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(54) **Electrical circuit assemblies**

(57) A sub-assembly unit for a circuit assembly comprises a planar substrate 10, with at least one component or module 13 supported on at least one major surface 11 of the substrate, together with possibly a lead retaining member 16 the lead 14 of the modules being shaped to form the contact surface of a plug, or socket, including, at least part of the substrate and/or the lead retaining member, if provided, and to co-operate with an associated socket, or plug, respectively, to complete the circuit assembly, the terminals of the component or module within the circuit assembly and of the circuit assembly, being provided by the contact parts 21 of the associated socket, or plug.

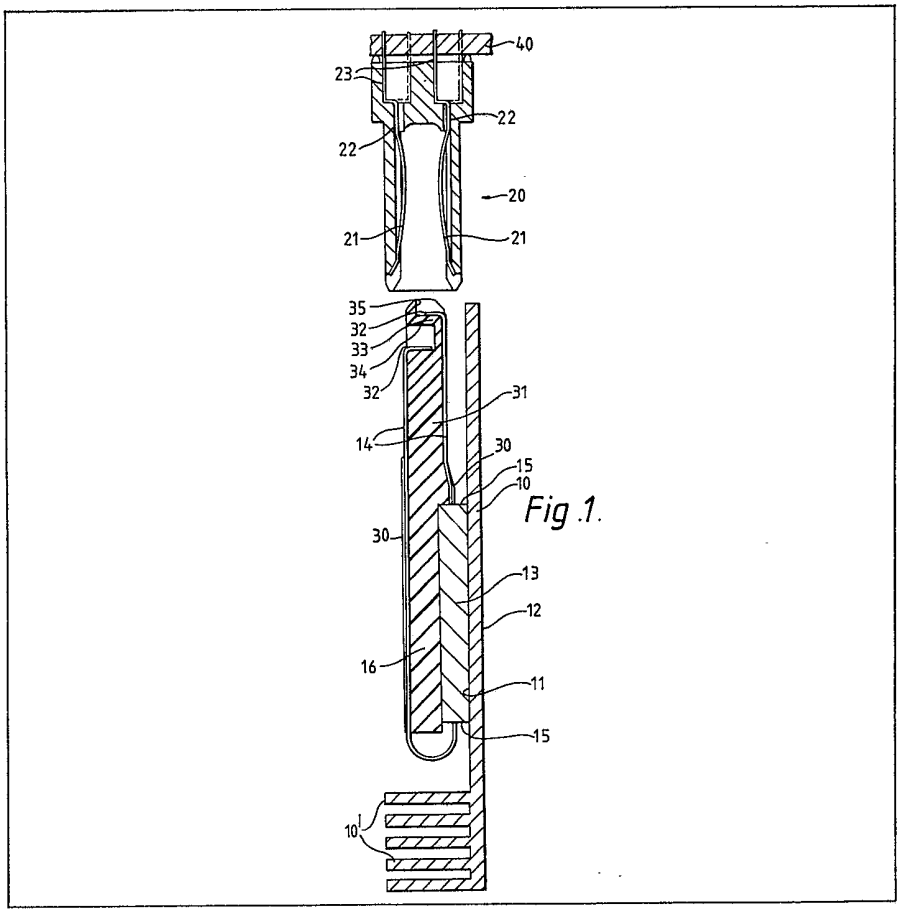

Fig .1.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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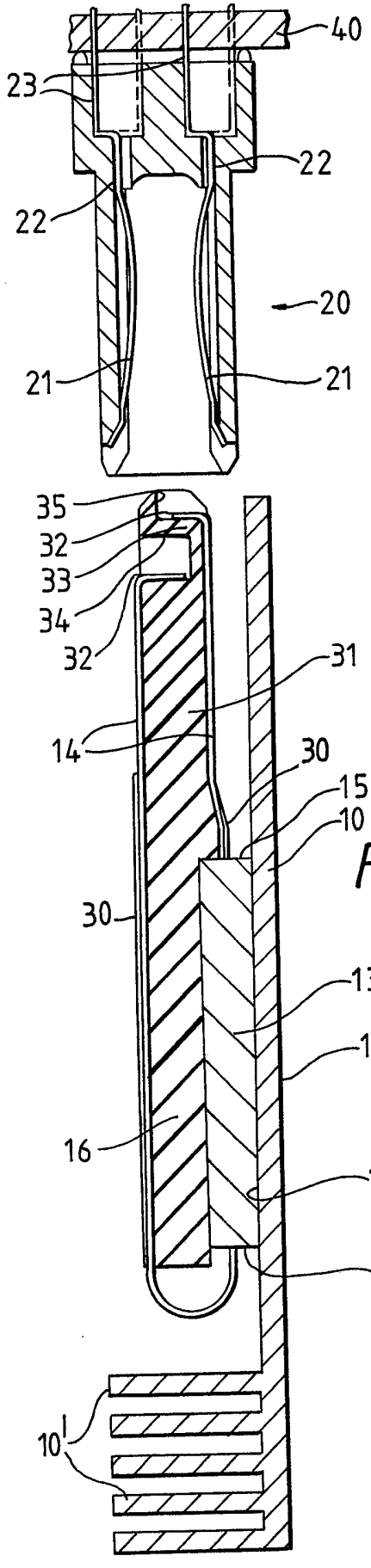

