

[54] WIRING ADAPTER

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[51] Int. Cl. H05k 1/04

[58] Field of Search 339/17, 18, 176, 339/99, 198, 156, 154, 174, 19; 317/101

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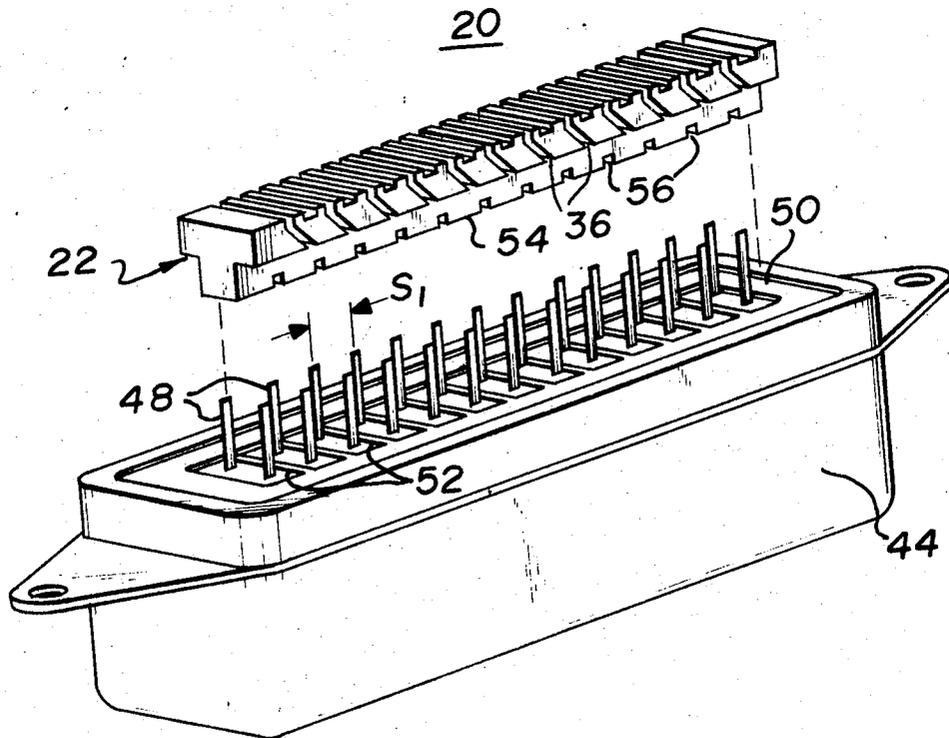
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Attorney—David Teschner et al.

[57] ABSTRACT

A wiring adapter for disposition intermediate a plural-

ity of first conductors having a first predetermined spacing and a plurality of second conductors having a second predetermined spacing different than the spacing between the first conductors to permit a convenient, simple, and rapid interconnection therebetween. The device comprises a generally elongate base member formed preferably of electrically insulating material and having a series of generally parallel transverse first recesses disposed in one surface thereof and two further series of recesses each series extending down a respective surface on either side of the base member, the series of recesses on one side communicating with the even ones of the first series of recesses and the recesses extending down the other side of the base member communicating with the odd ones of the first series of recesses. The side recesses extend at an oblique angle with respect to the longitudinal axis of the base member, each pair of alternated, opposed side recesses generally defining a Vee, the apex of which is arranged to engage a respective pair of aligned parallel conductors in a socket member or the like, wherein the pitch of the parallel conductors may be selectively altered to conform to that defined by the series of first recesses.

