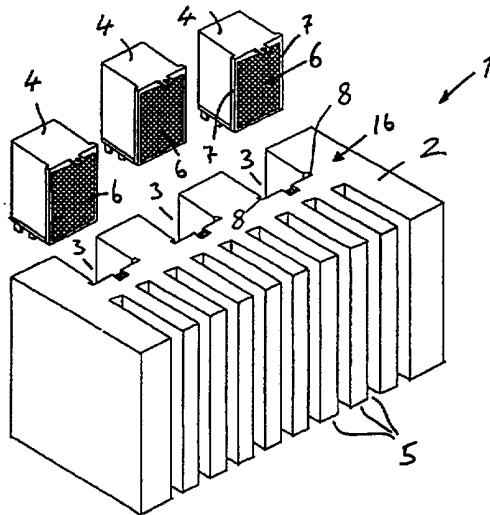


FIGURE 3

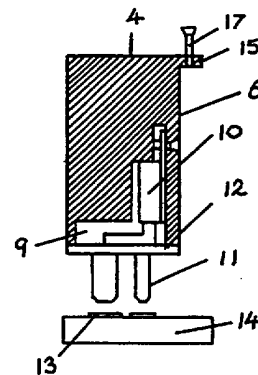


FIGURE 1

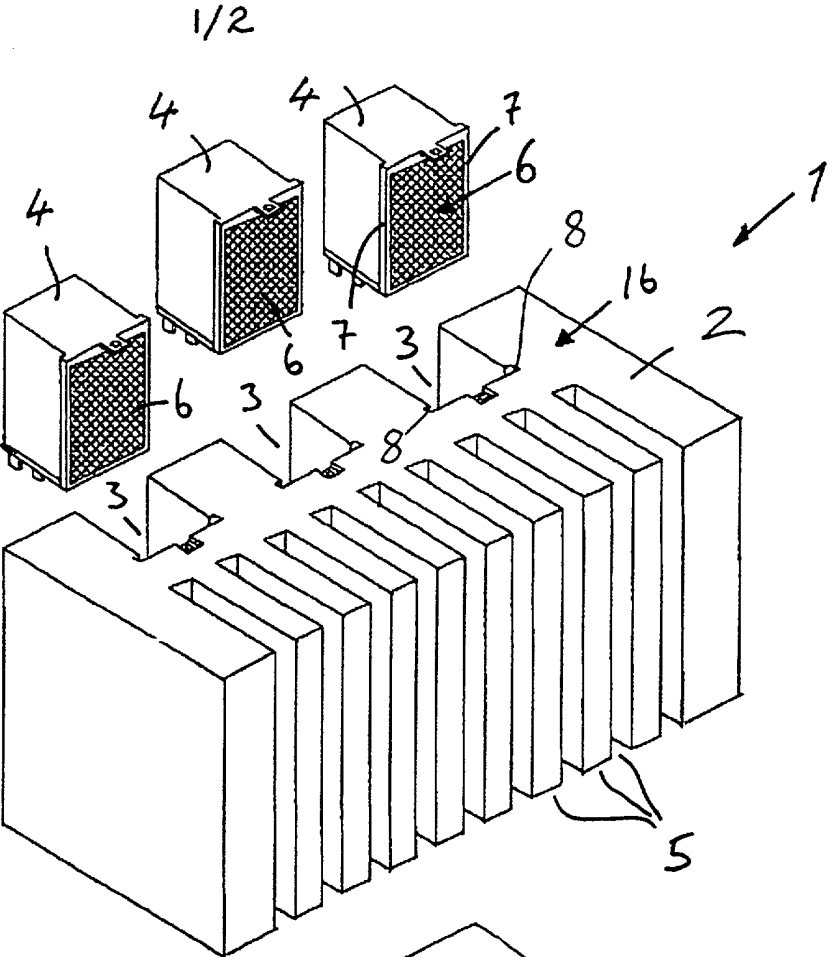


FIGURE 2

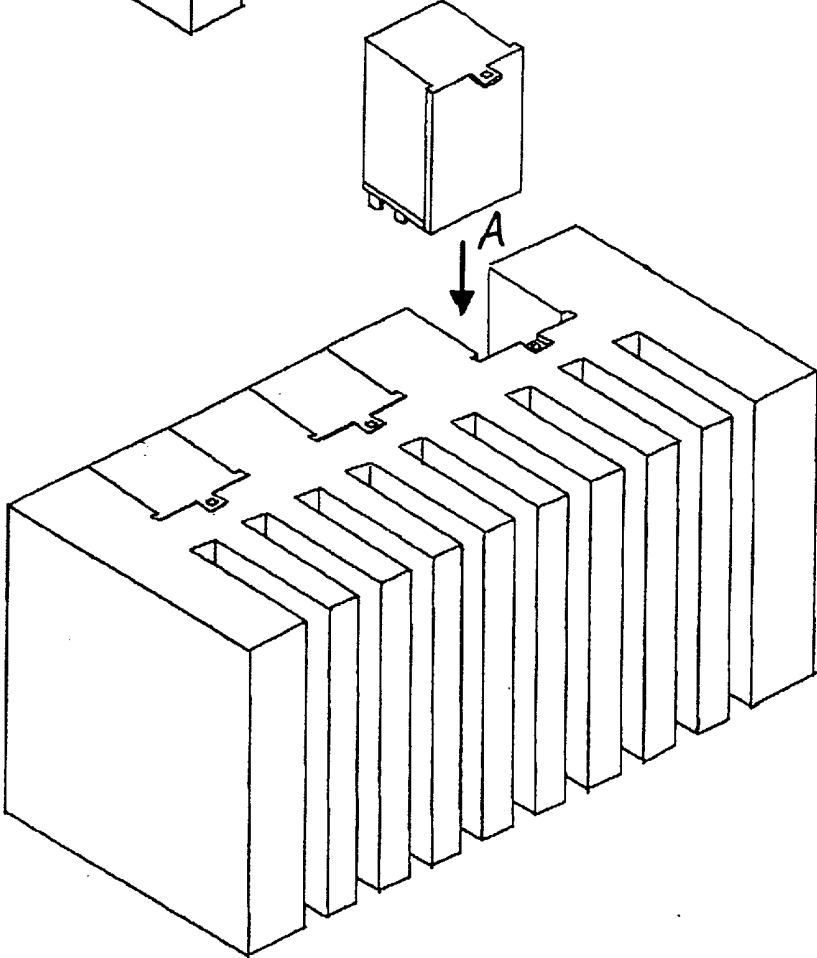


FIGURE 3

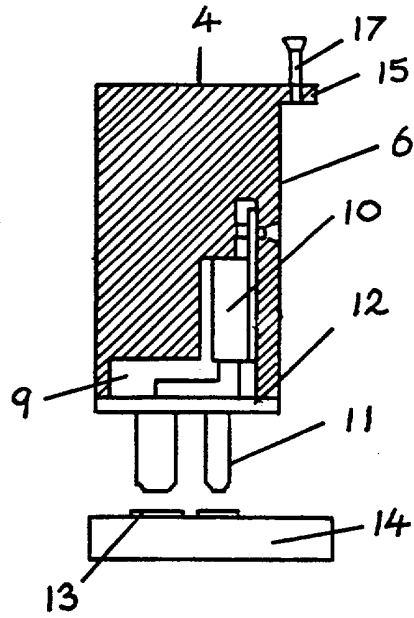
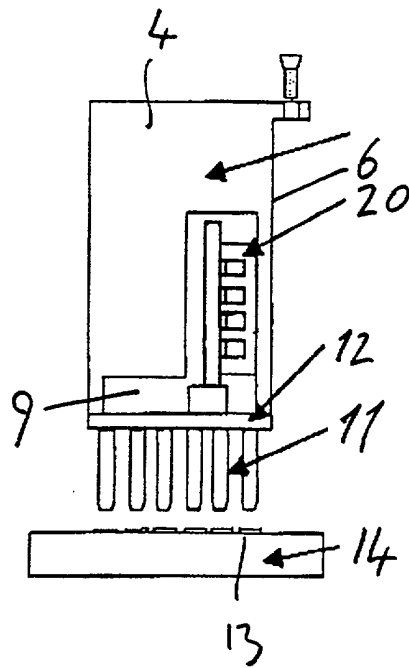


FIGURE 4



Assembly for Electrical/Electronic Components

5 The present invention relates to an assembly for
electrical/electronic components.

10 Increasingly electronic systems are prevalent in automotive
and other products. The need for convenient maintenance and
ease of upgradability is critical to maintain continuity of
use, and reduce operating costs. Problems with current
assemblies and systems exist. For example in the situation
of a component installed onto a printed circuit board and
fitted with a heatsink, if the component fails, the service
engineer has to disassemble the main unit, detach the
15 component from the heatsink and desolder the part from the
circuit board. The resultant effect of this could be
reduced reliability of the circuit board due to heat
damage, damaged conductor tracks, lifted pads, heat
stressed electronics etc.