Fig .1.

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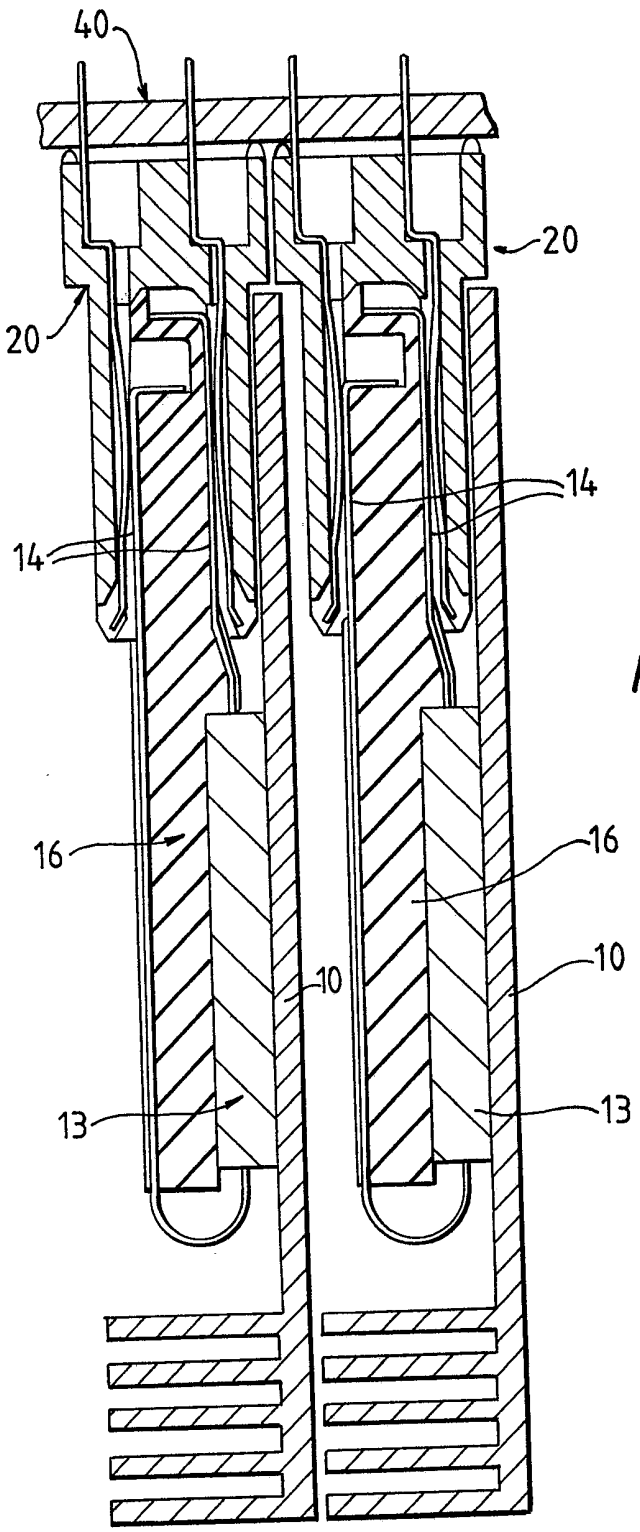

Fig.2.

SPECIFICATION

Electrical circuit assemblies

This invention relates to electrical circuit assemblies, and in particular to sub-assembly units of such circuit assemblies, each sub-assembly unit having at least one component or module with leads extending therefrom, and an at least substantially planar substrate upon which each constituent component and/or module is supported, possibly the at least substantially planar substrate comprising a heat sink.