19 Claims, 12 Drawing Figures



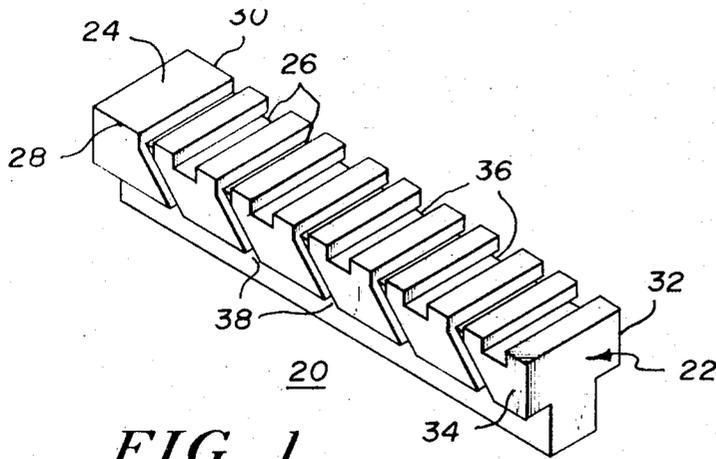


FIG. 1

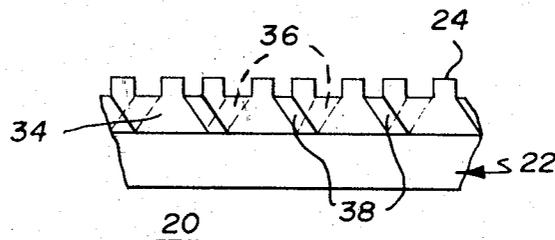


FIG. 2

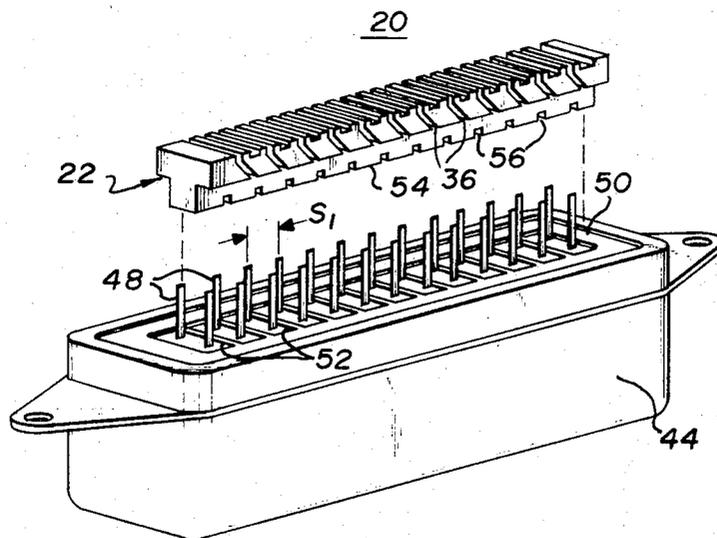
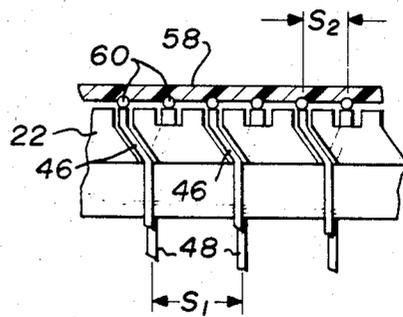
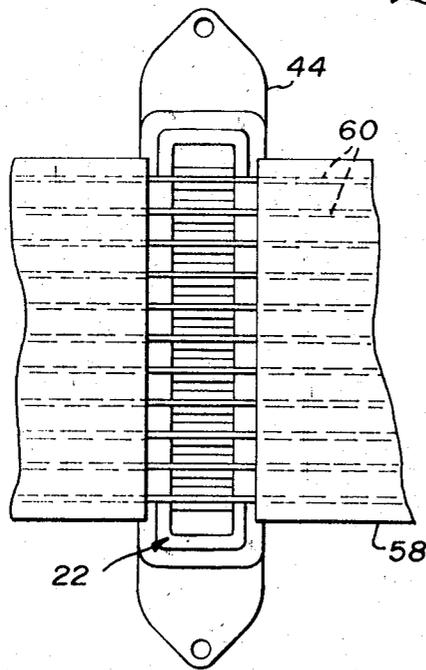
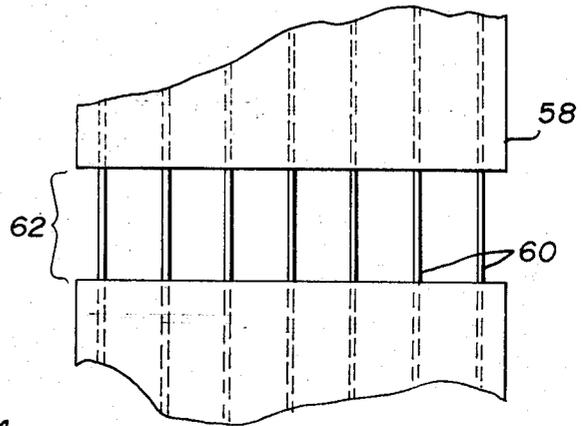
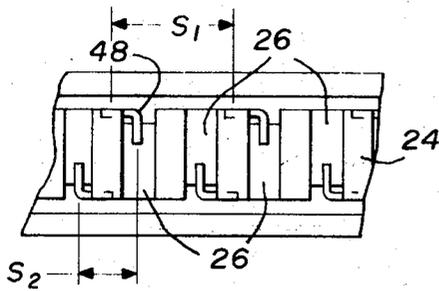