20

An improved assembly has now been devised.

25 According to a first aspect, the invention provides an
assembly for electrical/electronic components, the assembly
comprising:

- i) a heatsink body including a plurality of
receiving stations;
- 30 ii) one or more component carriers arranged to mate
with a respective receiving station and be in

thermal communication contact with the heatsink body;

5 iii) a respective electrical and/or electronic component carried by a respective component carrier; and,

10 iv) an electrical contact arrangement for a respective component/component carrier sub-assembly, the electrical contact arrangement configured for connection to an electric/electronic circuit.

15 Separate receiving stations desirably have substantially uniform receiving configurations, a respective component carrier arranged to mate with a plurality of respective receiving stations. In this way uniformly configured component carriers may be mated with different uniformly configured receiving stations depending upon system requirements. Various different components may also be carried by standard, uniformly configured component carriers permitting different components to be easily interchanged or replaced.

25 Beneficially, the assembly further comprises an electrical/electronic circuit positioned adjacent the component/component carrier sub assembly arrangement, the electrical contact arrangement of respective component/component carrier sub-assemblies, contacting with
30 the electrical/electronic circuit (preferably when the component carriers are fully mated with respective

receiving stations).

5 The electrical contact between the electrical contact arrangement of respective component/component carrier sub-assemblies, and the electrical/electronic circuit is preferably non-soldered/non-fused contact. This provides enhanced ease of replacement/interchangeability of component/component carrier sub-assemblies, and minimises the risk of circuit damage during disassembly and replacement.

10 The electrical/electronic circuit is preferably configured to be operable in different operational set-up configurations, desirably depending upon:

- 15
- i) the nature of the electrical/electronic component or components comprising the assembly; and/or
 - ii) the placement configuration of component/
- 20 component carrier sub-assemblies in respective receiving stations of the heatsink body.

25 Beneficially, in a first set-up operational configuration, one or more portions of the circuit are operationally redundant and in a second set-up operational configuration other portions of the circuit operationally are redundant. This facility enables a single master circuit to be used for a number of different operational requirements. The use to which the circuit can be put depends upon the

30 components used in the component/ component carrier sub-assembly, and the placement configuration in the receiving

stations of the heatsink body.

The receiving stations are preferably provided in a row along the heatsink body.

5

The component carriers are desirably arranged to be a push or slide fit with a respective receiving station. Preferably, the receiving stations comprise a recess, slot or channel within which the respective component carriers are received. In a preferred embodiment, the receiving stations comprise respective seats within which the respective component carriers are seated.

10

Beneficially, the component carriers may be mated with and retracted from respective receiving stations in common mating and retraction directions. Preferably, when mated with respective receiving stations, respective component carriers are accessible from a common access side of the heatsink body for removal (retraction) and replacement. Such an arrangement provides enhanced access to components for replacement or inspection.

15

20

The component carrier and respective receiving station preferably include respective complementary engaging receiving formations arranged to enhance retention of the component carrier with the receiving station when the component carrier is mated with the receiving station. A sliding tongue and groove configuration is suitable for this purpose.

25

30

The component carrier preferably includes an internal

cavity for receiving the electrical/electronic component. The component carrier beneficially includes a highly heat conductive heat transfer surface arranged to dissipate heat from the component to the heat sink body. The heat
5 conductive heat transfer surface of the component carrier is preferably substantially planar.

The heatsink body beneficially includes heat dissipation means arranged to enhance heat dissipation from the
10 heatsink body to atmosphere. The heat dissipation means preferably comprises a heat dissipation zone of greater atmosphere contacting surface area per unit volume of the heatsink than other areas. The heat dissipation means desirably includes heat dissipation formations such as fins
15 louvres or the like.

In a preferred embodiment the receiving stations are provided in a row along the heatsink body, the heat dissipation means comprising a heat dissipation zone
20 extending adjacent the row of receiving stations.

The heatsink body preferably comprises a monolithic body (preferably metallic) of heat conductive material.