It is an object of the present invention to provide a sub-assembly unit of such a circuit assembly, the sub-assembly unit having a construction which facilitates the provision of required electrical interconnections between the leads extending from each constituent component and/or module and terminals for the component or module provided within the circuit assembly.

According to the present invention a sub-assembly unit for a circuit assembly, the sub-assembly unit comprising an at least substantially planar substrate, on at least one major surface of which substrate is supported at least one component or module with leads extending therefrom, the leads extending generally parallel to the plane of said at least substantially planar substrate, there is also provided within the sub-assembly unit means both to retain and to locate the leads of said at least one component or module, so that the leads comprise at least parts of a plug, or of a socket, of an electrical connector, the plug, or socket, being arranged to co-operate, respectively, with an associated socket, or plug, of the electrical connector, the associated socket, or plug, having contact parts both to abut against the leads of the sub-assembly unit, and to provide terminals for the component or module within the circuit assembly.

The means both to retain and to locate the leads of said at least one component or module includes, or comprises, a lead retaining member of electrical insulating material; or the substrate, or comprises both the substrate and a lead retaining member, when the substrate is of electrical insulating material; the substrate and/or the lead retaining member, and the leads, together, comprising at least part of the plug, or socket, provided by the sub-assembly unit.

Any such arrangement according to the present invention facilitates the interconnection between the leads and the terminals for the component or module within the circuit assembly. This obviates the need to provide a printed circuit board for this purpose.

By arranging that the leads extend generally parallel to the plane of the substrate a compact arrangement for the sub-assembly unit, and the circuit assembly, is possible. Usually, each lead extends at least substantially wholly in a common plane, or in one of two spaced, parallel planes in which the leads extend.

The leads are required to be shaped to form the required contact surfaces of the plug or socket.

It is required that the leads of the component or module are located in an accurate manner, at least in the part of the sub-assembly unit to provide part of the electrical connector, and are required to be held securely, at least whilst the electrical connector is being completed.

Within the parts of the sub-assembly unit not to comprise the plug, or socket, the leads may extend within channels provided by the substrate, and/or the lead retaining member, if provided, and within the part of the sub-assembly unit to comprise the plug, or socket, the leads are at least partially exposed beyond the general level of the adjacent surface or surfaces provided by the substrate, and/or the member, and supporting the leads. Further, the ends of the leads may be bent to extend transversely to adjacent contact surfaces provided by the leads, and the lead ends co-operate with an adjacent end portion of the substrate and/or the member to be in interference fit therewith. At least some of said leads ends may be an interference fit within at least one groove provided in said end portion of the substrate and/or the member. In addition, or alternatively, at least some of said lead ends may be an interference fit with the periphery of said end portion of the substrate and/or the member.

When the sub-assembly unit provides a plug, at least a portion of the substrate, and at least a portion of the lead retaining member, if provided, must not enter the associated socket of the electrical connector. If a lead retaining member, is provided it is not essential that a part of the substrate enters the associated socket and comprises part of the plug.

The leads retaining member, when providing at least part of a plug, usually, is at least substantially planar in shape, and possibly extends generally parallel to said at least substantially planar substrate, the leads being retained to extend over at least one major surface of the member.

The lead retaining member may be sufficiently flexible to facilitate the leads extending thereon to be an interference fit with the contact of the associated socket. Hence, the lead retaining member may be of thermoplastics material.

At least the part of the member to enter the associated socket may be spaced from the substrate, for example, the part of the member to enter the associated socket extending beyond the periphery of the substrate.

The leads may be retained to extend over two surfaces of the member. It is not essential that, in such an arrangement, the two member surfaces bearing the leads are major surfaces of an at least substantially planar member.

If the leads are retained to extend over only one surface of the member remote from the substrate, the part of the substrate adjacent to a part of the member to enter the associated socket, and irrespective of whether or not this substrate part bears leads, also may enter the associated socket, and comprise part of the plug, but if leads are provided on the part of the substrate to enter the associated socket, in such an arrangement, they can be provided only on one major surface of the substrate remote from the lead retaining member.

The leads retaining member and said at least one component or module may be provided on opposing major substrate surfaces.

When the leads of said at least one component or module of the sub-assembly unit extend from more than one surface of the component or module, or more than one component and/or module is provided on a common substrate of the sub-assembly unit, it may be convenient to arrange that the leads either extend along two opposing surfaces of the lead retaining member, or along both one surface of the member and one major surface of the substrate.

When more than one component and/or module is provided within a sub-assembly unit according to the present invention, the constituent components and/or modules may be interconnected in any desired manner within the sub-assembly unit, and/or external thereof.