FIG. 3



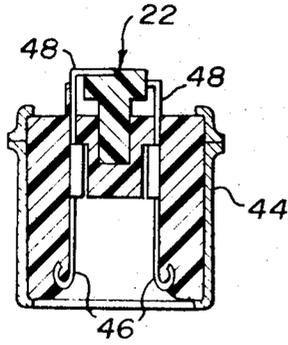


FIG. 8

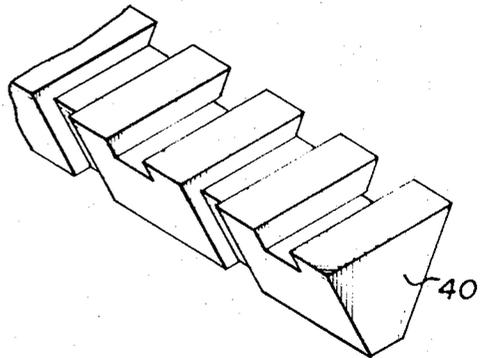


FIG. 9

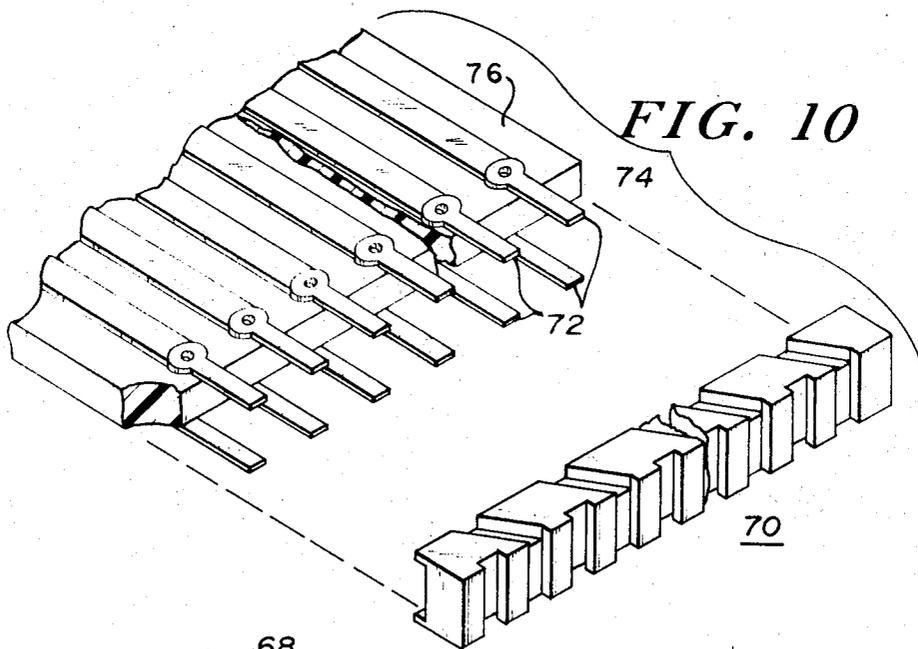


FIG. 10

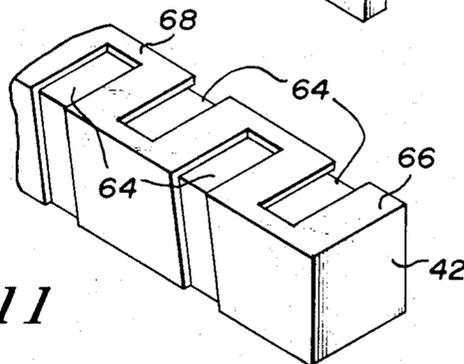


FIG. 11

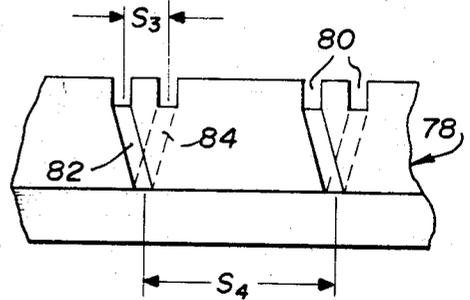


FIG. 12

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WIRING ADAPTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention is directed to wiring devices and principally to a means for interconnecting differently pitched conductive elements.

2. Description of the Prior Art

Prior art devices for interconnecting, for example the conductors of a flat cable to a printed circuit board or the like generally included a multi-contact connector arranged, for example, to be disposed over the edge of a printed circuit board for engagement with the individual conductive portions thereon. Presently employed flat cable which generally comprises a plurality of individual conductors embedded in the dielectric medium is often manufactured to provide the maximum density of conductors in the smallest width; one common arrangement comprising conductors disposed on 0.0425 centers. In order to provide an interconnection between such conductors and the printed circuit board connector it is, of course, necessary that the spacing between the associated contacts in the connector must be formed on similar centers whereby, due to the closeness of the spacing of such contacts, the soldering of individual conductors of the flat cable to such contacts becomes a tedious, time-consuming, and laborious operation, and wherein the probability of shorts developing between the contacts due to the flow of solder therebetween during the soldering operation is highly increased. The manufacture of such connectors is further complicated by the fact that extremely narrow contacts must be employed in order to provide the necessary center to center spacing and clearance. Accordingly, the contacts are susceptible to inadvertent deformation and breakage, and are also restrictively limited in their current carrying capacity due to the extremely small cross sectional area thereof. The extensive use of flat