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(71) Applicant: E.I. DU PONT DE NEMOURS AND COMPANY
1007 Market Street
Wilmington Delaware 19898(US)

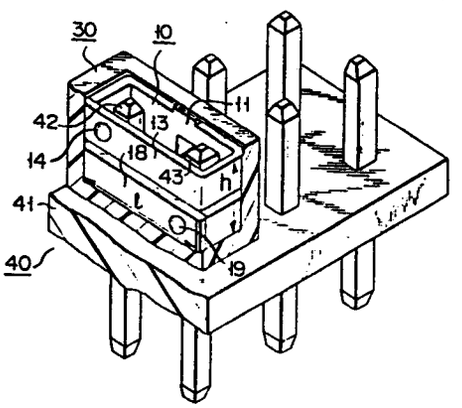
(72) Inventor: Ito, Isao
4-4-11-406 Tsuchihashi Miyamae-ku
Kawasaki-shi(JP)

(74) Representative: Barnard, Eric Edward et al,
BROOKES & MARTIN High Holborn House 52/54 High Holborn
London WC1V 6SE(GB)

(54) Electrical connector.

(57) A connector for electrically connecting a pair of parallel conductive pins (42, 43) and comprising a conductive base plate (11) arranged at one side the pins and first and second resilient cantilevered holding portions (13, 18) at another side of the pins opposite the plate (11). The holding portions (13, 18) extend transversely to the pins and have projections (14, 19) formed at their distal end regions (131, 181) which cooperate with projections (15, 20) on the plate (11) to establish releasable contact with the pins.

FIG. 2



EP 0 214 780 A2

ELECTRICAL CONNECTOR

Field of the Invention

This invention relates to an electrical connector, and in particular an electrical connector for short-circuiting a pair of pins mounted on a printed circuit board.

Background of the Invention

One known form of connector, illustrated in Figure 1 of the accompanying drawings and described hereinafter, cannot be decreased in a height dimension corresponding to the length of the pins it is used to short-circuit, without compromising stability and contact reliability.

Summary of the Invention

A general object of this invention is to provide a compact connector of a low height or profile which ensures a firm, stable and better contact with an adjacent pair of conductive pins with adequate holding pressure and proper balance.

According to this invention, there is provided a connector for electrically connecting a pair of parallel conductive pins to one another, said connector comprising:

a conductive base plate, first and second resilient holding portions spaced from the plate so that the conductive pins can be located between the base plate and the holding portions;

first and second connection portions connecting corresponding side edges of the base plate to the respective holding portions; and

contact zones formed on the inside surfaces of end regions of said first and second holding portions for contacting the pins.

The holding portions act like cantilevered springs and project laterally of the pins. Hence the connector can have a height shorter than the pin length. The connector can be conveniently fitted into an insulation housing to form an assembly. Normally, the pins

themselves would be mounted as a header on a printed circuit board.

The holding portions normally lie in the same plane parallel to the main base plate and may be rectilinear strips. In another arrangement, the holding portions are cranked to possess regions located at different levels or heights. Inter alia, this modifies the position of the contact zones. Additional end portions which act as supports can be disposed opposite the connector portions and connect solely with the plate. These support portions may abut or lie near the displaceable distal end regions of the holding portions. In this manner, two U-shaped contact units, one superimposed on the other, in inverted fashion are created.

Preferably, further contact zones are provided on the plate to cooperate with those on the holding portions. the contact zones may be at the same or different levels.

The invention may be understood more readily, and various other features of the invention may become apparent from consideration of the following descriptions.

Brief Description of the Drawings

In the accompanying drawings:

Figure 1 is a perspective view of a conventional connector in operation;

Figure 2 is a perspective view, partly broken away, of a connector assembly constructed in accordance with the invention in operation;

Figure 3 is a perspective view showing part of the connector assembly of Figure 2 without the housing;

Figure 4 is a front view of the connector part shown in Figure 3;

Figure 5 is a plan view of the connector part shown in Figure 3;

Figure 6 is a rear perspective view of the connector part shown in Figure 3;

Figure 7 is a perspective exploded view of the connector assembly depicted in Figures 2 to 6;

Figure 8 is a perspective view, partly broken away, of a further connector assembly constructed in accordance with the invention;

Figure 9 is a front view showing part of the connector assembly of Figure 8 without the housing; and

Figure 10 is a plan view of the connector part shown in Figure 9.