Whether more than one component and/or module is provided on the same major surface of the substrate, or at least one module or component is provided on each of both opposing major surfaces of the substrate of the sub-assembly unit, only one plug, or socket, is provided within the sub-assembly unit. A sole lead retaining member may be provided, and if comprising part of a plug, possibly the member being bifurcated, with parts extending along both opposing major surfaces of the substrate, and a common part extending beyond the periphery of the substrate, or the leads of all the constituent components and/or modules extend either along a common member supported on only one of the opposing major surfaces of the substrate, or along both one surface of the sole member and one major surface of the substrate.

Whether at least one module or component is provided on each of both opposing major surfaces of the substrate, or not, possibly two discrete lead retaining members are provided, with a member supported on each of both opposing major surfaces of the substrate, different members being supported on different major substrate surfaces, the members combining to provide a single plug, or socket.

The arrangment may be such that the associated socket, or plug, is to co-operate with the substrate, at least partially to be secured to the sub-assembly unit thereby.

Instead of providing an at least substantially planar substrate of electrical insulating material, the substrate may comprise a heat sink, incapable of bearing the leads of the constituent modules and/or components of the circuit assembly, and unsuitable to enter the associated socket.

The lead retaining member, when provided, may be secured within the sub-assembly unit in any convenient way, possibly solely by the leads, and/or by the component or module, being secured to the substrate. In addition, or alternatively, the lead retaining member may be secured directly to the substrate, and may be integral with a substrate of electrical insulating material.

Desirably, but not essentially, said at least one module or component, if secured to the substrate, is so secured in a readily detachable manner, and the leads of said at least one module or component also are secured in the sub-assembly unit in a readily detachable manner, to facilitate the replacement of said at least one module or component of the circuit assembly, for example, when faulty. Thus, for example, the leads are provided within channels of the substrate and/or the lead retaining member in a readily detachable manner, by being press fit therein. The arrangement may be such that the lead retaining member, if provided, is removed with the modules and components.

Said at least one component or module of the sub-assembly unit may be secured to the substrate in any convenient way, possibly solely by the leads, and/or by the lead retaining member, if provided, being secured to the substrate.

The leads also may be secured within the sub-assembly unit in any convenient way. When the ends of the leads are bent to be an interference fit with the end portion of the substrate and/or the lead retaining member, it is essential that the substrate, said at least one component or module with the leads extending therefrom, and the lead retaining member, if provided, co-operate with each other in the required manner. In addition, or alternatively, the leads may be clamped within the sub-assembly unit. In any such arrangement the leads may not be secured to a provided lead retaining member, and/or to the substrate, but only are retained and located thereby.

More than one sub-assembly unit, each with a plug, or socket, and according to the present invention, may be provided to share a common at least substantially planar substrate, possibly with the different plugs, or sockets, of the different sub-assembly units being adjacent to different parts of the common substrate and to co-operate with different sockets, or plugs, of electrical connectors. Whether different co-operating sockets, or plugs are provided, or not, possibly the different plugs, or sockets, of the different sub-assembly units are at least partially on both opposing major surfaces of the substrate, there being at least one module or component provided on each of both opposing major surfaces of the common substrate.

According to another aspect the present invention comprises a circuit assembly comprising at least one sub-assembly unit of any one of the forms referred to above, and a socket, or plug, co-operating, respectively, with the plug, or socket, provided by the sub-assembly unit, the co-operating plug and socket to comprise an electrical connector, the co-operating socket, or plug, having contact parts both to abut against the leads of the sub-assembly unit, and to provide within the circuit assembly terminals for the component or module of the sub-assembly unit, these terminals also comprising terminals of the circuit assembly.

There may be an interference fit between the co-operating socket and the plug of the electrical connector.

When more than one sub-assembly unit is provided within a circuit assembly, the constituent sub-assembly units may be interconnected in a desired manner either within the circuit assembly, and/or external thereof. A common substrate may be

provided for the plurality of constituent sub-assembly units. In addition, or alternatively, a common socket, or plug, may be provided to co-operate with the plurality of sub-assembly units of such a circuit assembly.

The arrangement of a circuit assembly according to the present invention is readily contactable by contacting the terminals provided by the co-operating socket, or plug. The terminals may comprise the contact parts of a socket or of a plug of the circuit assembly, to co-operate with an associated plug or socket, respectively, to comprise another electrical connector.

