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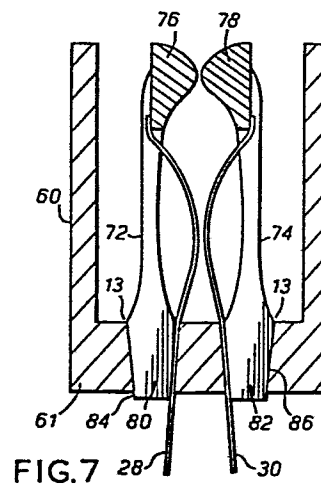
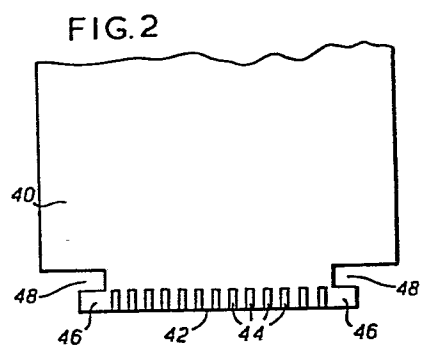
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"IMPROVEMENTS IN AND RELATING TO PRINTED-CIRCUIT BOARD
EDGE CONNECTORS"

The present invention relates to connectors for
5 providing a plurality of simultaneous electrical connections
to a printed circuit board by the insertion therein of an
edge of the printed circuit board.

It is well known to employ an edge connector for
providing plural simultaneous electrical connections to a
10 printed-circuit board.

The edge of the board is provided with an array
comprising a plurality of spaced contact pad areas. The
areas are in general gold plated or plated with any other
corrosion-resistant substance which is suitable for providing
15 electrical connection. The connector comprises a
correspondingly spaced array of spring contacts. The edge of
the board is inserted into the connector to compress the
spring contacts and bring each one of the contact pads into
sliding engagement with a corresponding one of the spring
20 contacts. The spring contacts are in general also plated
with gold or any other corrosion resistant electrical
conductor.

The spring contacts on the connector are generally
arranged in opposed pairs such that one spring contact in
25 each pair opposes the other through the thickness of the
board. The pairs are regularly spaced along the length of
the edge of the board. When the board is not therebetween

- the opposed members of each pair, being in a non-compressed condition, approach one another closely but do not touch. Even when non-compressed there is generally some residual force pushing each spring contact against stops in their housing such that it requires a definite starting force to initiate the separation of a pair.

In order to insert the board between the pairs it is necessary first to separate the pairs without damage thereto. To this end the board is generally provided with chamfers on its insertable edge. The contact pads reach right to the edge of the chamfers. By the time the spring contacts have been separated by the chamfers they are in contact with the leading edges of the pads and are also exerting maximum restoring force. High attritional wear therefore occurs where the pads meet the chamfers. Having been inserted to the ends of the chamfers the board is further introduced between the pairs of spring contacts until each spring contact lies centrally on a corresponding one of the connector pads on the board. During this further introduction the pairs exert maximum restoring opposing forces against one another causing considerable and undesirable attritional wear as each spring contact slides against its pad. Plastic flow of the non-corrosive electrically conducting layer can also occur.

The attrition of the surfaces of both the spring contacts and the pads causes the exposure to air of the underlying non-noble substrata which then become liable to

- atmospheric oxidation bringing about a degradation of the electrical conductivity of the spring contact to pad interface.

The plastic flow of the non-corrosive layers
5 renders their thickness less along the path of sliding engagement between each spring contact and its corresponding pad. The layers are therefore subject to a greater susceptibility to disappearance by attrition.

In the presence of possible oxidation the
10 reliability of an edge connector decreases rapidly. When there are plural sets of contacts the chances of all sets simultaneously providing satisfactory operation is unacceptably small.

It has been one solution to the above problem
15 to offset the effects of oxidation by arranging that the force between opposing pairs of spring contacts is very large indeed so that any oxide layer is broken up and the heat generated by friction causes small areas of air-excluding spring-to-pad welds. This approach causes the
20 insertion force of a board into a connector to be extremely large and the withdrawal force correspondingly great. The rate of wear on the spring contacts and pads is enormous so that only a limited number of insertions and withdrawals is possible before a board and connector combination has to
25 be discarded. The boards and connector housings must be unnecessarily mechanically strong to withstand the forces exerted thereon.

It has been another approach to provide that separate means is provided for lowering the spring contacts onto the board by the use of manually operable levers and the like. This approach relieves attritional wear but substitutes complexity and high cost, the connectors themselves taking up much space. Consequently, although successful, this approach is reserved for test equipment for testing boards.

It is therefore desirable to provide an edge connector of simple construction and small size for the insertion therein of a board for the establishing of electrical connection therebetween with substantially no sliding between spring contacts in the connector and contact pad areas on the board.

The present invention consists in a system for providing electrical connection to a printed-circuit board, said system comprising a connector comprising first and second elastically opposed members in turn comprising first and second opposed protrusions and first and second opposed spring contacts respectively, and a printed circuit board comprising an edge, first and second contact pads, and a void, said edge being insertable between said protrusions to separate said spring contacts by separating said members, said board being insertable a predetermined distance therebeyond without engaging said spring contacts for said protrusions to engage said void and to allow the elastic restoration of the unseparated positions of said

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- members for said first and second spring contacts to engage said first and second contact pads respectively.

In a first preferred embodiment first and second lever arms are rigid and pivoted at their ends remote
5 from the direction of entry of a board into the connector. First and second spring contacts are preferably associated with the first and second lever arms respectively. The spring contacts preferably urge the lever arms together. The spring contacts preferably engage the lever arms by
10 means of catches near to the end wherefrom a board enters the connector. The first and second lever arms preferably comprise first and second cutaways-respectively to form a common void. The first and second lever arms preferably comprise first and second protrusions respectively at the
15 end wherefrom a board is inserted into the connector and, when urged together by the spring contacts, the protrusions preferably meet to press against one another. The first and second spring contacts preferably comprise first and second contact sections. The contact sections preferably
20 protrude into the common void. When both the first and second lever arms are urged together by the spring contacts, the contact sections are preferably non-contiguously proximate to one another in the void. The first and second protrusions preferably comprise first and second entry
25 ramps which co-operate to force the lever arms apart when the edge of a board is introduced thereto. The protrusions preferably comprise a bearing surface for pushing

- against one another and for pushing against a board. The first and second protrusions preferably comprise first and second exit ramps for pushing the protrusions apart whenever a board which has been inserted into the connector
- 5 is withdrawn therefrom.