25 An important aspect of the invention is also the facility for a 'standard' circuit to be utilised to perform different output functions dependant upon the assembly design. Accordingly, a further aspect of the invention
30 provides an assembly for electrical/electronic components, the assembly comprising:

i) a retainer body including a plurality of receiving stations;

5

ii) one or more component carriers arranged to mate with a respective receiving station;

iii) a respective electrical and/or electronic component carried by a respective component carrier;

10

iv) an electrical contact arrangement for a respective component/component carrier sub-assembly;

15

v) an electrical/electronic circuit positioned adjacent the component/component carrier sub-assembly arrangement, the electrical contact arrangement of respective component/component carrier sub-assemblies contacting with the electrical/electronic circuit, the electrical electronic circuit being configured to be operable in different operational modes depending upon:

20

25

i) the nature of the electrical/electronic component or components comprising the assembly; and/or

30

ii) the placement configuration of component/component carrier sub assemblies in respective receiving stations of the

5 heatsink body, wherein in a first operational configuration, certain portions of the circuit are operationally redundant and in an alternative operational configuration other conductive tracks of the circuit are redundant.

10 The invention will now be further described in a specific embodiment, by way of example only, and with reference to the accompanying drawings, in which:

15 Figure 1 is a perspective view of an exemplary embodiment of an assembly according to the invention in an un-assembled condition;

Figure 2 is a perspective view of the assembly of figure 1, partially assembled;

20 Figure 3 is a schematic sectioned view of a component/component carrier sub-assembly; and,

25 Figure 4 is a schematic sectioned view of an alternative embodiment of component/component carrier sub-assembly.

30 Referring to the drawings, an exemplary assembly 1 according to the invention includes a main heatsink body 2, of cast or extruded metal profile including a row of seating recesses 3 each arranged to receive a corresponding respective mini-heatsink component carrier 4 (as will be described in detail below).

Adjacent the row of seating recesses 3 there is formed a heat dissipation zone comprising an array of spaced fins 5. The respective mini-heatsink component carriers 4 include a thermally conductive heat transfer surface 6 which, in use, thermally abuts the rear wall of respective seating recesses 3.

Marginal tongue portions 7 of the component carrier 4 are shaped and dimensioned to be a sliding fit in complementary marginal groove portions 8 adjacent the rear wall of the respective seating recess 3. The component carriers 4 are introduced to be matingly received in the seating recesses 3 by means of sliding engagement (in the direction of arrow A in Figure 2). The tongue 7 and groove 8 arrangement serves to aid retention of the component carrier 4 within the respective seating recess 3.

As will be readily appreciated from the drawings, the respective component carriers 4 are of uniform, standard, configuration (and therefore interchangeable) and arranged to be received in the complimentary standard configuration seating recesses 3 provided on the main heatsink body 2.

Referring now to Figures 3 and 4, there are shown alternative arrangements of electronic component within respective internal cavities 9 of the standard, uniform configuration component carriers 4. In the embodiment shown in Figure 3, the electronic component 10 is connected to a two-pin terminal arrangement 11 provided for the component 10/component carrier 4 sub-assembly. The two-pin terminal arrangement 11 supported on terminal carrier 12 is

arranged (when the component carrier 4 is mated within the
respective seating recess 3) to contact respective circuit
contacts 13 provided on an electrical/electronic circuit
mounted directly below the row of recesses 3. In this way,
5 the electrical/electronic circuit 14 operationally includes
the component 10 carried by component carrier 4 (when the
component carrier 4 is fully mated within the seating
recess 3). A lip 15 (provided with a screw through bore)
locates within corresponding receiving recess provided for
10 each seating recess 3 on the upper surface 16 of heatsink
body 2 to ensure accurate seating and location. A fixing
screw 17 is provided to ensure secure location; the fixing
screw is easily removable for permitting selective removal
of the component carrier 4 for replacement, component
15 inspection or the like.

An important feature of the arrangement is that good
contact between the terminals 11 of the terminal carrier 12
and the terminals 13 is ensured, without the need for
20 soldering. This ensures that soldered links are not
required to be created when introducing components, nor is
there a requirement to break soldered links when replacing
or inspecting components.

25 Referring to the component carrier 4/component 20 sub-
assembly shown in Figure 4, the recess 9 receives and
locates an integrated circuit semiconductor component 20.
A multi-pin terminal array 11 is provided for the terminal
carrier element 12, and the required connections are
30 included between the input/output to the integrated circuit
20 and the terminal array 11. The terminal array 11 is

configured to contact with the corresponding multi contact array 13 on the underlying circuit board 14.