When more than one constituent module and/or component, and/or more than one sub-assembly unit, are provided in a circuit assembly according to the present invention, required electrical interconnections between the constituent components and/or modules, and/or the constituent sub-assembly units, may be provided by an associated circuit assembly, the circuit assemblies so associated with each other to be connected together to form a more complex circuit assembly than any constituent circuit assembly.

According to yet another aspect the present invention comprises a combination of at least one first circuit assembly, each first circuit assembly being of any one of the forms referred to above, at least one second circuit assembly, possibly comprising the associated circuit assembly referred to in the preceding paragraph, and the first and second circuit assemblies are connected together to form a more complex circuit assembly than any constituent circuit assembly.

Said at least one second circuit assembly, if not comprising a circuit assembly of any one of the forms referred to above, may at least include a pattern of conductors on an electrical insulating support, such as a printed circuit board. Modules and/or components of the more complex circuit assembly may be provided in said at least one second circuit assembly.

Alternatively, said at least one second circuit assembly comprises a circuit assembly of any one of the forms referred to above for a first circuit assembly.

With any such arrangement said at least one second circuit assembly may be connected directly to the terminals of said at least one first circuit assembly, or an electrical connector may be provided between each second circuit assembly and each co-operating first circuit assembly, the electrical connector or connectors each possibly having a known form.

The present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a section of a sub-assembly unit, with a module, having leads extending therefrom, mounted on a substantially planar substrate, and comprising one embodiment of a sub-assembly unit according to the present invention, a part of the sub-assembly unit, including the leads, comprising a plug; the Figure also including a section of an associated socket, which socket together with the plug form an electrical connector, the illustrated sub-assembly unit and the associated, and illustrated, socket together comprising one embodiment of a circuit assembly according to the present invention, and

Figure 2 is a section of part of one embodiment of a more complex circuit assembly according to the present invention, than the circuit assembly shown in Figure 1, the more complex circuit assembly comprising at least two of the circuit assemblies of Figure 1 interconnected by a printed circuit board comprising an associated circuit assembly.

The substantially planar substrate 10 of the sub-assembly unit, shown in Figure 1, has a heat sink of aluminium, and the substrate is rectangular shaped in plan, with cooling fins 10' adjacent to one edge thereof. The substrate 10 has opposing major surfaces 11 and 12. Adhering to one major surface 11 of the heat sink 10 are four identical rectangular shaped-in-plan, modules 13, for example, thin film modules, each module 13 having leads 14 extending from two opposing surfaces 15 thereof. The leads 14 extend generally parallel to the substrate 10. A substantially planar, lead retaining member 16, and of an electrical insulating material, is secured to surfaces of the modules 13 remote from the substrate 10, and also extends generally parallel to the substrate 10. The lead retaining member 16 is common to the modules 13. The member 16 extends beyond the modules, but does not extend beyond the substrate 10.

The member 16, and the leads 14, together comprise a plug to be inserted into a co-operating socket, associated with the sub-assembly unit, and indicated generally at 20. The socket 20 and the sub-assembly unit together comprise a circuit assembly. In particular, the leads 14 comprise the contacting surfaces of the plug, to abut against portions 21 of the contact parts 22 of the socket 20, and portions 23 of the contact parts 22 comprise the terminals for the modules 13 within the circuit assembly, and comprise the terminals of the circuit assembly.

The part of the member 16 to enter the socket is spaced from the substrate, and is spaced from the modules.

For the leads 14 to co-operate reliably with the portions 21 of the contact parts 22, when the plug is inserted into the socket 20, it is essential that the leads are located in an accurate manner, and are held securely in the sub-assembly unit, at least whilst being inserted into the socket. The provision of the lead retaining member 16 facilitates the obtaining of these criteria. The illustrated member 16 has channels 30 formed in the portions of the major surfaces thereof not to be inserted into the socket, and the leads are a press fit into these channels 30, the channels 30 having a depth greater than the leads cross-sectional thickness. The part 31 of the member 16 to be inserted into the socket is not provided with channels, and the leads extend exposed on this part 31 of the member, but are supported by this part of the member. Hence, these parts of the leads to be inserted into the socket provide the contact surfaces of the plug. The ends 32

of the leads are bent to extend transversely to adjacent contact surfaces provided by the leads, and the lead ends 32 co-operate with the adjacent end portion 33 of the member to be an interference fit therewith. Some of the lead ends 32 are an interference fit within a groove 34 provided in the end portion 33 of the member, and the remaining lead ends are an interference fit with the periphery of the end portion of the member, a groove 35 being formed in the periphery.

