

# PATENT SPECIFICATION

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- (21) Application No. 41795/77 (22) Filed 7 Oct. 1977 (19)  
(31) Convention Application No. 2 646 616 (32) Filed 15 Oct. 1976 in  
(33) Fed. Rep. of Germany (DE)  
(44) Complete Specification published 17 Dec. 1980  
(51) INT. CL.<sup>3</sup> H05K 5/02 7/00  
(52) Index at acceptance  
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## (54) MODULAR HOUSING MEANS FOR ELECTRICAL AND ELECTRONIC COMPONENTS

(71) We, C. A. WEIDMULLER KG, of Postfach 950, 4930 Detmold, West Germany, a German Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to means for housing electrical and electronic components, of the kind comprising a frame-like housing of electrically insulating material designed to be mounted in a row with other such housings, to form a modular system, the housing having an internal space in which electrical and/or electronic components can be mounted, preferably in interchangeable manner, means being provided for connecting such components to external leads.

In known housing devices of the aforesaid kind, connectors for the external leads are permanently built into the housing. In the most common arrangement, the housing is provided with built-in connecting terminals at each narrow side, through which sides access is obtained, and the internal space of the housing is designed to receive circuit boards, in particular printed circuits, with contact points which can be connected to the terminals and thereby to external leads: see for example German Patent Specification No. 1,765,973. This arrangement has the serious disadvantage that the connection facilities cannot be adapted to particular circumstances, and to meet differing requirements it is necessary to provide a large variety of housings having different kinds of terminal built thereinto. Furthermore, in some cases not all of the terminals provided are actually needed, indeed in some cases terminals could be omitted completely, and the unnecessary terminals then take up space which could more usefully be occupied by the electrical or electronic components to be housed.

The object of the present invention is to provide modular means for housing electrical and electronic components, which will be free from the above disadvantages and in

particular will be of greatly increased versatility in respect of the number, kind and location of terminals provided for connection of external leads.

According to the present invention, there is provided a housing for electrical and electronic components, comprising a generally prismatic frame-like housing member having two parallel major faces of which at least one is open and a plurality of minor faces defined by walls extending between said major faces, at least one said wall containing at least one aperture providing access to the internal space of the housing member, the housing member being provided internally with locating elements accessible through a said open major face, for locating releasably in plug-in manner adjacent to at least one said aperture at least one terminal unit for connecting external leads to a said component or components when housed in the housing.

The housing can be a simple, relatively thin-walled, hollow frame, which is only fitted with a terminal unit or units as and when required. The housing can therefore be left completely free of terminals if desired, thereby providing the maximum space for receiving electrical and electronic components. A plurality of interchangeable terminal units provided respectively with different types can be provided, any one or more of which can be plugged into a housing to meet particular requirements. Preferably, the housing is provided with locating elements disposed so that a plurality of terminal units can be inserted in the housing at different positions, or the position of a single terminal unit can be changed. It will be seen that, to provide a wide range of different connection facilities, it is only necessary to produce and stock a single type of housing, or a small number of housing types, together with a number of types of terminal unit which are fitted to housings as required.

The individual connection facilities provided in the terminal units can be of any desired kind, for example screw-clamping terminal sleeves, solder tags, plug pins or

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sockets, and wire-wrap pins. An individual terminal unit may incorporate a plurality of different types of connector.

5 The housing may be provided with openings for external leads, and/or for accommodating connectors of the components or components to be housed, and/or for connections forming part of a terminal unit or units. This provides greater versatility and  
10 in particular the ability to accommodate components on which connections for external leads, such as solder tags, are provided directly (thereby eliminating the need for a terminal unit).

15 In a preferred arrangement, at least one pair of the said locating elements is provided, each element extending internally along a said wall between and substantially perpendicular to the said major faces, the or each  
20 said pair serving to locate a respective terminal unit. Preferably, each said locating element is a generally cylindrical rib.