In the prior art arrangement shown in Figure 1, a pin header 50 and an associated connector 60 serve to interconnect a pair of pins to modify a circuit on a printed circuit board. The pin header 50 comprises a sheet-like body made of an insulating material carrying a plurality of parallel metal conductive pins. The pins vertically penetrate the header body and are fixed thereto. The lower ends of the pins which project downwardly from the header body are inserted in through holes in the printed circuit board (not shown) and soldered to the board. A pair of adjacent pins can be short-circuited by locating the connector 60 on the upper ends of these pins. The connector 60 itself is a metal component composed of a base section 61 and two pairs of resilient strip sections 62a, 62b; 63a, 63b which extend from the base section 61. The strip sections 62a,62b; 63a,.63b have outwardly directed lips for guiding the pins therebetween. The strip sections 62a, 62b; 63a,63b act as leaf springs and hold two adjacent pins in the longitudinal direction to electrically interconnect the pins, i.e. as a short-circuit.

The connector is not particularly compact. The height (h) is especially a problem since the resiliency of the strip sections 62a,62b; 63a,63b as leaf springs depends on their length ( ). If the length ( ) is made shorter to decrease the height, the sections 62a,62b; 63a,63b cannot provide a stable holding force.

Detailed Description of the Preferred Embodiments

In Figure 2 a connector assembly has a connector component 10 held in a housing 30 and is located on a pair

of pins 42,43 of a header 40. The pin header 40 is again composed of a sheet-like body 41 made of an insulating material carrying a plurality of parallel metal conductive pins (42,43). The pins vertically penetrate the header body 41 and are fixed to the body 41. The lower ends of the pins which extend below the header body, are inserted in through holes in a printed circuit board (not shown) and are soldered to the board.

Figures 3 to 6 show the connector component 10 which is made of a conductive material, such as a metal and had a generally rectangular hollow configuration. The component part 10 has a rigid base plate 11 serving as a main body portion extending between a pair of side edges A and B spaced apart in the direction C and first and second respective holding portions 13,18 opposite the plate 11. The holding portions 13,18 extend in the direction C and are spaced from each other in a direction D substantially perpendicular to the direction C, to permit the conductive pins 42,43 to be inserted between the plate 11 and the portions 13,18. An end portion 12 connects an end region 132 of the holding portion 13 to the side edge A of the plate 11 and end portion 17 connects an end portion 182 of the holding portion 18 to the edge side B of the plate 11. A supportive end portion 16, opposite the portion 12, extends from the edge B of the plate 11 to a position at or near an end region 131 of the holding portion 13. A further supportive end portion 21, opposite the portion 17, extends from the edge A of the plate 11 to a position at or near an end region 181 of the holding portion 18.

The dimensions of the respective end portions 16,21 12,17 are such that the holding portions 13 and 18 are located in the same plane and the distance between the holding portions 13 and 18 and the plate 11 remains uniform along the entire length of the portions 13 and 18. The plate 11, together with the portions 12 and 13

constitute a first U-shaped contact unit while the plate 11, together with the portions 17 and 18 constitute a second U-shaped contact unit inverted in relation to the superimposed first unit.

On the inside surfaces of the end regions 131,181 of the holding portions 13,18, and corresponding regions of the plate 11, there are respective domed projections 14,19; 15,20. The pairs of projections 14,15 and 19,20 disposed oppositely one another serve as contact zones for the corresponding pins 42,43. A further U-shaped projection 22 is provided on the exterior of the main portion 11.

The connector component 10 with its constituent portions 11,12 17,13,18,16,21 as described is formed in one piece by bending a single conductive metal blank a number of times.

During use, the pins 42,43 located in the rectangular cavity defined by the portions, 11, 12, 13, 16, 18, 17,21 with the pin 42 disposed between the plate portion 11 and the end region 131 of the holding portion 13 and gripped by the projections 14 and 15 and the pin 43 disposed between the plate portion 11 and the end region 181 of the holding portion 18 and, gripped by the projections 19 and 20. In this way, the pins 42 and 43 are reliably electrically connected via the component 10.

It is worth noting that the holding portions 13 and 18 have a height (h) (Figure 2) less than the conventional counterpart of Figure 1 and a length ( ) (Figure 2) longer than the length of the conventional counterpart of Figure 1.

Figure 7 shows the component 10 with the associated housing 30 in which the component 10 is fitted as indicated by arrow E. The housing 30 is made of an insulating material, such as plastics and is of generally rectangular hollow box-like configuration. The housing 30 has a bottom wall 31 adjoining four surrounding side walls defining an opening therebetween. Two through

holes 32 and 33 are provided in the bottom wall 31 of the housing 30 to provide access for the pins 42,43. A recess or window 35 is formed in one of the longer side walls 34 to confront the plate 11 and more particularly the projection 22 thereof. When the connector component 10 is inserted into the housing 30 an upper face 221 of the projection 22 (Figure 6) is brought into latching engagement with an upper surface 36 of the window 35 and fixes the component 10 in the housing 30.