With such an arrangement the leads are shaped to form the required contact surfaces of the plug.

By extending along both major surfaces of the planar member 16, the leads extend in two spaced parallel planes. Such an arrangement is convenient when the leads extend from two opposing surfaces of each module, the leads from one surface initially being bent through 180°.

Thus, the interconnection between the leads 14 and the terminals 23 for the modules 13 within the circuit assembly is facilitated, the interconnection comprising a plug and socket electrical connector; and, for example, obviates the need to provide a printed circuit board for this purpose.

By arranging that the leads extend generally parallel to the plane of the substrate a compact arrangement for the sub-assembly unit, and the circuit assembly, is possible.

It is essential that the substrate, the modules, and the lead retaining member, co-operate with each other in order that the leads are held securely, at least whilst the plug is being inserted into the socket.

It is desirable that the plug is an interference fit with the contacts of the socket.

Various modifications of a sub-assembly unit according to the present invention are possible.

The lead retaining member may be omitted from a circuit assembly according to the present invention, the leads of the modules being retained and located in the desired manner solely by the substrate within the sub-assembly unit, the substrate being of electrical insulating material, and fulfilling the purpose of the lead retaining member as described above.

Alternatively, the substrate, of electrical insulating material, and the lead retaining member, together, may fulfill the purpose of the lead retaining member as described above.

Whether the substrate is to be employed to retain and to locate the leads, or not, the substrate may be of electrical insulating material. When a lead retaining member is provided, it may be integral with such a substrate.

When a lead retaining member is provided, the member and the modules may be provided on opposing major substrate surfaces.

The part of the member to enter the socket may be spaced from the substrate by extending beyond the periphery of the substrate.

The member may not be substantially planar in form.

A flexible lead retaining member, for example, of thermo-plastics material, facilitates the insertion of the plug into the socket, and may be provided.

The constituent modules may not be identical, possibly having different numbers of leads.

The modules may be interconnected in any desired manner within the sub-assembly unit, and/or external thereof.

At least one module may be replaced by a discretely packaged electrical component, such as a resistor or a capacitor.

Only one module or component may be provided in the sub-assembly unit.

If the leads extend over only one surface of the member remote from the substrate, the part of the substrate adjacent to the part of the member to enter the socket, and irrespective to whether or not this substrate part bears leads, also may enter the socket and comprises part of the plug. In such an arrangement some of the leads may be supported on the major surface of the substrate remote from the member, and these leads are retained and located by the substrate in the manner required for the plug of the sub-assembly unit. In addition, or alternatively, the part of the member to enter the socket may not be spaced from the substrate.

Shallow channels for the leads may be provided in the part of the member and/or the substrate to be inserted into the socket.

Whether more than one module and/or component is provided on the same major surface of the substrate, at least one module or component is provided on each of both opposing major surfaces of the substrate, only one plug is provided within the sub-assembly unit. A sole lead retaining member may be provided, and possibly, this lead retaining member may be bifurcated, with parts extending along both opposing major substrate surfaces, and with a common part extending beyond the periphery of the substrate. Alternatively, the leads of all of the constituent components and/or modules extend either along a common member supported on only one of the opposing major surfaces of the substrate, or along both one surface of the sole member and one major surface of the substrate.

Whether at least one module or component is provided on each of both opposing major surfaces of the substrate, or not, possibly two discrete lead retaining members are provided to comprise a single plug, with a member supported on each of both opposing major surfaces of the substrate, different members being supported on different major substrate surfaces, the members combining to provide a single plug.

The leads may extend substantially only in a common place, parallel to the substrate. However, if the leads extend from more than one surface of a module or component, or more than one module and/or component is provided in the sub-assembly unit, it may be convenient for the leads to extend in two spaced parallel planes in any one of the possible constructions referred to above.

The lead retaining member may be secured within the sub-assembly unit solely by the leads, possibly by the leads being directly secured to the substrate.

Desirably, but not essentially, the modules or components may be readily detachably secured within the sub-assembly unit, to facilitate the replacement of the modules or components, for example, when faulty. Hence, it is required that the

leads are detachably retained by the member, and by the substrate, if relevant. Usually the modules or components will be detachably secured to the substrate, but it is possible that the modules or components are not directly secured to the substrate, but are secured solely by the leads and/or the member, being secured to the substrate. The arrangement may be such that the lead retaining member, if provided, is removed with the modules and components, as in the illustrated arrangement.