- In the first preferred embodiment the printed-circuit board preferably comprises a leading edge. The leading edge is preferably unchamfered. A plurality of contact pads are preferably provided along the leading edge.
- 10 the contact pads are preferably evenly spaced along the leading edge. Each end of the leading edge is preferably provided with a tab sharing an end portion of the leading edge. The tab preferably extends backwards from the leading edge for a distance a little less than the extent of the
- 15 common void. Behind the tab there is preferably provided a gap large enough for the protrusions to touch one another therethrough.

- The connector of the first preferred embodiment preferably comprises first and second members comprising
- 20 first and second contact - spacing bars respectively. The contact separating bars preferably run the length of the connector. Each contact- spacing bar preferably comprises a lever arm at each end so that the entire connector comprises two opposed contact separating bars
- 25 and four lever arms. The spring contacts preferably engage the rear of the contact - spacing bars. When the lever arms are separated the contact bars preferably move all of

- spring contacts on their respective sides of the connector together.

In the operation of the first preferred embodiment the leading edge of the board is preferably introduced to the first and second entry ramps of the closed first and second lever arms respectively, and forced therebetween to push the protrusions apart. The board is thereafter insertable therebeyond. In being pushed apart, the first and second lever arms preferably pull the first and second contact sections of the first and second spring contacts respectively far enough apart to avoid contact with a board as it is inserted into the connector. The board is preferably insertable until the leading edge engages the remote boundary of the common void. As the board engages the remote edge of the common void, the first and second protrusions preferably fall behind the tab into the gap preferably allowing the first and second lever arms to come together and allowing the plurality of contact sections of the plurality of spring contacts on both sides of the board along the length of the contact - spacing bars to oppose one another on opposite sides of the board for each spring contact to connect with a corresponding contact pad.

In the first preferred embodiment the connector preferably comprises a common housing for the protection of the spring contacts. In a first preferred manner of mounting for the lever arms, the first lever arm is preferably affixed to the second lever arm by means of a pivot. The second lever

arm is preferably a little longer than the first lever arm and is preferably affixed within the housing leaving only the second lever arm free to move within the housing. The housing is preferably U-shaped being open in the direction
5 of insertion of a board.

In a second preferred manner of mounting for the lever arms both the first and second lever arms are provided with pegs which fit loosely into corresponding recesses in the housing and allow a degree of rotation of
10 each lever arm relatively to the housing.

In a second preferred embodiment all things are as in the first preferred embodiment save that the lever arms, instead of being pivoted, are flexible and bend towards and away from one another without hinges or pivots.
15 The protrusions are preferably provided at regular intervals along the length of the contact spacing bar. When said regular spacing necessitates the provision of a protrusion other than in the vicinity of a lever arm, that is, other than at the end of the leading edge of a board, the tab and
20 gap is preferably replaced by a hole remote from the leading edge of the board by a distance equal to the width of a tab, the hole extending away from the leading edge by a distance sufficient to allow the coming together therethrough of a pair of protrusions.

25 In both the first and second preferred embodiments whenever an inserted board is to be withdrawn from the connector the rear of the tab or the edge of the hole

- in the board engages the exit ramps on the first and second lever arms forcing them apart with progressive withdrawal of the board and thereby disengaging the contact sections of the spring contacts from the pads on the board. Thereafter the board is preferably withdrawable from between the lever arms without any engagement with the spring contacts, the lever arms closing behind the leading edge of the board as the leading edge of the board is removed from the entry ramps.

The present invention is further explained, by way of an example, by the following description read in conjunction with the appended drawings, in which:

Figure 1 shows a cross sectional view of the active members of the connector of the first preferred embodiment.

Figure 2 shows a plan view of the printed-circuit board of the first preferred embodiment.

Figures 3A to 3C show three successive stages in the insertion of a board according to figure 2 into the connector according to figure 1.

Figure 4 shows the connector of figure 1 in its housing.

Figure 5 shows a first manner of mounting the connector of figure 1 in its housing.

Figure 6 shows a second manner of mounting the connector of figure 1 in its housing.

Figure 7 shows a cross sectional view of the connector according to the second preferred embodiment.

Figure 8 shows the contact-spacing bar of the second preferred embodiment.

Figure 9 shows the printed-circuit board according to the second preferred embodiment.

5 Figure 1 shows a cross sectional view of the active members of the connector of the first preferred embodiment.

The active assembly 8 comprises a first lever arm 10 and a second lever arm 12. The first and second lever
10 arms 10 12 are pivoted about their basal ends 13 in a manner to be described later so that they can swing apart from one another at their non-basal ends.

The first lever arm 10 comprises a first protrusion 14 extending towards the second lever arm 12. The second
15 lever arm 12 comprises a second protrusion 16 extending towards the first lever arm 10. Both the first protrusion 14 and the second protrusion 16 are proximate to the non-basal ends of the first lever arm 10 and the second lever arm 12 respectively.

20 The first protrusion 14 comprises a first entry ramp 18 extending diagonally from the tip of the first lever arm 10 towards the second lever arm 12. The second protrusion 16 has a second entry ramp 20 extending from the tip of the second lever arm 12 towards the first lever
25 arm 10 in a complementary manner to the first entry ramp 18 so that together they form a concave wedge symmetrical about the line of contiguity between the first and second

lever arms 10 12 .

A common void 22 is formed by the provision of complementary cutaway sections in the first and second lever arms 10 12 to the basal side of the first and second protrusions 14 16 respectively.