cable presently manufactured in a wide range of conductor spacings, in conjunction with printed wiring devices and the like also available in a multiplicity of ranges of contact spacings and the resulting need for establishing a simple, low cost, rapid interconnection therebetween has engendered a great need for means for overcoming the above noted difficulties and limitations.

SUMMARY OF THE INVENTION

The invention overcomes the difficulties and limitations noted above with respect to prior art wiring methods by providing a selectively recessed novel wiring adapter arranged to provide a simple, rapid means for interconnecting differently pitched conductor arrays. In one embodiment, the device comprises a generally elongate base member formed preferably from dielectric material and having an essentially T-shaped cross section, wherein the upper part of the T comprises a first surface having a first series of selectively spaced, generally parallel, transversely extending recesses disposed therein. A second and a third series of recesses extend, respectively, obliquely down opposite sides of the base member in converging relationship, the terminating ends of the recesses on one side of the base member being axially aligned with the terminating ends of the recesses extending down the opposing side of the base member. The device may thus be disposed adjacent two rows of parallel contact longitudinally spaced

one from another a first predetermined amount and the contacts thereafter guided along the opposing side recesses for placement within an associated one of the first series of recesses whereby the original pitch of the contacts is altered in conformity with the pitch of said first recesses. Thus, a series of parallel contacts disposed on for example, 0.085 centers may be altered to provide an alternate array of contacts disposed on 0.0425 centers. Although the T shaped cross section of the base member may be found convenient in many applications, other suitable configurations readily adaptable for use in typical wiring applications are disclosed. It is therefore an object of this invention to provide a novel wiring adapter.