The leads may be secured within the sub-assembly unit in any convenient manner. In order to be detachably secured the leads may be clamped within the sub-assembly unit. In any such arrangement the leads may not be secured to the lead retaining member, but only are retained and located thereby.

A sub-assembly unit according to the present invention may provide a socket, instead of a plug, and to co-operate with an associated plug to comprise an electrical connector, the leads of said at least one component or module to comprise the contact parts of the socket.

Various modifications of the circuit assembly are possible.

The terminals of the modules, also comprising the terminals of the circuit assembly, may comprise the contact parts of a socket or of a plug of the circuit assembly, to co-operate with an associated plug or socket, respectively, to comprise another electrical connector.

More than one sub-assembly unit, each with a plug, or a socket, may be provided to share a common substrate, possibly with the different plugs, or sockets, of the different sub-assembly units being adjacent to different parts of the common substrate, and to co-operate with different sockets, or plugs.

In any arrangement in which more than one sub-assembly unit is provided within a circuit assembly, a common socket, or plug, may be provided to co-operate with the plurality of plugs, or sockets, irrespective of whether a common substrate is provided, or not.

Whether different associated sockets, or plugs, are provided, or not, possibly the different plugs, or sockets, of different sub-assembly units with a common substrate are at least partially on both opposing major surfaces of the substrate, there being at least one module or component provided on each of both opposing major surface of the common substrate.

When more than one sub-assembly unit is provided within a circuit assembly, the constituent sub-assembly units may be interconnected in a desired manner either within the circuit assembly, and/or external thereof.

When more than one constituent module and/or component, and/or more than one sub-assembly unit, are provided in a circuit assembly according to the present invention, required electrical interconnections between the constituent components and/or modules, and/or the constituent sub-assembly units, may be provided by an associated circuit assembly, the circuit assemblies so associated with each other to be connected together to form a more complex circuit assembly than any constituent circuit assembly.

Two first circuit assemblies, each of the form described above with reference to Figure 1, are shown in Figure 2 as being connected to a second circuit assembly, comprising the associated circuit assembly referred to in the preceding paragraph, to form a more complex circuit assembly than any constituent circuit assembly. The terminals 23 of the first circuit assemblies are shown as being connected to the conductors of a printed circuit board, indicated generally at 40.

Modules and/or components of the more complex circuit assembly may be provided in the second circuit assembly 40.

Various modifications of the more complex circuit assembly are possible.

Any desired number of first circuit assemblies may be provided.

More than one second circuit assembly may be provided.

Each constituent first circuit assembly may have any one of the forms for a circuit assembly referred to above, and according to the present invention.

Each provided second circuit assembly may have any convenient form, and may have any one of the forms for a circuit assembly referred to above, and according to the present invention.

With any such arrangement, each second circuit assembly may be connected directly to the terminals of the co-operating first circuit assemblies, or an electrical connector may be provided between each second circuit assembly and each co-operating first circuit assembly, the electrical connector, or connectors each possibly having a known form.

Any such arrangement is advantageous in that designing the construction of the more complex circuit assembly is facilitated; it is easy to remove a first circuit assembly with a faulty component or module; and it is possible to have a standard construction for each first circuit assembly, and perhaps also it is possible to have a standard construction for each second circuit assembly, for each of a plurality of different possible more complex circuit assemblies, each different possible first circuit assembly, and perhaps also each different possible second circuit assembly, respectively, varying from each other only in the form of, and/or in the number of, constituent modules and/or components, where appropriate.

CLAIMS

1. A sub-assembly unit for a circuit assembly, the sub-assembly unit comprising an at least substantially planar substrate, on at least one major surface of which substrate is supported at least one component or module with leads extending therefrom, the leads extending generally parallel to the plane of said at least substantially planar substrate, there also being provided within the sub-assembly unit means both to retain and to locate the leads of said at least one component or module, so that the leads comprise at least part of a plug, or of a socket, of an electrical connector, the plug, or socket, being

arranged to co-operate, respectively, with an associated socket, or plug of the electrical connector, the associated socket, or plug having contact parts both abut against the leads of the sub-assembly unit, and to provide terminals for the component or module within the circuit assembly.

2. A sub-assembly unit as claimed in claim 1 in which the means to retain and to locate the leads of said at least one component or module includes, or comprises, a lead retaining member of electrical insulating material, or comprises the substrate, or comprises both the substrate and a lead retaining member, when the substrate is of electrical insulating material; the substrate and/or the lead retaining member, and the leads, together, comprising at least part of the plug, or socket, provided by the sub-assembly unit.