The basal boundary of the first protrusion 14 with the common void 22 is provided in the form of a first exit ramp 24 which extends diagonally towards the second lever arm 12 in the general direction of its tip. The basal boundary of the second protrusion 16 with the common void 22 is provided in the form of a second exit ramp 26 which extends diagonally towards the first lever arm 10 in the general direction of its tip and which is complementary to the first exit ramp 24 such that together they form a concave wedge, when viewed from their basal ends, which is symmetrical about the line of contiguity between the first and second lever arms 10 12 .

A first spring contact 28 is provided in association with the first lever arm 10 and a second spring contact 30 is provided in association with the second lever arm 12. The first spring contact 28 as illustrated is in fact representative of a plurality of spring contacts stretching accross the width of a connector in a manner which will be made clear in later description. The second spring contact 30 is similarly representative of a plurality of such contacts.

The first spring contact 28 comprises a

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first contact section 32 extending towards the second lever arm 12 in the area of the common void 22. The second spring contact 30 comprises a second contact section 34 extending towards the first lever arm 10 in the area of the common
5 void. When the first and second lever arms 10 12 are closed together the first and second protrusions 14, 16 meet preventing closer approach of the first and second lever arms 10 12 in which position the first and second contact sections 32 34 fail to meet by a distance less than the
10 thickness of a board.

The first lever arm 10 is provided with a first contact spacing bar 36. The first spacing bar 36 extends accross the entire width of a connector in a manner which will become clear on reading later description. The first
15 spring contact 28 engages the side of the first spacing bar 36 remote from the second lever arm 12 to urge the first lever arm 10 towards the second lever arm 12.

The second lever arm 12 is provided with a second contact spacing bar 38 which is extensive accross the entire
20 width of a connector in the same manner as the first contact spacing bar 36. The second spring contact 30 engages the side of the second contact spacing bar 38 remote from the first lever arm 10 to urge the second lever arm 12 towards the first lever arm 10.

25 It is to be appreciated that the engaging of the first contact spacing bar 36 by the first spring contact 28 is representative of such engagement by a plurality of

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- similar spring contacts across the width of a connector and that the engaging of the second contact spacing bar 38 by the second spring contact 30 is representative of such engagement by a plurality of such spring contacts
- 5 across the width of a connector.

Figure 2 shows the board of the first preferred embodiment.

A printed circuit board 40 for the construction thereon of electrical or electronic circuits comprises a
10 leading edge 42 for insertion into an electrical connector for the provision of electrical contacts to the board 40.

A plurality of contact pad areas 44 are provided adjacent to the leading edge 42. The areas 44 need not necessarily be contiguous with the leading edge 42. The
15 areas 44 are arranged with a regular spacing along the leading edge 42, and are on both faces of the board 40.

At either end of the leading edge 42 the board 40 is provided with a tab 46. The tab 46 is rectangular and shares one of its edges with the leading edge 42. The tab
20 46 extends backwards from the leading edge 42 by a distance which would allow the tab 46 to rest within the common void 22 of figure 1.

To the rear of the tab 46 the board 40 is provided with a gap 48. The width and disposition of the gap 48 is
25 such that, if the tab 46 is resting within the common void 22, the first and second protrusions 14, 16 are able to meet

- within the gap 48.

Figure 3A shows the first stage of the insertion of a board 40 into the active assembly 8 of figure 1.

- 5 The board 40 is inserted in the direction of the insertion arrow 50 . The leading edge 42 of the board 40 engages the first and second entry ramps 18 20 to separate the first and second protrusions 14 16 which move apart to allow the entry of the tab 46 therebetween.

- 10 Figure 3B shows the second stage of the insertion of a board 40 into the active assembly 8 of figure 1.

- 15 In forcing apart the first and second protrusions 14 16 the entering board 40 also forces apart the first and second lever arms 10 12 which carry with them the first and second contact sections 32 34 respectively which separate by a distance greater than the thickness of a board 40 to allow the insertion of the tab 46 between the first and second protrusions 14 16 into the common void without abrasion between the contact sections 32 34 and the pads 44.

- 20 Figure 3C shows the last stage in the insertion of a board 40 into the active assembly 8 of figure 1.

- 25 The tab 46 has passed entirely into the common void 22. The first and second protrusions 14 16 have then been able to come together through the gap 48 allowing the restoration of the previous positions of the first and second second lever arms 10 12. The contact sections 32 34 are thereby allowed to impinge onto the board 40 to engage the pads 44 without significant sliding therebetween.

When it is desired to remove the board 40 the first and second exit ramps 24 26 behave towards the edge of the tab 46 remote from the leading edge 42 of the board in the same way that the entry ramps 18 20 behave towards the leading edge 42. The tab 46 causes the separation of the first and second protrusions 14 16 and the consequent separation of the first and second lever arms 10 12 and of the first and second spring sections 32 34 to allow the removal of the board 40 without abrasion between the contact sections 32 34 and the pads 44.

It is to be appreciated that by suitable choice of elastic constant for the spring contacts 28 30 and suitable choice of pretension when the lever arms 10, 12 are open and choice of the separation of the contact sections 32 34 when the lever arms 10 12 are closed without a board 40 therebetween, the contact sections 32 34 can be caused to exert any desired pressure on the pads 44.

It is also to be appreciated that, although the leading edge 42 of the board is here shown as being unchamfered, there is nothing to prevent its being chamfered nor is there any reason why the edge of the tab 46 remote from the leading edge 42 should not be chamfered.

The tab 46 and the gap 48 are here shown as being substantially rectangular. It is to be appreciated that any other shape will suffice for them 46 48 which allows for the mutual interaction of board 40 and active assembly 8 as described with relation to figures 3A 3B and 3C.

The spring contacts 28 30 and the pads 44 will in general be coated with an oxidation-resistant layer of a noble metal such as gold.

5 The entry ramps 18 20 and the exit ramps 24 26 are here shown as planar. It is to be appreciated that many other shapes will suffice for these surfaces, the only requirement placed thereon being that the pair of entry ramps 18 20 can co-operate to open the lever arms 10 12 in response to the insertion of a board 14 and that the
10 pair of exit ramps 24 26 can co-operate to separate the lever arms 10 12 in response to the withdrawal of a board 40. Whilst the two pairs 18 20 and 24 26 are here shown with reflective symmetry about the line of contiguity between the lever arms 10 12, those skilled in the art will
15 readily appreciate that the invention will function without such symmetry with modifications which will be apparant.