It is a further object of this invention to provide a means for selectively altering the pitch of a plurality of aligned conductive elements.

It is another object of this invention to provide a rapid, convenient and economical means for interconnecting a conductor array having a given pitch to a further conductor array having a different pitch.

It is still another object of this invention to provide means for selectively terminating and altering the original pitch of the contacts of a connecting device.

It is still a further object of this invention to provide a means for connecting a narrowly pitched array of flat cable conductors to a wider pitched array of connector contacts.

Other objects and features will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose by way of example the principal of the invention and the best modes contemplated for carrying it out.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings

FIG. 1 is a perspective view of a wiring adapter constructed in accordance with the concepts of the invention.

FIG. 2 is a fragmentary side elevational view of the device of FIG. 1 as seen from the left side of FIG. 1.

FIG. 3 is a perspective view of the device of FIG. 1 illustrating a manner of use thereof.

FIG. 4 is a fragmentary top elevational view showing the members of FIG. 3 in a further state of assembly.

FIG. 5 is a fragmentary top elevational view showing one manner of preparing the conductors of a typical flat cable for attachment to the device of FIG. 1.

FIG. 6 is a top elevational view showing the assembly of a flat cable to a socket means and incorporating the device of FIG. 1.

FIG. 7 is a fragmentary side elevational view, partially in section, of the assembly of FIG. 6.

FIG. 8 is a front elevational view, in section, of an assembly of the members shown in FIG. 3.

FIG. 9 is a fragmentary perspective view of a further embodiment of a wiring adapter constructed in accordance with the concepts of the invention.

FIG. 10 is a perspective view of still another embodiment of a wiring adapter constructed in accordance with the concepts of the invention, and a terminated printed circuit board mateable therewith.

FIG. 11 is a fragmentary perspective view of yet another embodiment of a wiring adapter constructed in accordance with the concepts of the invention.

FIG. 12 is a fragmentary side elevational view of yet a further embodiment of a wiring adapter constructed in accordance with the concepts of the invention.

Similar elements are given similar reference characters in each of the respective drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1, 2 and 3 there is shown a wiring adapter 20 constructed in accordance with the concepts of the invention. Wiring adapter 20 comprises a base member 22 having a generally T-shaped cross sectional configuration substantially as shown. A first or upper surface 24 of base member 22 is provided with a series of selectively spaced, parallel first recesses 26 extending between a first edge 28 and a second edge 30 of surface 24. The depth and width of the first recesses 26 may be selectively chosen so as to permit a conductor or contact extension to be suitably disposed therein while the top most part of such conductor (not shown) protrudes slightly above the first surface 24. A second surface 32 and a third surface 34 define, respectively, the opposing sides of the enlarged portion of the T-shaped base member 22. A second series of recesses 36 extend from even ones of the first recesses 26 along the second surface 32 and a third series of recesses 38 extend from odd ones of the first recesses 26 along the third surface 34 as is more clearly seen in FIG. 2. Recesses 36 and 38 extend obliquely across surfaces 32 and 34, respectively, in generally equal but opposing angular orientation with respect to the longitudinal axis of base member 22, converging along an axis remote from the first surface 24, the axis of convergence being oriented substantially normal to the longitudinal axis of base member 22. Although the recesses 26, 36, and 38 are illustrated as being generally rectangularly contoured, the arrangement may be readily modified where necessary or desirable to provide a semicircular, elliptical, or V-shaped cross sections without departing from the spirit of the invention and within the concepts herein disclosed. The arrangement thus described defines essentially two sets of preferably contiguous recesses, one set comprising the odd ones of the recesses 26 and the recesses 36 communicating therewith, and the other set comprising the even ones of recesses 26 and the recesses 38 communicating therewith. The T-shaped cross sectional configuration of the wiring adapter 20 shown in FIG. 1, although generally suitable for many applications, may be appropriately modified, to define a generally tapered or rectangular cross-section, as shown for example, in FIGS. 9 and 11, at 40 and 42 respectively. It will of course be readily appreciated that in each of the configurations shown in FIGS. 1, 9, and 11, any one or more of the generally planar surfaces may be arcuately formed, where necessary or desirable, without departing from the spirit of the invention and within the concepts herein disclosed. The number of recesses provided in the base member 22 should of course be chosen to provide a number sufficient to provide at least one recess therein for each of the terminal ends to be engaged therewith. With reference specifically to FIG. 3, a wiring adapter such as 20 may be coupled to a further device such as a socket means 44. As illustrated, socket means 44 may comprise a given number of parallel pairs of contacts 46 (See FIG. 8) each having an extending portion 48 protruding a given length from a rear surface 50 of socket