It is preferred that both major faces of the housing are open.

25 In use, the or each open face is closed by a cover plate or an adjacent modular housing, and accordingly the housings are preferably provided at their open faces, with detent apertures for receiving locating projections  
30 of such cover plates or adjoining housings. Such apertures can be provided in the ends of the aforesaid cylindrical ribs.

35 The invention will be further described, by way of example only, with reference to the accompanying drawing, which is an exploded perspective view of a housing and two terminal units, one of which is in place in the housing.

40 The drawing shows a generally rectangular frame-like housing member 1 of moulded electrically insulating material, for example plastics, having two parallel major faces each of which is open, and a plurality of  
45 minor faces defined by the walls of the housing member. The housing member is designed to be mounted side by side with other such members, and/or with terminal blocks of generally similar form, as part of a modular assembly. The housing member  
50 is used to accommodate electrical and/or electronic components, for example printed circuit boards, and the drawing shows a circuit board 10 which is to be housed. In use, the open faces are closed by adjacent members of said assembly or by cover plates 6.

55 Integral with the internal surface of each side wall 15 of the housing member is a generally cylindrical rib 3 extending between and perpendicular to the open major faces of the housing. A similar rib 3 is provided  
60 respectively adjacent to each end of the internal surface of the upper wall 16 of the housing member. The ribs are hollow, at least at their ends, thereby providing detent recesses or openings 5 in their end faces,

for receiving detent pins of a cover plate, or double-ended pins for securing together two adjacent housing members; the latter arrangement can be used to provide an internal space larger than that available within  
70 a single housing member.

The ribs constitute two pairs, each comprising a rib on a side wall 15 and the rib at the adjacent end of the top wall 16. Each such pair serves releasably to locate a plug-in terminal unit 2, as shown at the righthand side of the housing member in the drawing. The terminal units are thereby firmly located, with their entire side surfaces, in secure  
75 engagement between the ribs 3 and the adjoining internal wall surfaces of the housing member.

Each terminal unit has a body 17 of insulating plastics material, in which are mounted electrical connectors. The terminal unit  
80 shown separate from, i.e. not yet plugged into, the housing member has solder tags 7 arranged for connection to a component or components within the housing member, and associated screw-clamping terminal sleeves 18 for connection of external leads. Alternative types of connector and connector combinations can be provided as desired, for example including plug pins and/or jacks and/or wire-wrap pins.

To provide access for external leads to screw-clamping connectors of the terminal units, each side wall 15 contains two holes 8 placed so as to be aligned with the clamping sleeves of the terminal unit when the  
85 latter is plugged in between the ribs. The top wall of the housing member has holes 19 for access to the clamping screw of such terminal units.

The housing member also has apertures 9  
100 in the form of slits extending across the side wall from an open face of the housing member. This makes it possible to use terminal units provided with connector parts, for example solder tags or plug pins, which project out of the housing member.

The illustrated circuit board 10 has a flat connector pin 11 for direct connection to an external lead, and the housing member is also provided with openings 12 to accommodate such connectors of the housed components for direct connection to external leads; these openings 12 are also slits extending across a wall of the housing member from an open face of the latter.

115 The insulating bodies of the terminal units have detent pins 13 and the circuit board 10 has corresponding holes 14 which fit over the pins 13, to assist in retaining the several components together. It is therefore possible  
120 to assemble the circuit board with one or more terminal units, thereafter plugging the assembly into the housing member.

Simultaneously with the mechanical interlocking of the circuit board and terminal  
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unit or units, solder pins extending from the terminal unit can enter holes of the circuit board. It is thereby possible for the circuit board to be fitted with the terminal unit or units and other electrical-electronic components simultaneously, and soldered in a single manufacturing step. The expensive procedure of separately soldering the terminal units to the contact paths of the circuit board is thereby eliminated.

The internal surfaces of the housing member have ribs 20 for locating flat plug pins, and mating grooves 21 are provided in the insulating bodies of the terminal units.