Figures 8 to 9 depicts another assembly constructed in accordance with the invention wherein like reference numerals denote like parts to Figures 2 to 7. In the connector 10 of the assembly of Figure 8, the holding portions 13, 18 of the connector component 10 are non-rectilinear. More particularly as shown in Figure 9, the portion 13 is cranked at about its center to project downwards from a region aligned with the top of the plae 11 and the portion 18 is cranked to about its center to project upwardly from a region aligned with the bottom of the plate 11. The projections 14,19 are formed on end regions of the portions 13 and 18 are located at the same level, while the complementary projections 15 and 20 are also likewise aligned and disposed opposite to the projections 14 and 19 so that all the projections 14, 15, 19, 20 are at the same level. The supportive portion 12 is disposed at a higher level than the level of the projections 14,19,15,20, and the portion 17 is disposed at a lower level than the projection level. The modified form of connector component 10 can be fitted to the pins 42,43 with an improved balance and stability.

In the above-described embodiments, the end portions 12,17, 16,21 are flat and perpendicular to the main plate portion 11 but this is not essential and these portions may have, for example, a curved profile.

CLAIMS

1. A connector for electrically connecting a pair of parallel conductive pins to one another, said connector comprising:

a conductive base plate (11), first and second resilient holding portions (13,18) spaced from the plate (11), so that the conductive pins (42,43) can be located between the base plate (11) and the holding portions (13,18);

first and second connection portions (12,17) connecting corresponding side edges of the base plate to the respective holding portions (13,18); and

contact zones (14,19) formed on the inside surfaces of end regions (131,181) of said first and second holding portions (13,18) for contacting the pins (42,43).

2. A connector according to claim 1, wherein said first and second holding portions (13,18) are disposed in a common plane and extend transversely to the pins.

3. A connector according to claim 1 or claim 2, wherein the first and second holding portions (13,18) are cranked to possess end regions extending of different levels.

4. A connector according to claim 1, 2 or 3, and further comprising first and second supportive end portions (16,21) disposed opposite the first and second connection portions (12,17) and extending from the corresponding side edges of the plate (11) to the end regions of the first and second holding portions (12,17) to support these end regions .

5. A connector according to any one of claims 1 to 4, wherein said contact zones are in the form of domed projections (14,19) which extend towards said base plate (11).

6. A connector according to any one of claims 1 to 5 wherein further contact zones (15,20) are formed on the inside of said base plate (11) and face the corresponding

contact zones (14,19) of the first and second holding portions.

7. A connector according to any one of claims 1 to 6 and formed in one piece by bending a single conductive metal blank.

8. A connector assembly composed of a connector according to any one of claims 1 to 7,and a housing (30) having four side walls for enclosing the connector.

9. An assembly according to claim 8, wherein the housing (30) has a bottom wall (31) in which there are openings (32,33) through which the pins (42,43) project into the connector.

10. An assembly according to claim 8 or 9 wherein a window (35) is provided in one of the side walls of the housing (30) and a shaped projection (22) is formed on an outer surface of said base plate (11) and serves to mate with the window (31) to form a latch therewith for locking the connector in the housing.