means 44. In the arrangement shown, each laterally disposed pair of contact extending portions 48 is longitudinally spaced a given distance S , from an adjacent pair, the distance S , generally being chosen to provide mating cooperable relationship with one form or another of receiving member (not shown) which comprise a mating plug or a plurality of conductive strips or contacts disposed on either one or both surfaces of a printed circuit board 76 such as shown, for example, in FIG. 10. The respective pairs of extending portions 48 may be separated one from another by divider portions 52 molded into or otherwise formed adjacent the surface 50 of socket means 44. To effect the alteration of the relative spacing and disposition of the extending portions 48, the wiring adapter 20 is positioned intermediate the two rows of contact extending portions 48 and each of the portions 48 selectively guided within an associated one of the second and third series of recesses 36 and 38, respectively. Due to the oblique angular orientation of each of the recesses 36 and 38, each of the upstanding portions 48 will be required to be slightly reoriented to seat appropriately in its respective recess. As further illustrated in FIG. 3 the lower portion of the wiring adapter base member 22 may be castellated, as at 54, to provide a series of slots 56 selectively spaced and suitably proportioned to accommodate a respective one of the dividers 52. The remaining length of portions 48 extending beyond the first surface 24 of base member 22 is further displaced to lie within a respective one of the recesses 26, as shown in greater detail in FIGS. 4 and 8. Thus the original spacing S , between adjacent pairs of contact extending portions 48 is effectively altered to provide a series of extending portions 48 disposed in an alternate array having a spacing S_2 between adjacent ones thereof (see FIG. 4). Where the extending portions 48 and the recesses 26, 36 and 38 of base member 22 are arranged in a symmetrical pattern of equally spaced elements, the spacing S_2 between adjacent portions 48 will be essentially equal to one half the original spacing S_1 . It will of course be readily apparent to those skilled in the art that various selective patterns or arrays may be obtained merely by altering the symmetry and spacing of the respective first, second, and third series of recesses 26, 36, and 38. For example, in the embodiment illustrated in FIG. 12, a base member 78 is provided with a series of first recesses 80, a series of second recesses 82, and a series of third recesses 84. The first recesses 80 are dispositionally arranged to provide a pattern consisting of pairs of relatively closely spaced recesses spaced a distance S_3 from one another each pair being relatively widely spaced a distance greater than S_3 from an adjacent pair. The second and third series of recesses, 82 and 84, respectively, convergingly extend from respective odd and even ones of recesses 80 in a manner essentially equivalent to that described above with respect to recesses 36 and 38 shown in FIG. 2, the converging recesses 82, 84 having a pitch or spacing S_4 . However, in this case, because of the unequal spacing between recesses 80, the spacing S_3 will be somewhat less than one-half of the spacing S_4 . Thus, it is readily apparent that almost any desired pitch alteration may be accomplished in a similar manner merely by selectively varying the spacing between adjacent pairs of first recesses 80 and the spacing between the recesses 80 forming each such pair.

