A mating contact connector housing assembly having a plurality of contacts housed therein, the contacts including contact blade portions and terminal portions and being mounted within the housing in a cantilever manner such that they are restrained from moving within longitudinally extending planes yet are permitted to undergo flexural movement within laterally extending planes, whereby the contact members accommodate and compensate for contact misalignment with mating contact members. The housing is also provided with additional aligning pins to properly align the housing relative to a mating housing and is further provided with a dependent skirt which serves to additionally promote the alignment between the mating housing as well as protect the contact members against structural damage.

3 Claims, 6 Drawing Figures
MATING CONTACT CONNECTOR HOUSING ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention
The present invention relates generally to electrical contact housings, and more particularly to a housing which readily permits the rapid and positive connection of the contacts housed therein with mating contacts housed within mating contact housings.

2. Description of the Prior Art
Current electronic assembly techniques, particularly in the field of computers, utilize banks of removable printed circuit boards in modules whereby the printed circuits may be connected to and disconnected from associated circuitry. In order to facilitate such connections between the various circuits and the associated circuitry, contact housings are employed whereby mating contacts serve to connect the leads of the associate circuitry with the leads of the printed circuits.

Although a multitude of such housings are currently being employed in conventional electronic systems, there is a substantial need for example, for electrical contacts which may be simply and economically produced and easily and quickly assembled within the contact housings, and concomitantly therewith, there is in addition a substantial need for contact housings which in turn facilitate the rapid and positive interconnection between the various circuits. Throughout the service life of a particular piece of electronic equipment, for example, the circuit boards housed therein may be exchanged an unaccountable number of times, and an often resulting occurrence within such systems is an improper condition, due to, for example, misaligned contact pins within the connector housings. Such an occurrence could of course result in damage to the contact pins, as well as to the housings and possibly the equipment, aside from the fact that the equipment will fail to operate properly within all phases of its operation, such of course necessitating operative delays and repairs.

Accordingly, it is desirable to provide mating contact housings, coupled with the associate circuitry to be electrically interconnected which overcome the aforementioned disadvantages. In this manner, the circuit contacts may be quickly and easily assembled within the separate housings, whereupon the contacts and housings may be subsequently rapidly and properly mated so as to interconnect the associated circuitry when and as desired. One such type of housing is disclosed within the accompanying co-pending and commonly assigned application entitled "Preloaded Contact and Latchable Housing Assembly," and the present application is consequently directed toward the mating contact housing.

SUMMARY OF THE INVENTION
Accordingly, it is an object of the present invention to provide an improved mating electrical contact connector housing assembly which may be simply and economically manufactured.

Another object of the present invention is to provide an improved mating electrical contact connector housing assembly wherein the contacts may be rapidly inserted therein and the housing and contacts may subsequently be quickly secured relative to a particular printed circuit board.

Still another object of the present invention is to provide an improved mating electrical contact connector housing assembly which facilitates the rapid interconnection with a mating housing and contact assembly coupled with associate electronic circuitry.

Yet another object of the present invention is to provide an improved mating electrical contact connector housing assembly which automatically facilitates proper alignment with another mating assembly upon interconnection therebetween.

A further object of the present invention is to provide an improved mating electrical contact connector housing assembly wherein the contact components are permitted to flex within predetermined limits so as to facilitate proper and positive contact with the mating contact components.

A yet further object of the present invention is to provide an improved mating electrical contact connector housing assembly wherein the contact components are protected against mechanical damage.

A still further object of the present invention is to provide an improved mating electrical contact connector housing assembly wherein the contact members are secured within the housing without the use of separate fastening components.

The foregoing objects are achieved according to this invention through the provision of a mating electrical contact housing assembly including a substantially rectangular housing having two rows of contacts housed therein, the contacts including contact blade portions and terminal portions interconnected by bevelled sections which mate with corresponding wall portions of the housing whereupon the contact blades are permitted to undergo lateral flexural movement in planes transverse to the longitudinal axis of the housing, but are restrained from any lateral movement in planes extending longitudinally of the housing, such flexural movement assuring proper contact blade alignment with the mating contact members. The bevelled portions also assure proper seating of the contacts within the housing after which the contacts may be secured to associate circuitry within a printed circuit board. The housing is also provided with skirt means for protecting the contact blades against mechanical damage, and independent alignment pins for facilitating proper alignment between the mating housings.

BRIEF DESCRIPTION OF THE DRAWINGS
Various other objects, features, and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings, in which like reference characters designate like or corresponding parts throughout the several views, and wherein:

FIG. 1 is an exploded perspective view partially in section, of an entire mating housing assembly and the associated circuitry, including the assembly constructed according to the present invention and showing its cooperative parts;

FIG. 2 is a partial view of FIG. 1 showing the entire mating housing assembly prior to interconnection of the mating housings and contact members;

FIG. 3 is a cross-section view of the entire mating housing assembly, subsequent to interconnection of the mating housings and contact members, taken along the plane 3--3 of FIG. 2;
FIG. 4 is a cross-sectional view of the mating housing assembly of the present invention, taken along the line 4-4 of FIG. 3;

FIG. 5 is a partial view of FIG. 3 showing the assembly of an electrical contact member within the mating housing of the present invention; and

FIG. 6 is a view similar to FIG. 3 showing the interconnection of the mating housings and contact members, the housing and contact member of the present invention being shown in dotted line prior to interconnection with the mating housing and contact member, and being shown in solid line subsequent to the interconnection with the mating housing and contact member.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, and more particularly to FIGS. 1 and 2 thereof, there is shown the entire mating housing assembly, including the housing and contact members of the present invention, generally indicated by the reference characters 10 and 12, respectively, as well as the housing and contact members of the co-pending and commonly assigned application, noted heretofore, generally indicated by the reference characters 14 and 16, respectively. The one-piece housing 10 is substantially rectangular in shape and may be inexpensively manufactured from suitable plastic material, such as for example, by means of any one of the conventional molding processes. Similarly, in manufacturing the electrical contacts of the present invention, a suitable metal sheet may be subjected to a stamping process whereby a serial array of the longitudinal contacts 12, including the dependent contact blade portions 18 and the integral supporting terminal portions 20, as well as a carrier strip 22, may be simply and economically produced, the strip 22 being integrally connected to each of the contact members 12 along the lower planar surface of the blade portions 18, as particularly seen in FIG. 1. It will be noted that the diametrical extent of the terminal portions 20 is less than that of the blade portions 18 of the contacts 12, and that the integral connection therebetween includes bevelled portions 21 which are disposed upon only two of the planar surfaces of contacts 12 and which serve a unique purpose which will be more fully apparent hereinafter.

Since the stamped contacts are simple in structure and integral with each other requiring no folding parts, they may be placed in a very close spatial relationship so as to facilitate storage. For example, the carrier strip 22, along with contacts 12, may be rolled upon a spool, not shown, and may also be provided with a plurality of apertures 24 which are adapted to cooperate, in sprocket wheel fashion, with pins provided upon appropriate automatic machinery, also not shown, which serves to unwind the strip and contacts from the storage spool when it is desired to insert the contacts within housing 10. The contacts may all be simultaneously inserted within housing 10 while still attached to the strip 22 from which the strip may be removed by appropriately severing the connection between the strip and each contact member 18, either by cutting, bending, or the like.

Referring now to FIGS. 1, 2, and 3, it will be seen that the housing 10 is provided with two parallel rows of equally-spaced vertically extending apertures which form receptacles for the contacts 12, each of the apertures 26 within one row being co-planar with a corresponding aperture 28 within the other row. In addition, the housing portions 30, 32, and 34 defining the apertures 26 and 28 therebetween, respectively, are of progressively shorter height, and consequently, the housing 10 has a step-like configuration in cross-section, as particularly seen in FIG. 3, whereby the apertures 26 are seen to extend substantially the entire height of the housing while the apertures 28 extend only approximately one-half the height of the housing. In this manner, subsequent to insertion of the contacts 12 within the housing apertures 26 and 28, the housing portions 32 and 34 serve as anvill-type means about which the terminal portions 20 of contacts 12 may be bent so as to extend in co-planar fashion, and laterally of the housing 10, whereupon such portions 20 may subsequently be secured within a printed circuit board 36 by any conventional means, such as for example, solder 37. A pair of upstanding lugs 39 are integrally provided at each end of the housing through which suitable fastening means may of course be passed in order to firmly secure the PC board to housing 10, and to additionally support board 36 relative to the housing, housing section 34 is integrally provided with laterally extending flange means 41, board 36 being supported upon the upper planar surface thereof.

In order to facilitate the entrance and retention of the contacts 12 within the housing 10, the housing portions 30, 32, and 34 defining the apertures 26 and 28, are respectively provided with pairs of relatively convergent and parallel sidewall portions 38 and 40, when viewed perpendicular to a plane transverse to the longitudinal axis of the housing, as seen in FIG. 3, the diametrical extent of terminal portion 20 of contact 12 being slightly less than that of aperture 26 defined between wall portions 40, while the distance between wall portions 38 is substantially greater than the diametrical extent of blade portions 18 of contacts 12.

The remaining pairs of sidewall portions of housing 10, defining apertures 26 and 28, when viewed perpendicular to plane which extends longitudinally of the housing 10, are seen to be quite unlike sidewall portions 38 and 40, and include relatively parallel sidewall portions 42 and 44 which correspond to, and have diametrical extents slightly greater than, blade portions 18 and terminal portions 20 of contacts 12, and a bevelled portion 46 interposed between portions 42 and 44 which of course corresponds to the bevelled portion 21 of contacts 12, as seen in FIG. 4. Sidewalls 44 extend the entire height of housing 10 so as to define transversely extending slot means 47 (See FIGS. 1 and 2) which serve to guide the laterally extending portions of terminals 20 and maintain the same in co-planar alignment so as to facilitate proper interconnection with printed circuit board 36.

Consequently, upon insertion of the contacts 12 within the housing 10, the contact blades 18 will be firmly seated and restrained from any lateral movement in a longitudinal plane of the housing 10 due to the interengagement between bevelled portion 21 of contacts 12 and bevelled seating portion 46 of housing 10 as well as between the blade 18 and wall portions 42, while concomitantly therewith, lateral flexural movement of the contact blade portions 18 within a transverse plane is permitted due to the location of wall portions 38 relative to the blades, as seen in FIG. 5, it
being further appreciated that terminal portions 20 are restrained from any lateral movement due to the presence of wall portions 40 and 44. The contacts are also restrained from any longitudinal movement relative to housing 10 due to the interengagement between bevelled portion 21 of contacts 12 and bevelled seating portion 46 of housing 10, as well as the interengagement between terminal portions 20 of contacts 12 and the upper planar surfaces 48 and 50 of housing portions 32 and 34, respectively, subsequent to the bending of terminals 20.

Referring now to FIGS. 1, 2, 3 and 6 the significance of the lateral flexural movement of the contact blades 18 within the housing 10 of the present invention will now become apparent. In order to insure that the mating contact members 12 and 16 within the housings 10 and 14 will be relatively properly aligned, a pair of dependent aligning pins 52 disposed along the longitudinal axis of the housing, project downwardly from each end of housing 10, and corresponding apertures 54 are provided within the end portions 56 of housing 14, wherein insertion of pins 52 within apertures 54 serves to initially align housings 10 and 14 relative to one another. In addition, housing 10 is further provided with dependent skirt means 58 integrally formed with housing sections 30 and 34 such that the outer surfaces of skirts 58 are in effect continuations of the outer surfaces of sections 30 and 34 while the lateral extent between the skirt portions is slightly greater than the lateral dimension of the central recessed section 60 of substantially I-shaped housing 14, as particularly seen in FIG. 3, whereby proper seating and alignment between the housings is further facilitated, although some play therebetween is nevertheless permitted as seen in FIG. 6 at 61. It will be noted that the skirt does not extend the entire length of housing 10 and in this manner the end portions 62 of housing 10 may be supported upon the end sections 56 of housing 14, and similarly, the depth to which skirt 58 extends is slightly greater than that to which contact members 12 extend when firmly seated within housing 10 whereby skirt 58 additionally serves to protect the contact members from structural damage.

Although the housings 10 and 14 may consequently be properly supported and aligned relative to one another, as noted heretofore, throughout the service life of a particular piece of electronic equipment, the circuit boards housed therein may be exchanged an unaccountable number of times wherein misaligned contact members within the connector housings is a common occurrence. However, as particularly seen in FIG. 6, upon mating of the housings 10 and 14, if the contact blades 18 should be out of alignment with the corresponding apertures 64 and contact receptacles formed by contact members 16 of housing 14, the upper bevelled portions associated with apertures 64 will tend to deflect the contact blades 18 so as to in fact become axially aligned within the contact receptacles formed by contact members 16. Correspondingly, since contact blades 18 are in effect mounted within housing 10 in a cantilever fashion and are permitted to flex within a lateral plane, within predetermined limits defined by wall portions 38, the blades are able to be aligned with the mating contact members 16 without undergoing any structural damage, deformation or fatigue.

Thus, it may be seen that the mating contact connector housing assembly of the present invention has important advantages over the known prior art structures in that the connector housing facilitates the rapid assembly thereof of the mating contact members and in turn the rapid assembly and interconnection with mating housings and associate circuitry. In addition, the connector housing includes various means to insure proper support and alignment between such housing and mating housings as well as between the mating housing contact members whereby the operational mode of the particular electronic equipment is unimpeded.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is to be understood therefore that within the scope of the appended claims the present invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States:

1. An electrical connector having a plurality of electrical terminals mounted in rows within a housing of dielectric material, comprising:

first and second rows of apertures in said housing receiving said terminals,

said housing having a first end portion and a second end portion,

each aperture having a relatively large first portion extending through said first end portion of said housing and an adjacent relatively narrow second portion extending through said second end portion of said housing,

each terminal having a relatively enlarged wide portion received in a corresponding first portion of a corresponding aperture and protruding from said first end portion of said housing,

each terminal having a relatively narrow portion received in a corresponding second portion of a corresponding aperture,

said housing defining a seating portion between the first and second portions of each aperture,

each terminal engaging and seating against a corresponding seating portion,

said housing second end portion defining first and second anvil surfaces,

said first row of terminals having the second portions thereof extended outwardly of said first row of apertures and bent to overlie against said first anvil surface and to project outwardly of said housing, and

said second row of terminals having said second portions thereof extended outwardly of said second row of apertures and bent to overlie against said second anvil surface and to project outwardly of said housing.

2. The structure as recited in claim 1, wherein, said second end portion of said housing includes a plurality of slots adjacent said first and second anvil surfaces for receiving said second end portions of said terminals which overlie against said first and second anvil surfaces.

3. The structure as recited in claim 1, wherein, each first portion of a corresponding aperture includes opposite converging sidewalls, and a corresponding second portion of a corresponding terminal is capable of resilient cantilever deflection in a space between said opposite converging sidewalls.