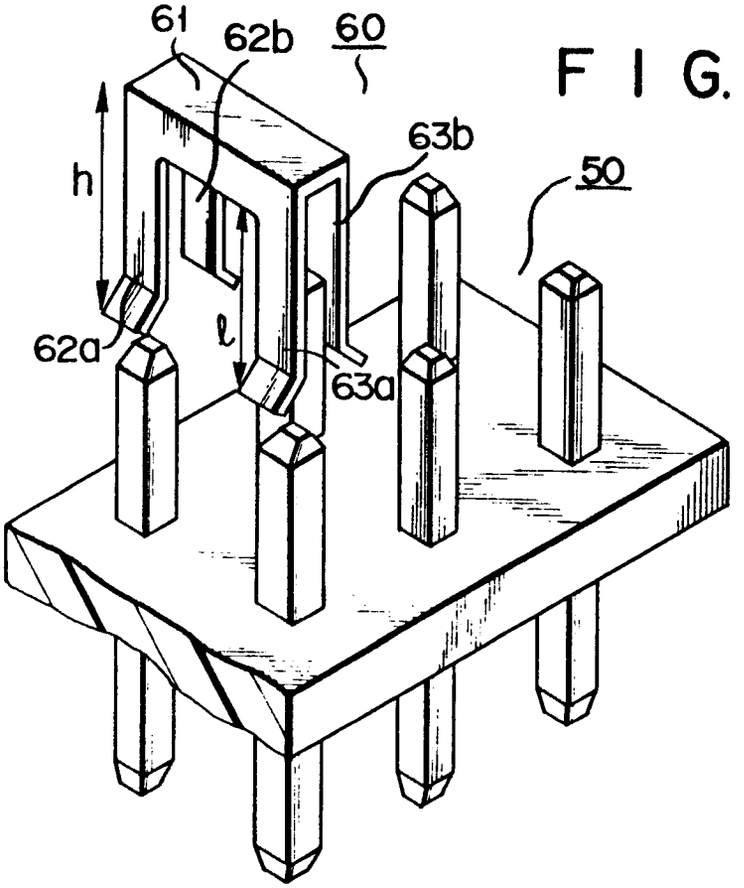


FIG. 1

FIG. 2

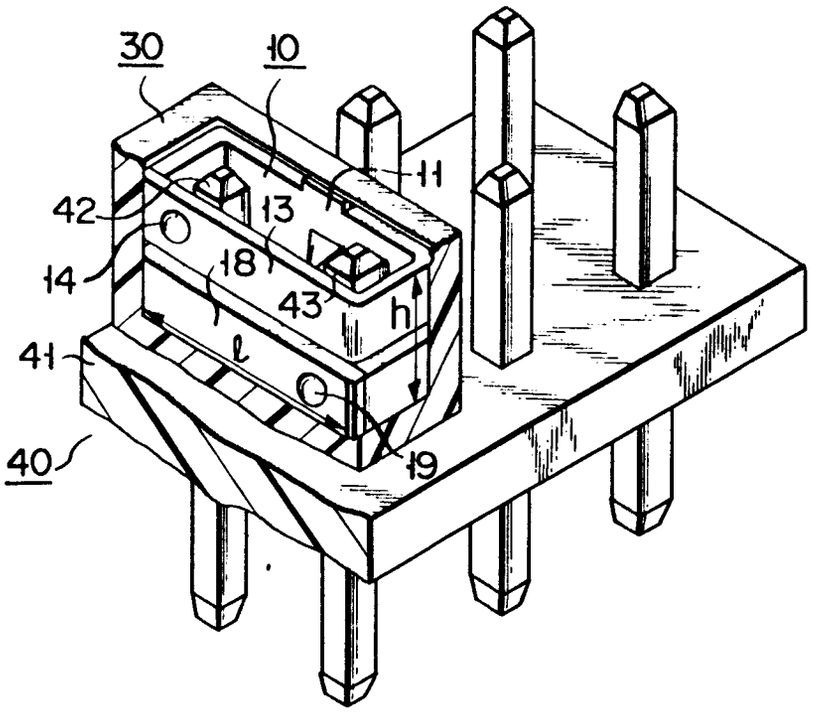


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FIG. 3

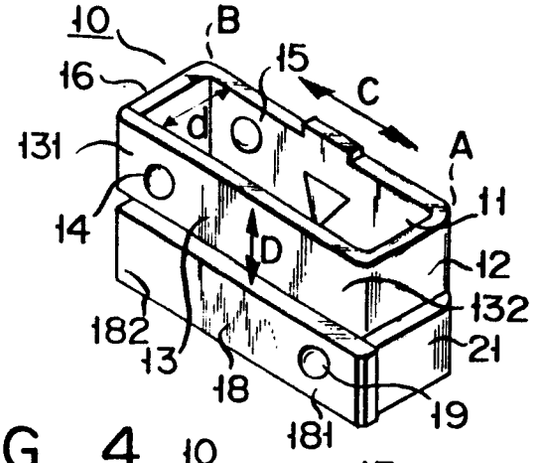

FIG. 4

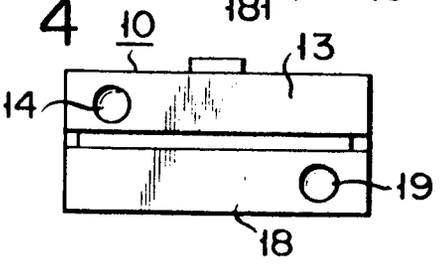

FIG. 5

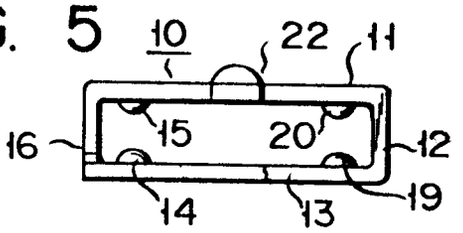

FIG. 6

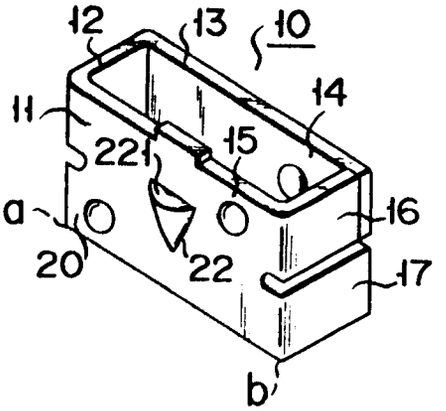

FIG. 7

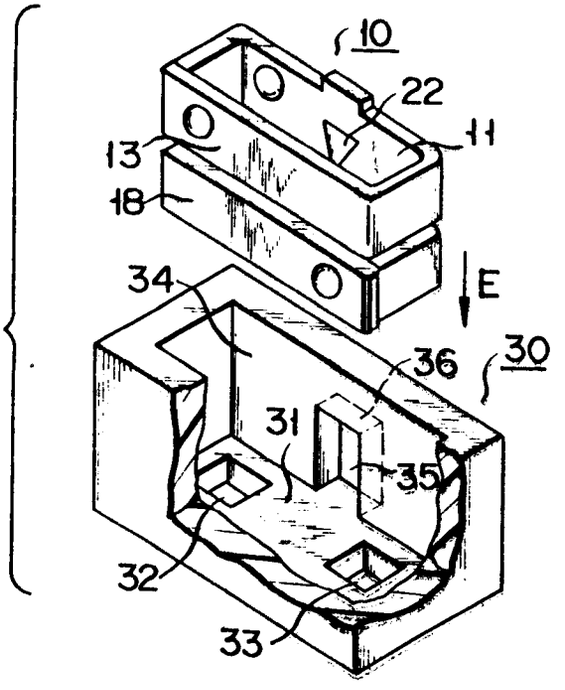

FIG. 8

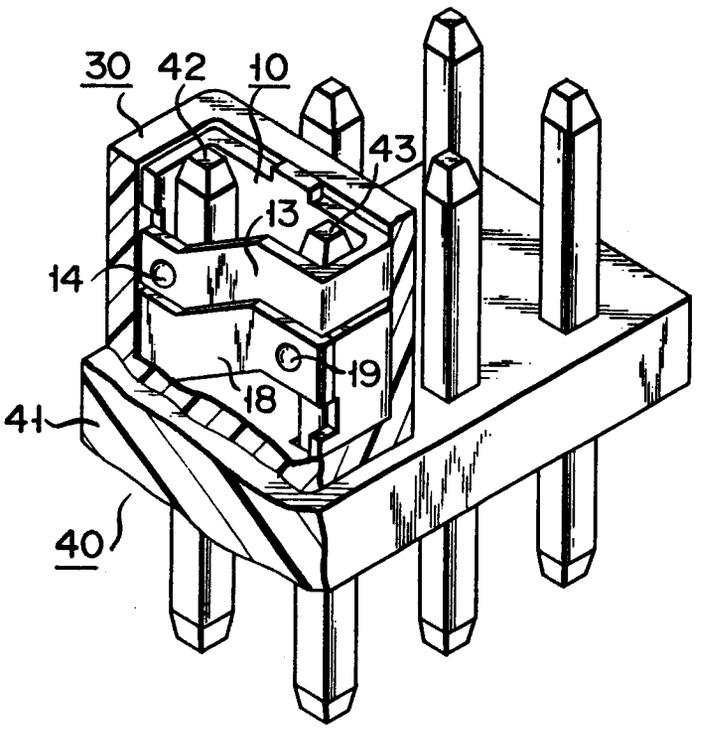

FIG. 9

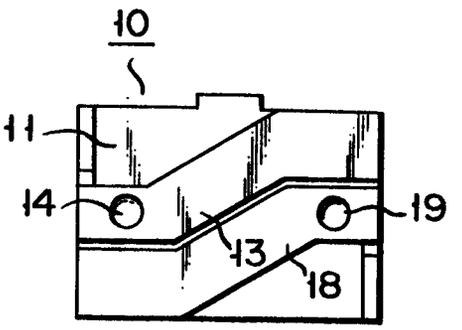

FIG. 10