The invention is here described showing two sets of spring contacts 28 30. It is to be appreciated that an active assembly 8 comprising only one set of
20 spring contacts 28 can be provided for making contact with pads 44 on just one side of a board 40, in which case there is a necessity for just one pivotable lever arm 10, the other lever arm 12 being replacable by an inert bearing surface, the inert surface being provided
25 with a protrusion 16 as an optional feature.

Figure 4 shows the active assembly 8 of figure 1 in a protective housing.

The active assembly 8 is housed within a U-shaped protective housing 60. The active assembly 8 and the housing 60 together make up a connector. The housing 60 is in the form of a rectilinear, rectangular-cross-section U-shaped trough with the basal end 13 of the active assembly 8 attached to the base section 61 of the trough and the protrusions 14 16 proximate to the open face of the trough such that a board 40 can be inserted through the open face of the trough into the active assembly 8 as described.

10 The active assembly 8 runs the entire length of the housing 60 by means of the contact spacing bars 36 38 only one of which is clearly visible in figure 4. The spring contacts 28 30 are regularly spaced along the contact spacing bars 36 38 accross the full width of the housing 60. A set
15 of lever arms 10 12 is provided at either end of the contact spacing bars 36 38 and the two sets of lever arms 10 12 co-operate on the insertion of a board in a manner which will be apparant to separate the contact spacing bars 36 38 in the manner described.

20 Figure 5 shows a first manner of attaching the active assembly 8 in the housing 60.

The first and second lever arms 10 12 are provided on their basal ends with first and second pegs 62 64 repectively which provide a loose fit in first and
25 second apertures 66 68 in the base 61 of the housing 60. The pegs 62 64 are so shaped with enlargements at their distal ends that they are not free to disengage the

base 61. Being of a loose fit, the pegs 62 64 allow for the mutual pivoting between the first and second lever arms 10 12 required for the operation of the present invention.

There is of course no reason why the pegs 62 24 should not entirely through-penetrate the base 61 of the housing 60.

The spring contacts 28 30 pass right through the housing 60 and can be soldered to on the exterior of the housing.

Figure 6 shows a second manner of affixing the active assembly 8 within the housing 60.

The first lever arm 10 is attached to the second lever arm 12 by means of a pivot 70. The pivot 70 can range in complexity from a simple dimple-and-socket arrangement at either end of a pair of mouldings where a first moulding consists in a first lever arm 10 provided at either end of a first contact-spacing bar 36 and the second moulding consists in a second lever arm 12 provided at either end of a second contact spacing bar 38, one moulding snap-fitting inside the other, to a full hinge stretching the entire length of a connector. The second lever arm 12 is slightly longer than the first lever arm 10 and is solidly and inflexibly affixed to the base 61 of the housing 60 to hold the first lever arm 10 a short distance clear of the base 61 for the first lever arm 10 to be free to pivot relative to the now unpivotable second lever arm 12. The second lever arm 12 can be affixed within the housing 60 in any suitable

- manner ranging from being an integral part of the housing 60 60 moulding by incorporation with its base 61 or one of its walls 71 to being pegged or glued into or onto the base 61.

Once again the spring contacts 28 30 through-penetrate
5 the base 61 for soldering to external conductors outwith the housing, it being appreciated that connecting means other than soldering are possible.

Those skilled in the art will appreciate that the manner of mounting shown in figure 6 can readily be adapted
10 to do away with the housing 60 by the attachment of the basal end of the second lever arm 12 to any rigid support, the second lever arm 12 acting as the support for the first lever arm 10.

Figure 7 shows a cross sectional view of the active
15 assembly of the second preferred embodiment of the present invention.

In the second preferred embodiment the first and second rigid lever arms 10 12 of the first preferred embodiment are replaced by first and second flexible arms
20 72 74. The flexible arms 72 74 do not require the provision of any means for providing pivotal movement therebetween since the pivotal movement is automatically provided for by the mutual elastic deformability of the arms 72 74 . The spring contacts 28 30 engage the outside faces of
25 opposed bulbous protrusions 76 78 on the non-basal ends of the first and second flexible arms 72 74 respectively to provide some or all of the elastic restoring force tending

to bring the arms 72 74 back together. The basal ends 13 of the first and second flexible arms 72 74 are provided with first and second pegs 80 82 respectively which provide a firm push-fit into first and second peg-holes 84 86 in the 5 base 61 of the housing 60. The spring contacts 28 30 pass through the base 61 as for the first preferred embodiment.

Figure 8 shows one of the two contact spacing bars of the second preferred embodiment.

The contact spacing bar 90 is provided on either 10 end with a first flexible arm 72 just as the first contact spacing bar 36 of the first preferred embodiment is provided at either end with a first lever arm 10, it being understood that in a complete connector according to the second preferred embodiment there is provided a second contact 15 spacing bar provided at either end with a second flexible arm 74 just as the second contact spacing bar 38 of the first preferred embodiment is provided at either end with a second lever arm 12.

The bulbous protrusions 76 are provided at the 20 ends of the spacing bar 90 in association with the flexible arms 72 at either end. In order to prevent flexing of the spacing bar 90 when a board 40 is inserted into a connector, one or more additional bulbous protrusions 92 are provided at regular or irregular intervals along the length of 25 the spacing bar 90 to assist in the separation of the flexible arms 72 74 and to distribute the load, it being understood that each additional bulbous protrusion 92 on

- . the spacing bar 90 which is shown is opposed by a correspondingly-placed additional bulbous protrusion 92 on the other spacing bar which is not shown.

In use, the second preferred embodiment operates
5 in the same manner as the first preferred embodiment, the surfaces of the bulbous protrusions 76, 78 92 acting in the same manner as the ramps 18 20 24 26 of the first preferred embodiment.