3. A sub-assembly unit as claimed in claim 1 or claim 2 in which the ends of the leads are bent to extend transversely to adjacent contact surfaces provided by the leads, and the lead ends co-operate with an adjacent end portion of the substrate and/or the member to be an interference fit therewith.

4. A sub-assembly unit as claimed in claim 3 in which at least some of said lead ends are an interference fit within at least one groove provided in said end portion of the substrate and/or the member.

5. A sub-assembly unit as claimed in claim 3 or claim 4 in which at least some of said lead ends are an interference fit with the periphery of said end portion of the substrate and/or the member.

6. A sub-assembly unit as claimed in any one of the preceding claims providing a plug.

7. A sub-assembly unit as claimed in claim 6 and in which a lead retaining member at least substantially planar in shape is provided, the leads being retained to extend over at least one major surface of the member.

8. A sub-assembly unit as claimed in claim 7 in which the lead retaining member is flexible.

9. A sub-assembly unit as claimed in claim 8 in which the lead retaining member is of thermoplastics material.

10. A sub-assembly unit as claimed in any one of claims 7 to 9, and in which at least the part of the member to enter the associated socket is spaced from the substrate.

11. A sub-assembly unit as claimed in any one of claims 7 to 10, and in which the leads are retained to extend over two surfaces of the member.

12. A sub-assembly unit as claimed in any one of the preceding claims in which more than one component and/or module is provided on a common substrate.

13. A sub-assembly unit as claimed in claim 12 in which at least one module or component is provided on each of both opposing major surfaces of the substrate.

14. A sub-assembly unit as claimed in claim 13 when dependent on claim 2, and in which a sole lead retaining member is provided.

15. A sub-assembly unit as claimed in claim 2, or in any one of claims 3 to 13 when dependent on claim 2, and in which two discrete lead retaining members are provided, with a member supported on each of both opposing major surfaces of the substrate, different members being supported on different major substrate surfaces.

16. A sub-assembly unit as claimed in any one of the preceding claims in which the at least substantially planar substrate comprises a heat sink.

17. A circuit assembly comprising at least one sub-assembly unit as claimed in any one of the preceding claims, and a socket, or plug, co-operating, respectively, with the plug, or socket, provided by the sub-assembly unit, the co-operating plug and socket to comprise an electrical connector, the co-operating socket, or plug, having contact parts both to abut against the leads of the sub-assembly unit, and to provide within the circuit assembly terminals for the component or module of the sub-assembly unit, these terminals also comprising terminals of the circuit assembly.

18. A circuit assembly as claimed in claim 17 in which a plurality of sub-assembly units are provided.

19. A circuit assembly as claimed in claim 18 in which a common substrate is provided for the plurality of sub-assembly units.

20. A circuit assembly as claimed in claim 19 in which at least one module or component is provided on each of both opposing major surfaces of the common substrate, and the different plugs, or sockets, of the different sub-assembly units are at least partially on both opposing major surfaces of the substrate.

21. A circuit assembly as claimed in claim 19 or claim 20 in which the different plugs, or sockets, of the different sub-assembly units are adjacent to different parts of the common substrate, and co-operate, respectively, with different sockets, or plugs.

22. A circuit assembly as claimed in claim 18 or claim 19 or claim 20 in which a common socket, or plug, is provided to co-operate with the plurality of sub-assembly units.

23. A circuit assembly as claimed in any one of claims 17 to 22 in which the terminals comprise the contact parts of a socket or plug of the circuit assembly, to co-operate with an associated plug or socket, respectively, to comprise another electrical connector.

24. A combination of at least one first circuit assembly, each first circuit assembly being of the form claimed in any one of claims 17 to 23, at least one second circuit assembly, and the first and second circuit assemblies are connected together to form a more complex circuit assembly than any constituent circuit assembly.

25. A combination as claimed in claim 24 in which said at least one second circuit assembly at least includes a pattern of conductors on an electrical insulating support.

26. A combination as claimed in claim 24 or claim 25 in which said at least one second circuit assembly is connected directly to the terminals of said at least one first circuit assembly.

27. A combination as claimed in claim 24 or claim 25 in which an electrical connector is provided between each second circuit assembly and each co-operating first circuit assembly.

28. A sub-assembly unit substantially as described herein with reference to the accompanying drawings.

29. A circuit assembly substantially as described herein with reference to the accompanying drawings.

30. A combination of circuit assemblies substantially as described herein with reference to Figure 2 of the accompanying drawings.

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