The cylindrical ribs 3 have shorter projecting rib portions 22 which provide bearing surfaces for the circuit board.

The bodies of the terminal units have laterally projecting ribs 23 to provide accurate location against the internal wall surfaces of the housing member and in particular to provide accurate location of the clamping sleeves relative to the holes 8.

For engaging the side surfaces of the ribs 3, the bodies of the terminal units have guide and support surfaces 4a and 4b. To protect and locate the connector strips (solder tags in the illustrated example) which extend into the clamping sleeves for clamping against an external lead, each terminal unit is provided with an insulating plate 24, secured by a rib or flange 25.

It will be understood that the pins 13 on the terminal units can also be used to engage holes or recesses in a cover plate 6.

It will readily be seen that the location, number and kind of connection facilities installed can be readily varied by variations in the location, number and form of the plug-in terminal units. If appropriate, terminal units can be omitted entirely, thereby greatly increasing the space available within the housing. Furthermore, by securing together a plurality of housing members without intervening partitions, a very large space can be provided, for example to accommodate a miniature transformer which may extend, for example, through four housing members secured together side by side; in this case, the two intermediate housing members can be left without any terminal units, each of the outermost housing members being provided at one side with a terminal unit.

It will be seen therefore that the invention is not confined to the housing of printed circuit boards and electronic components.

#### WHAT WE CLAIM IS:—

1. A housing for electrical and electronic components, comprising a generally prismatic frame-like housing member having two parallel major faces of which at least one is open and a plurality of minor faces defined by walls extending between said major faces, at least one said wall containing at least one

aperture providing access to the internal space of the housing member, the housing member being provided internally with locating elements accessible through a said open major face, for locating releasably in plug-in manner adjacent to at least one said aperture at least one terminal unit for connecting external leads to a said component or components when housed in the housing.

2. A housing as claimed in claim 1 having at least one pair of the said locating elements each extending internally along a said wall and substantially perpendicular to the said major faces, for locating a said terminal unit.

3. A housing as claimed in claim 2 in which each said locating element is a generally cylindrical rib.

4. A housing as claimed in claim 1, 2 or 3 having at at least one open major face means defining detent apertures for receiving locating projections of a cover plate or an adjoining housing.

5. A housing as claimed in claim 4 when dependent on claim 3 in which the detent apertures are in the ends of the said ribs.

6. A housing as claimed in any one of the preceding claims in which both said major faces are open.

7. A housing as claimed in any one of the preceding claims having in at least one said wall at least one hole for insertion of an external lead into a said terminal unit when located in the housing.

8. A housing as claimed in any one of the preceding claims having in at least one said wall at least one aperture for receiving a terminal of a said terminal unit.

9. A housing as claimed in claim 8 in which said aperture is a slit extending from a said open major face into said wall.

10. A housing as claimed in any one of the preceding claims having in at least one said wall an aperture for receiving a connection of a said component.

11. A housing as claimed in claim 10 in which said aperture is a slit extending from a said open major face into said wall.

12. In combination, a housing as claimed in any one of the preceding claims, and at least one terminal unit pluggable into and unpluggable from said locating elements and adapted to provide electrical connection between at least one external lead and at least one said component when housed in said housing.

13. The combination claimed in claim 12 in which said terminal unit comprises a body of insulating material shaped to mate with said locating elements, and at least one electrical connector mounted in said body.

14. The combination claimed in claim 12 or 13 in which the or each said terminal unit has at least one detent element disposed for engagement with a said component.

unit or units, solder pins extending from the terminal unit can enter holes of the circuit board. It is thereby possible for the circuit board to be fitted with the terminal unit or units and other electrical-electronic components simultaneously, and soldered in a single manufacturing step. The expensive procedure of separately soldering the terminal units to the contact paths of the circuit board is thereby eliminated.

The internal surfaces of the housing member have ribs 20 for locating flat plug pins, and mating grooves 21 are provided in the insulating bodies of the terminal units.

The cylindrical ribs 3 have shorter projecting rib portions 22 which provide bearing surfaces for the circuit board.

The bodies of the terminal units have laterally projecting ribs 23 to provide accurate location against the internal wall surfaces of the housing member and in particular to provide accurate location of the clamping sleeves relative to the holes 8.

For engaging the side surfaces of the ribs 3, the bodies of the terminal units have guide and support surfaces 4a and 4b. To protect and locate the connector strips (solder tags in the illustrated example) which extend into the clamping sleeves for clamping against an external lead, each terminal unit is provided with an insulating plate 24, secured by a rib or flange 25.

It will be understood that the pins 13 on the terminal units can also be used to engage holes or recesses in a cover plate 6.

It will readily be seen that the location, number and kind of connection facilities installed can be readily varied by variations in the location, number and form of the plug-in terminal units. If appropriate, terminal units can be omitted entirely, thereby greatly increasing the space available within the housing. Furthermore, by securing together a plurality of housing members without intervening partitions, a very large space can be provided, for example to accommodate a miniature transformer which may extend, for example, through four housing members secured together side by side; in this case, the two intermediate housing members can be left without any terminal units, each of the outermost housing members being provided at one side with a terminal unit.

It will be seen therefore that the invention is not confined to the housing of printed circuit boards and electronic components.

#### WHAT WE CLAIM IS:—

1. A housing for electrical and electronic components, comprising a generally prismatic frame-like housing member having two parallel major faces of which at least one is open and a plurality of minor faces defined by walls extending between said major faces, at least one said wall containing at least one

aperture providing access to the internal space of the housing member, the housing member being provided internally with locating elements accessible through a said open major face, for locating releasably in plug-in manner adjacent to at least one said aperture at least one terminal unit for connecting external leads to a said component or components when housed in the housing.

2. A housing as claimed in claim 1 having at least one pair of the said locating elements each extending internally along a said wall and substantially perpendicular to the said major faces, for locating a said terminal unit.

3. A housing as claimed in claim 2 in which each said locating element is a generally cylindrical rib.

4. A housing as claimed in claim 1, 2 or 3 having at least one open major face means defining detent apertures for receiving locating projections of a cover plate or an adjoining housing.

5. A housing as claimed in claim 4 when dependent on claim 3 in which the detent apertures are in the ends of the said ribs.

6. A housing as claimed in any one of the preceding claims in which both said major faces are open.

7. A housing as claimed in any one of the preceding claims having in at least one said wall at least one hole for insertion of an external lead into a said terminal unit when located in the housing.

8. A housing as claimed in any one of the preceding claims having in at least one said wall at least one aperture for receiving a terminal of a said terminal unit.

9. A housing as claimed in claim 8 in which said aperture is a slit extending from a said open major face into said wall.

10. A housing as claimed in any one of the preceding claims having in at least one said wall an aperture for receiving a connection of a said component.

11. A housing as claimed in claim 10 in which said aperture is a slit extending from a said open major face into said wall.

12. In combination, a housing as claimed in any one of the preceding claims, and at least one terminal unit pluggable into and unpluggable from said locating elements and adapted to provide electrical connection between at least one external lead and at least one said component when housed in said housing.

13. The combination claimed in claim 12 in which said terminal unit comprises a body of insulating material shaped to mate with said locating elements, and at least one electrical connector mounted in said body.

14. The combination claimed in claim 12 or 13 in which the or each said terminal unit has at least one detent element disposed for engagement with a said component.



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15. The combination claimed in any one of claims 12 to 14 comprising a plurality of interchangeable terminal units provided with different electrical connectors or different combinations of electrical connectors.

16. Means for housing electrical and electronic components, substantially as herein

described with reference to the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1980.  
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,  
from which copies may be obtained.



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