It is to be appreciated that whereas the pegs
10 80 82 are shown as being through-penetrative of the base 61 of the housing 60 they might equally well extend through only a portion of the thickness of the base. It is also to be appreciated that the side walls of the housing 60 can be omitted to leave only the base 61. The flexible arms 72
15 74 can be formed as part of a a common moulding with the housing 60.

In that instance where the pegs 80 82 through-
-penetrate the base 61, it is possible to associate
spring contacts 28 30 with the very ends of the connector
20 by jamming spring contacts 28 30 in the same peg holes 84 86 as the pegs 80 82.

Figure 9 shows a printed-circuit board 40 suitable
for use in the second preferred embodiment of the
present invention.

25 The board 40 is provided with tabs 46, gaps 48 and contacts 44 on both faces as before. In addition, the board is provided with one or more holes 94 which serve the

same purpose for the additional bulbous protrusions 92 as the gaps 48 serve for the bulbous protrusions 76 78 at the ends of the spacing bar 90. The hole 94 is here shown as being rectangular but it is to be understood that many alternate shapes can be used. In addition to the hole, the board 40 is shown as having special pads 96 modified for use in the vicinity of the additional bulbous protrusions 92, it being understood that the modified pads 96 can also be employed in the vicinity of the tabs 46 in those instances where spring contacts 28 30 are provided in association with the actual flexible arms 72 74 of the second preferred embodiment or the lever arms 10 12 of the first preferred embodiment.

It is to be appreciated that whereas the arms 72 74 10 12 have, in both the first and second preferred embodiments, been shown and described as being situated at the extremities of the contact spacing bars 36 38 90, it is perfectly permissible to include them at any suitable positions along the length of the spacing bars 36 38 90 and to have only one, or any number of them.

It is to be appreciated that the tabs 46 and gaps 48 can be entirely replaced by suitable holes 94 even at the extremities of the leading edge 42.

Whereas the present invention has been described with reference to the uses of a printed-circuit board 40 having a substantially straight leading edge 42 it is to be appreciated that with modifications which will be

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clear to those skilled in the art the invention can be made to function with leading edges of varied and different shapes. It will also be apparant that the printed-circuit board can be replaced by numerous other electrical devices, and one area of particular interest for the present invention is the provision of pluggable connections to very large scale integrated circuits up to the dimensions of an entire wafer.

The tabs 46 have so far been described as being of the same uniform thickness as the rest of the board 40. it is to be appreciated that the tabs 46 can be made with greater or lesser thickness than the board 40 to accomodate greater or lesser opening requirements for the arms 10 12 72 74.

It is lastly to be appreciated that whereas the gaps 48 and the hole 94 have been depicted as passing right through the board 40, the same function can equally be served by depressions that do not penetrate right through.

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Claims:

1. A system wherein a connector provides electrical connection to an edge of a printed-circuit board, said connector comprising first and second elastically-opposed members respectively comprising first and second opposed protrusions and first and second opposed spring contacts, and said printed circuit board comprising a void and first and second contact pads on opposite sides of said printed-circuit board proximate to said edge, where said edge is insertable between said opposed protrusions for the separation thereof to move apart said opposed members and thereby move apart said opposed spring contacts, where said printed-circuit board is insertable a predetermined distance between said opposed protrusions without said first and second spring contacts engaging said first and second contact pads, and where, when said printed-circuit board is inserted said predetermined distance, said protrusions can engage said void in said board to allow the elastic restoration of the unseparated positions of said protrusions for said first and second spring contacts, in the coming-together thereof, respectively to engage said first and second contact pads.

2. A system according to claim 1 wherein said first spring contact is coupled to said first opposed member for the urging thereof towards said second opposed member and wherein said second spring contact is coupled to said second opposed member for the urging thereof towards said first opposed member for said first and second spring contacts to provide said elastic opposition of said members.

3. A system according to claim 1 or claim 2 wherein said first opposed member comprises a first lever arm, wherein said second opposed member comprises a second lever arm, and wherein said connector comprises a pivot for allowing relative rotation between said first and second lever arms for the moving apart and coming together thereof.

4. A system according to claim 2 or claim 3 wherein said connector comprises a further set of said lever arms as third and fourth lever arms of third and fourth opposed members respectively having third and fourth opposed protrusions thereon, and wherein said printed-circuit board comprises a second void for engagement by said third and fourth protrusions, said connector further comprising a first contact-spacing bar intermediate between said first and said third lever arms and a second contact-spacing bar intermediate between said second and fourth lever arms, and a further plurality of opposed pairs of spring contacts for engaging said first and second contact-spacing bars and operable with the coming together thereof to engage a further plurality of pairs of contact pads.

5. A system according to claims 2, 3 or 4 wherein said first and second protrusions respectively comprise first and second entry ramps for pushing said lever arms apart with the insertion thereagainst of said edge of said printed-circuit board for the insertion thereof into said connector.

6. A system according to claims 2 to 5 wherein said first and second protrusions respectively comprise first and second exit ramps for pushing said lever arms apart in response to the urging thereagainst of the edge of said void in said printed-circuit board for the withdrawal thereof from said connector.

7. A system according to claims 2 to 6 wherein said connector comprises a base, through-penetrated by said first and second spring contacts, and wherein said first lever arm is affixed to said base and said second lever arm is affixed to said pivot to rotate about said first lever arm.

8. A system according to claims 2 to 6 wherein said connector comprises a base, through-penetrated by said first and second spring contacts, wherein said first and second lever arms comprise respectively first and second pegs at the basal end thereof, and wherein said base comprises first and second apertures for the loose but irremovable insertion of said first and second pegs respectively therein to allow a degree of movement between said first and second lever arms for the moving apart and coming together thereof.

9. A system according to claim 2 wherein said first opposed member comprises a first flexible arm, wherein said second opposed member comprises a second flexible arm, and wherein said connector comprises a base for the support thereof, said flexible arms being movable towards and away from each other.

10. A system according to claim 9 wherein said connector comprises a further set of said flexible arms as third and fourth opposed flexible arms having third and fourth opposed protrusions respectively thereon, and wherein said printed-circuit board comprises a second void for engagement by said third and fourth protrusions, said connector further comprising a first contact-spacing bar intermediate between said first and said third flexible arms and a second contact-spacing bar intermediate between said second and said fourth flexible arms, and a further plurality of pairs of opposed springs contacts for engaging said first and said second contact-spacing bars and operable with the coming together thereof to engage a further plurality of pairs of contact pads.