5 In both embodiments shown, heat is conducted from the component 10/20 to the heat transfer wall 6 for subsequent dissipation to the main heatsink 2 and ultimately, dissipation to the atmosphere via heat transfer fins 5.

10 The invention provides the possibility of interchangeable, modular component carrying units 4 to be used to "buildup" a modular circuit having the desired/required characteristics for predetermined function performance.

15 The underlying circuit board 14 may be provided with a multi-purpose circuit or link track (including a number of different connection terminal arrays 13). Certain portions of the track may be redundant for certain applications, in which case no component/component carrier sub-assembly (or a sub-assembly with dummy contacts) will be provided to
20 contact with the relevant connection terminal arrays 13. Other portions of the circuit will be active and respective terminal arrays 13 in active portions of the circuit will be contacted by terminals 11 connecting with active components 10/20 carried by respective component carriers
25 4 positioned in the seating recesses 3 of the main heatsink body 2.

30 In view of the modularity of the system with commonality of configuration of the component carriers 4 and seating recesses 3, the system is extremely flexible in terms of adaptability of use, and also provides ease of component

removal from the main heatsink body 2 for inspection and/or replacement.

Specific advantages of the invention are as follows:

5

i) The assembly may be used with any semiconductor or other component to reduce maintenance and service time of electronic equipment where heatsinks are present.

10

ii) The assembly eliminates the need to solder the semiconductor or other component directly to a main circuit board.

15

iii) The assembly can be used to insert various customised circuits into a system without the need to re-engineer the main circuit board.

20

iv) The use of a modular assembly permits a number of miniature heatsinks to be located on one main heatsink.

25

v) The assembly is able particularly suited for use in confined spaces, since the only limiting factor for undertaking maintenance is being able to see the top of the required miniature heatsink. This gives the benefit, that the main unit will not have to be removed from its installation position for maintenance, repair or the like.

30

vi) Over the life of the product, the assembly offers a potential cost saving.

vii) The assembly offers improved product quality as the main unit will not require dismantling.

5

The invention is particularly suited for implementation in electrical/electronic systems for automotive use where space is at a premium (within the engine compartment/dash area) and also the interchangeability of components can be useful where different performance characteristics are required for different models of vehicle and the like. The arrangement of heat transfer to the heatsink is also important in vehicle applications where heat shielding of electronic components is important because of the high level of heat energy produced within the vehicle engine compartment.

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Claims:

1. An assembly for electrical/electronic components, the
5 assembly comprising:
- i) a heatsink body including a plurality of
receiving stations;
 - 10 ii) one or more component carriers arranged to mate
with a respective receiving station and be in
thermal communication contact with the heatsink
body;
 - 15 iii) a respective electrical and/or electronic
component carried by a respective component
carrier; and,
 - 20 iv) an electrical contact arrangement for a
respective component/component carrier sub-
assembly, the electrical contact arrangement
configured for connection to an
electric/electronic circuit.
- 25 2. An assembly according to claim 1, wherein separate
receiving stations have substantially uniform
receiving configurations, a respective component
carrier being arranged to mate with a plurality of
respective receiving stations.
- 30 3. An assembly according to claim 1 or claim 2 further

comprising an electrical/electronic circuit positioned adjacent the component/component carrier sub assembly arrangement, the electrical contact arrangement of respective component/component carrier sub-assemblies, contacting with the electrical/electronic circuit.

5

4. An assembly according to claim 3, wherein the electrical contact arrangement of respective component/component carrier sub-assemblies, contact with the electrical/electronic circuit when the component carriers are fully mated with respective receiving stations.

10

5. An assembly according to claim 3 or claim 4, wherein the electrical contact between the electrical contact arrangement of respective component/component carrier sub-assemblies, and the electrical/electronic circuit is non-soldered/non-fused contact.

15

6. An assembly according to any of claims 3 to 5, wherein the electrical electronic circuit is configured to be operable in different operational modes depending upon:

20

i) the nature of the electrical/electronic component or components comprising the assembly; and/or
ii) the placement configuration of component/component carrier sub assemblies in respective receiving stations of the heatsink body.

25

7. An assembly according to claim 6, wherein in a first

30

set-up operational configuration, one or more portions of the circuit are operationally redundant and in a second set-up operational configuration other portions of the circuit operationally are redundant.

5

8. An assembly according to any preceding claim, wherein the receiving stations are provided in a row along the heatsink body.