To more fully appreciate the manner in which the wiring adapter 20 may be conveniently employed, reference is now made to FIGS. 5, 6, and 7, wherein for purposes of illustration only, and not by way of limitation or restriction, there is illustrated a manner of connecting a multi-conductor flat cable 58 to a socket means such as 44 where, for example, the socket means contact pairs 46 are longitudinally disposed on 0.085 centers and the individual conductors 60 of cable 58 are disposed on 0.0425 centers. It should, of course, be readily understood that these dimensions are not critical but are illustrative merely of configurations in common use at present. In the event it is desired to connect the flat cable 58 to the socket means 44 at a given area intermediate the ends of the cable 58, a selective portion of the insulation adjacent such area is removed from either one or both surfaces of the cable, as at 62, to at least partially bare a selective length, of the conductors 60 substantially as shown (see FIG. 5). The bared portions of conductors 60 are then placed over the first surface 24 of wiring adapter 20, as illustrated in FIG. 6, and the assembly joined together by soldering, welding, or any other commonly employed means for joining conductive elements. Thus, as may be more clearly seen in FIG. 7, the contact extending portions 48 having a pitch S_1 have been selectively interconnected to a plurality of conductors 60 having a pitch S_2 different than S_1 . Although the wiring adapter 20 is shown as an element separate and apart from the socket means 44, it may be formed or molded integrally therewith to provide a composite assembly for convenient employment in a particular application. The device may also be provided in discrete, predetermined sections or lengths for selective pitch alterations of a selected portion of a particular array of contacts or conductors.

Although recesses 26 of wiring adapter 20 may extend completely across the first surface 24 in direct communication with both the first and second edges 28 and 30 of base member 22 as illustrated for example, in FIG. 1, such arrangement may be modified as shown for example in FIG. 11 wherein there is illustrated a plurality of first recesses 64 extending partially across an upper first surface 66 of a base member 42, each of the recesses 64 being separated from an adjacent recess and one of the edges of member 42 by raised portions 68. This arrangement may be found particularly advantageous where it is desired to prevent the inadvertent flow of solder or other bonding material between adjacent recesses during the bonding operation.

Referring now to FIG. 10 there is shown a further embodiment of a wiring adapter 70 constructed in accordance with the concepts of the invention. In the example illustrated the adapter 70 may be employed to alter the predetermined pitch of a series of contacts 72 disposed in parallel pairs along one edge 74 of a printed circuit board 76. To effect the alteration of the existing pitch of contacts 72 it is merely necessary to position the wiring adapter 70 intermediate the two rows of contacts 72 in a manner similar to that described above with respect to the arrangement illustrated in FIG. 3. The disposition of the contacts 72 within the recesses provided in the wiring adapter 70 is also accomplished in a manner similar to that described above with respect to the arrangement of FIG. 3, whereby the original pitch or spacing of the contacts 72 is thus selectively altered according to the pre-arranged disposition

of the recesses in wiring adapter 70 to permit their cooperative interengagement with, for example, a further series of conductors having a pitch different than that of the contacts 72.

The instant adapter, although illustrated as comprising an essentially straight elongate member, may of course, be selectively formed in various curved or arcuate configurations, for example, for mating engagement with a complementarily formed further member with which such adapter is to be employed.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A wiring adapter comprising: a generally elongate base member having a first surface having first and second longitudinally disposed edges in selectively spaced parallel relationship, a second surface adjacent said first surface and communicating therewith along said first surface first edge, and a third surface adjacent said first surface and communicating therewith along said first surface second edge, therewith along said first surface second edge, there being a series of selectively spaced, generally parallel first recesses extending generally transversely across said first surface, there being a series of selectively spaced, generally parallel, second recesses extending from even ones of said series of first recesses across said second surface in oblique angular relationship with the longitudinal axis of said second surface, there being a series of selectively spaced, generally parallel, third recesses extending from odd ones of said series of first recesses across said third surface in oblique angular relationship with the longitudinal axis of said third surface, said series of second recesses and said series of third recesses being so oriented with respect to each other as to be substantially equally but oppositely angularly displaced from the longitudinal axis of said base member.

2. A wiring adapter as defined in claim 1 wherein said base member is formed from electrically insulating material.

3. A wiring adapter as defined in claim 1 wherein said second and said third surfaces are planarly oriented generally normal to the plane of said first surface.