11. A system according to claim 10 wherein said first and second contact-spacing bars comprise a plurality of further opposed pairs of protrusions for engagement with a further plurality of voids in said printed-circuit board.

12. A system according to claim 9, 10 or 11 wherein said base comprises first and second flexible-arm fitting apertures, wherein said first and second flexible arms comprise respectively first and second peg ends at the basal ends thereof, and wherein said first and second peg ends are affixed respectively within said first and said second apertures.
13. A system according to claim 12 wherein said first spring contact is affixed into said base by being wedged in said first aperture by said first peg end and wherein said second spring contact is affixed into said base by being wedged in said second aperture by said second peg end.
14. A system according to claims 9 to 13 wherein said first and said second protrusions comprise respectively first and second entry ramps for pushing said first and second flexible arms apart in response to the urging thereagainst of said edge of said printed-circuit board for the insertion thereof into said connector.
15. A system according to claims 9 to 14 wherein said first and said second protrusions comprise respectively first and second exit ramps for pushing said first and second flexible arms apart in response to the urging therebetween of the edge of said void for the withdrawal from said connector of said printed-circuit board.

16. A system according to any of the preceding claims wherein said printed-circuit board comprises a tab including a part of said edge, and wherein said void consists in the space behind said tab remote from said edge.

17. A system according to claims 1 to 15 wherein said void comprises a hole in said printed-circuit board proximate to said edge.

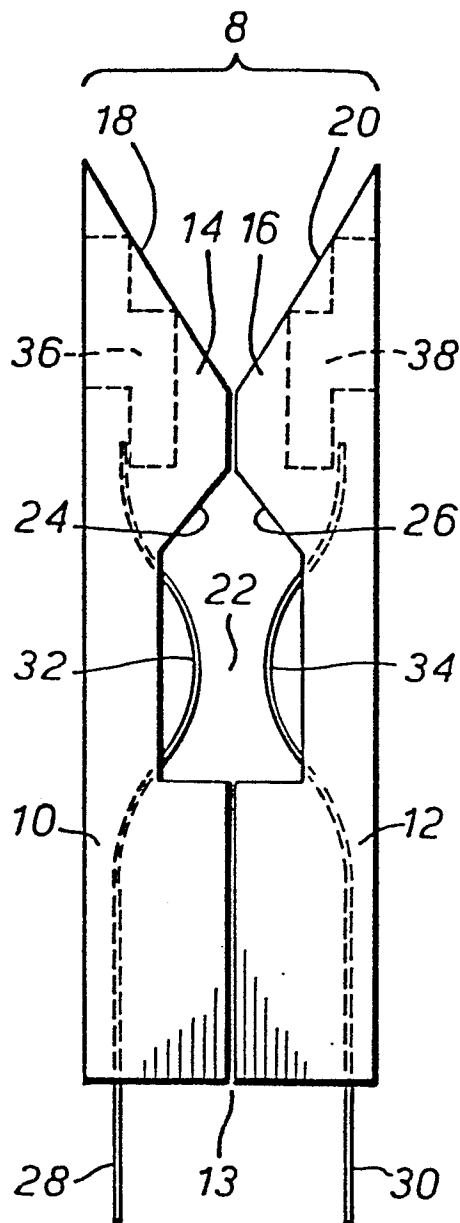


FIG. 1

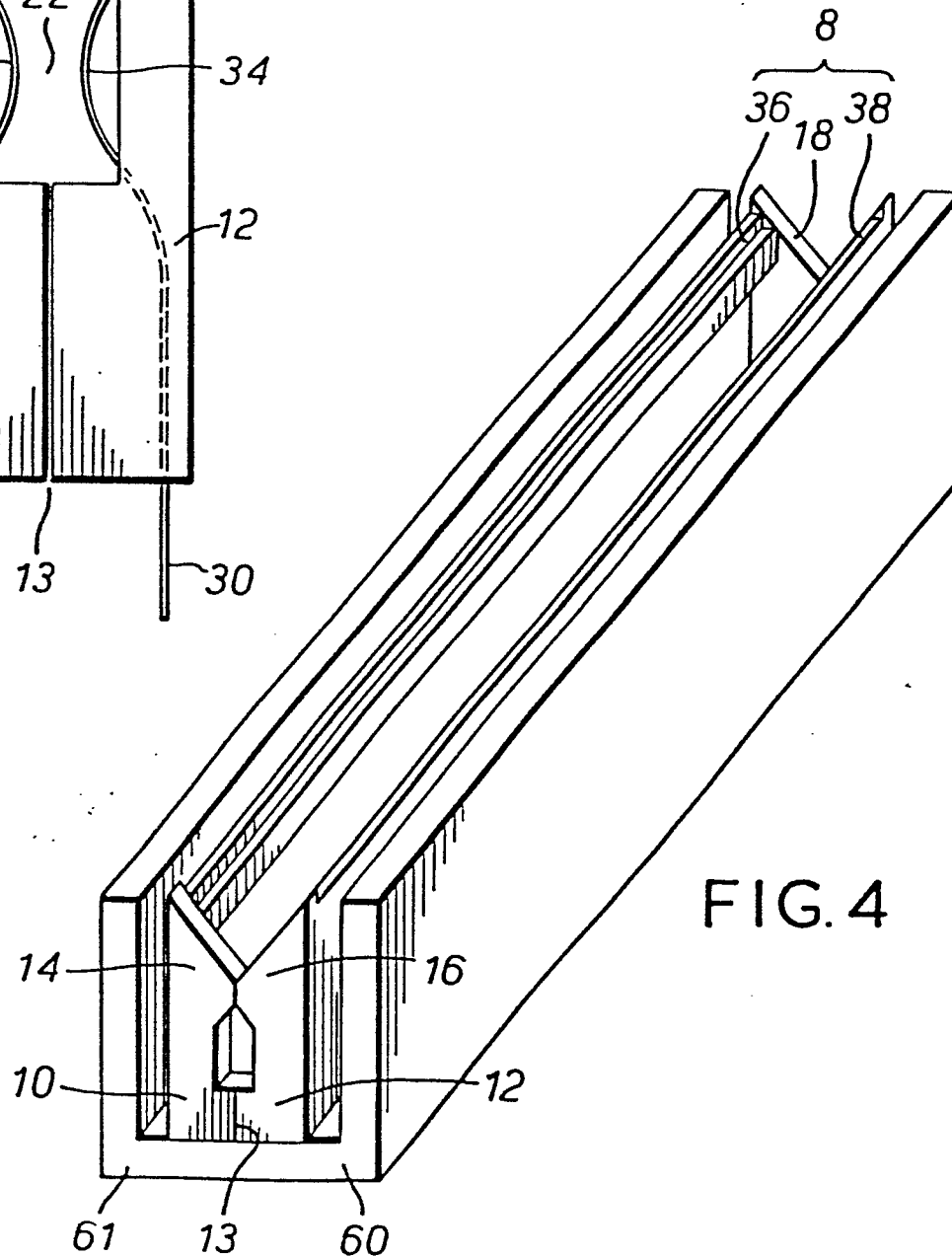


FIG. 4

FIG. 2

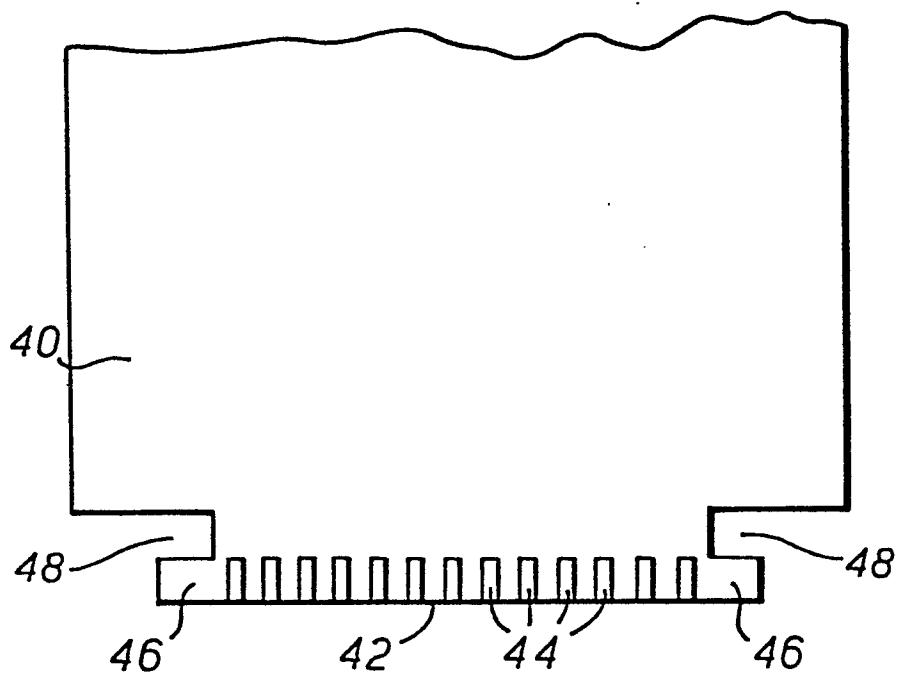
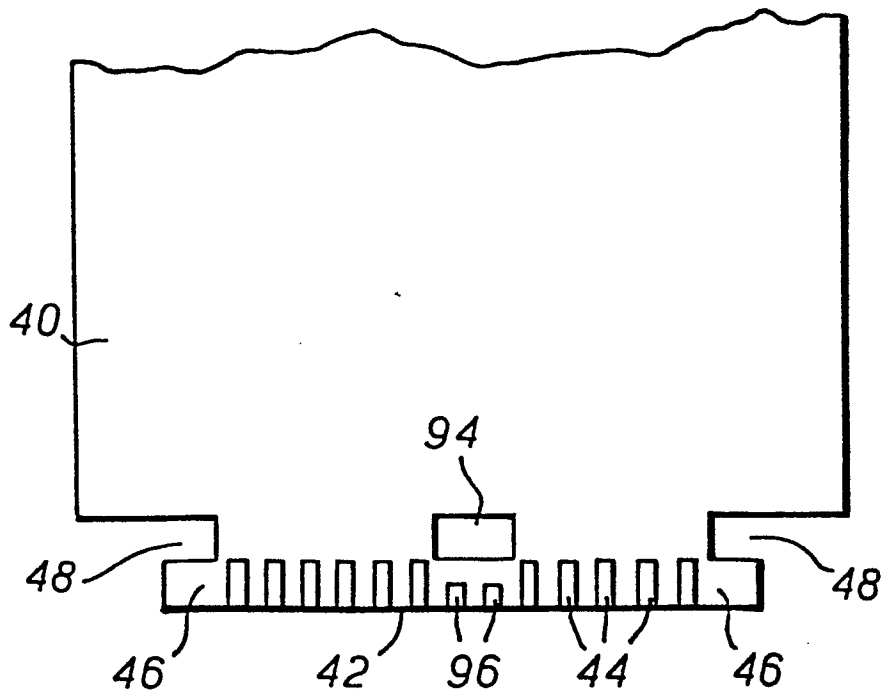


FIG. 9



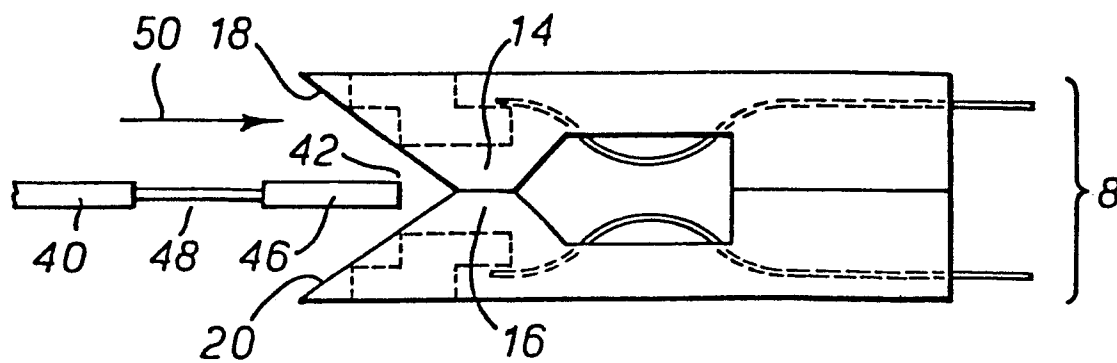


FIG. 3A

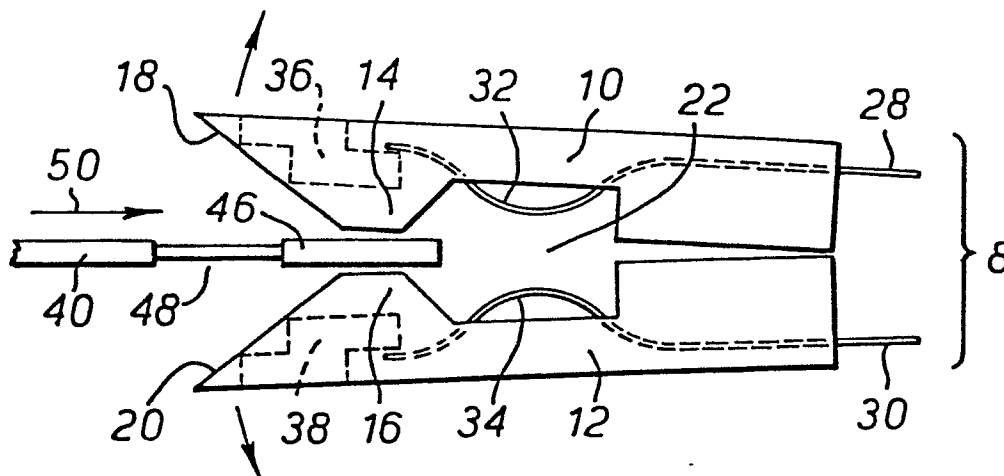


FIG. 3B

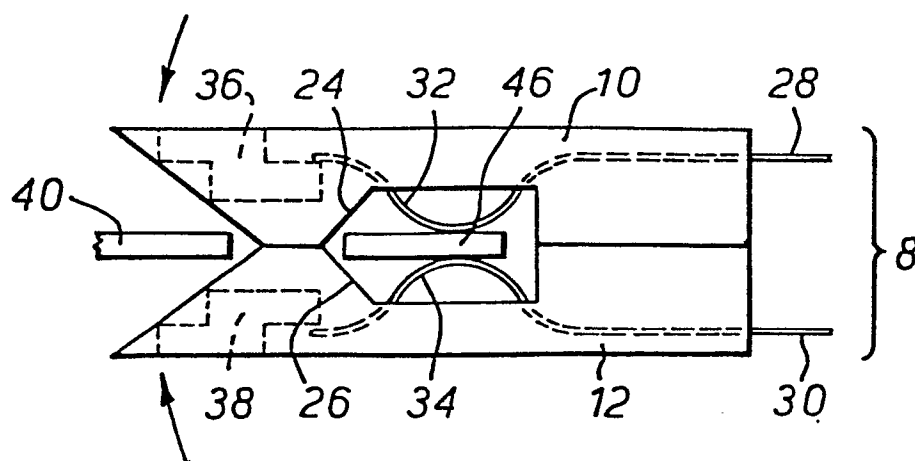


FIG. 3C

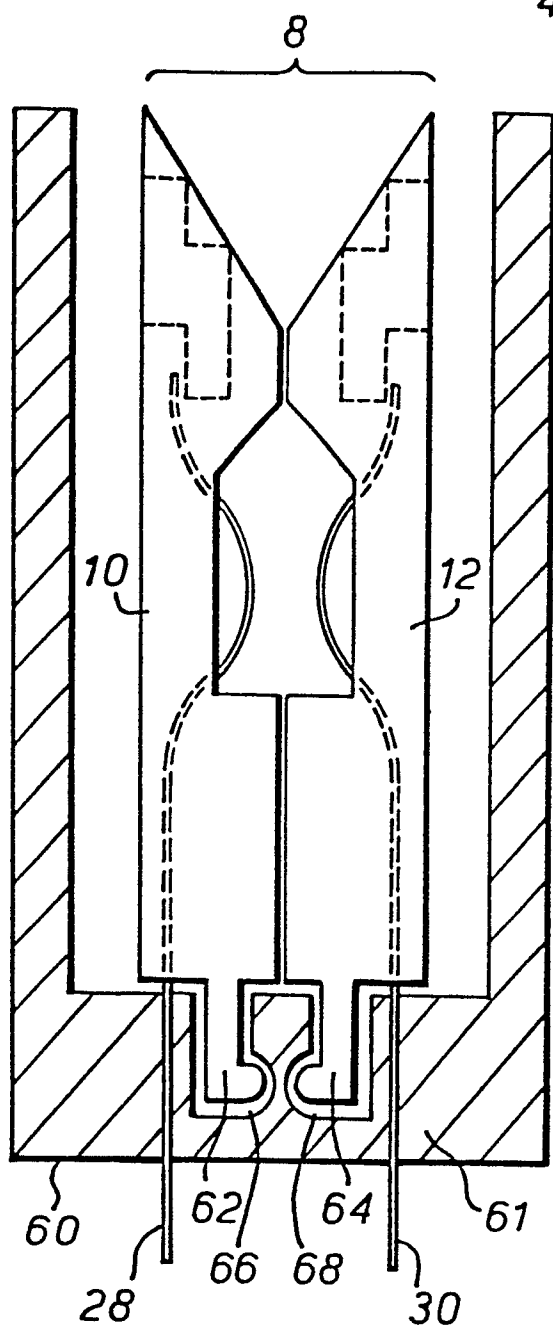


FIG. 5

FIG. 6