10

9. An assembly according to any preceding claim, wherein the component carriers are arranged to be a push or slide fit with a respective receiving station.

15

10. An assembly according to any preceding claim, wherein the receiving stations comprise a recess, slot or channel within which the respective component carriers are received.

20

11. An assembly according to any preceding claim, wherein the receiving stations comprise respective seats within which the respective component carriers are seated.

25

12. An assembly according to any preceding claim, wherein the component carriers are mated with and retracted from respective receiving stations in common mating and retraction directions.

30

13. An assembly according to claim 12, wherein when mated with respective receiving stations, respective

component carriers are accessible from a common access side of the heatsink body.

- 5 14. An assembly according to any preceding claim, wherein the component carrier and respective receiving station include respective complementary engaging receiving formations arranged to enhance retention of the component carrier with the receiving station when the component carrier is mated with the receiving station.
- 10 15. An assembly according to any preceding claim, wherein securing means is provided arranged to secure respective receiving stations and component carriers when fully mated.
- 15 16. An assembly according to claim 15 wherein the securing means comprises a mechanical fixing.
- 20 17. An assembly according to any preceding claim wherein the component carrier includes an internal cavity for receiving the electrical/electronic component.
- 25 18. An assembly according to any preceding claim, wherein the component carrier includes a heat conductive heat transfer surface arranged to dissipate heat from the component to the heat sink body.
- 30 19. An assembly according to claim 18, wherein the heat conductive heat transfer surface of the component carrier is substantially planar.

20. An assembly according to any preceding claim, wherein the heatsink body includes heat dissipation means arranged to enhance heat dissipation from the heatsink body to atmosphere.

5

21. An assembly according to claim 20, wherein the heat dissipation means comprises a heat dissipation zone of greater atmosphere contacting surface area per unit volume of the heatsink than other areas.

10

22. An assembly according to claim 20 or 21, wherein the heat dissipation means includes heat dissipation formations such as fins louvres or the like.

15

23. An assembly according to any of claims 20 to 22, wherein the receiving stations are provided in a row along the heatsink body, the heat dissipation means comprises a heat dissipation zone extending adjacent the row of receiving stations.

20

24. An assembly according to any preceding claim, wherein the heatsink body comprises a monolithic body of heat conductive material.

25

25. An assembly according to any preceding claim, wherein the heatsink body comprises a metallic material.

30

26. An assembly for electrical/electronic components, the assembly comprising:

i) a retainer body including a plurality of receiving stations;

5 ii) one or more component carriers arranged to mate with a respective receiving station;

10 iii) a respective electrical and/or electronic component carried by a respective component carrier;

iv) an electrical contact arrangement for a respective component/component carrier sub-assembly;

15 v) an electrical/electronic circuit positioned adjacent the component/component carrier sub-assembly arrangement, the electrical contact arrangement of respective component/component carrier sub-assemblies contacting with the electrical/electronic circuit, the electrical electronic circuit being configured to be operable in different operational modes depending upon:

25 i) the nature of the electrical/electronic component or components comprising the assembly; and/or

30 ii) the placement configuration of component/component carrier sub assemblies in

respective receiving stations of the
heatsink body, wherein in a first
operational configuration, certain portions
of the circuit are operationally redundant
and in an alternative operational
configuration other conductive tracks of the
circuit are redundant.

5

27. An assembly substantially as herein described with
reference to the accompanying drawings.

10



Application No: GB 9921307.6
Claims searched: 1-25

Examiner: R C Squire
Date of search: 29 March 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.R): H1R (RBK, RBM)
Int Cl (Ed.7): H05K
Other:

Documents considered to be relevant:

Table with 3 columns: Category, Identity of document and relevant passage, Relevant to claims. Rows include GB 1156434 (IBM), EP 0124029A (SIEMENS), WO 81/03734A (DIGITAL), US 4872102 (GETTER), US 4764847 (EISENBLATTER), and US 3909679 (PETRI).

Legend table with 2 columns: Category and Description. Includes categories X, Y, &, A, P, E with their respective meanings.



20



Application No: GB 9921307.6
Claims searched: 26

Examiner: R C Squire
Date of search: 30 November 2000

Patents Act 1977 Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.R): H1R (RBK, RBE, RBG, RBW)
Int Cl (Ed.7): H05K
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 1343868 SONCINI	
A	US 5179503 FOUTS	
A	US 4933808 HORTON(see particularly col.5 lines 5-24)	

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.