4. A wiring adapter as defined in claim 1 wherein said second and said third surfaces are planarly oriented in generally oblique angular relationship with the plane of said first surface.

5. A wiring adapter as defined in claim 1 wherein said base member further comprises means for selectively positioning said base member adjacent a plurality of terminals for attachment thereto.

6. A wiring adapter as defined in claim 1 wherein said first recesses are equally spaced one from another.

7. A wiring adapter as defined in claim 1 wherein said series of second recesses and series of third recesses are angularly oriented to define a plurality of paired sets, each set comprising one recess from said series of second recesses and one recess from said series of third recesses, the ends of each of said paired sets remote from their communication with respective ones of said series of first recesses being axially aligned generally normal to the longitudinal axis of said base member.

8. A wiring adapter as defined in claim 7 wherein said second and said third surfaces are planarly oriented generally normal to the plane of said first surface.

9. A wiring adapter as defined in claim 7 wherein said second and said third surfaces are planarly oriented in

generally oblique angular relationship with the plane of said first surface.

10. A wiring adapter as defined in claim 7 wherein said base member further comprises means for selectively positioning said base member adjacent a plurality of parallel pairs of terminals for attachment thereto.

11. A wiring adapter as defined in claim 7 wherein said first recesses are equally spaced one from another.

12. A wiring adapter as defined in claim 7 wherein said base member is formed from electrically insulating material.

13. A wiring adapter as defined in claim 12 wherein said second and third surfaces are planarly oriented generally perpendicular to the plane of said first surface.

14. A wiring adapter as defined in claim 1 further comprising socket means coupled to said base member.

15. A wiring adapter as defined in claim 14 wherein said socket means further comprises a plurality of parallel pairs of contacts, each of said contacts having an extending portion selectively disposed in an adjacent one of said series of second and third recesses and overlying an associated one of said series of first recesses.

16. A wiring adapter comprising: a generally elongate base member having a first surface having first and second longitudinally disposed edges in selectively spaced parallel relationship, a second surface adjacent said first surface and communicating therewith along said first surface first edge, and a third surface adjacent said first surface and communicating therewith along said first surface second edge, there being a series of selectively spaced, generally parallel first recesses extending generally transversely across said first surface, there

being a series of selectively spaced, generally parallel first recesses extending generally transversely across said first surface, there being a series of selectively spaced, generally parallel second recesses extending from even ones of said series of first recesses across said second surface in oblique angular relationship with the longitudinal axis of said second surface, there being a series of selectively spaced, generally parallel third recesses extending from odd ones of said series of first recesses across said third surface in oblique angular relationship with the longitudinal axis of said third surface, said first series of recesses being arranged in selective groups, said groups being spaced one from another a first predetermined distance, the recesses comprising each of said groups being spaced one from another a second predetermined distance, each of said groups comprising an even member of said first recesses, said first predetermined distance being at least equal to said second predetermined distance, said series of second recesses and said series of third recesses being so oriented with respect to each other as to be substantially equally but oppositely angularly displaced from the longitudinal axis of said base member.

17. A wiring adapter as defined in claim 15 wherein each of said groups comprises a pair of said first recesses.

18. A wiring adapter as defined in claim 15 wherein each of said groups comprises at least two pair of said first recesses.

19. A wiring adapter as defined in claim 15 wherein said first predetermined distance is a predetermined multiple of said second predetermined distance.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,777,299 Dated 12/04/73

Inventor(s) Earl F. Nickerson and John M. Cole

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 19, "0.0425" should be -- .0425" --

Column 1, line 67, "contact" should be -- contacts --

Column 2, line 7, "0.085" should be -- .085" --

Column 2, line 9, "0.0425" should be -- .0425" --

Column 4, line 54, "thirs" should be -- third --

Column 5, line 8, "0.085" should be -- .085

Column 5, line 10, "0.0425" should be -- .0425" --

Signed and sealed this 17th day of September 1974.

(SEAL)

Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents