

PATENT SPECIFICATION

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(54) CIRCUIT BOARD EDGE CONNECTOR

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a circuit board edge connector and particularly to such connector which is adapted to receive a circuit board with zero insertion force.

According to the invention, a circuit board edge connector comprises an insulating housing including first and second elongate side walls secured in spaced parallel relationship and defining a channel having an open side, means being provided in the channel to guide a circuit board inserted into the channel from the open side, a row of elongate resilient contact members positioned in the housing, each such member having a root end remote from the open side of the channel, an intermediate contact portion in the channel for engagement with an inserted circuit board and a free end in the vicinity of the open side, a lever in the form of a plate extending along the exterior of the first side wall and being pivoted thereto at a position remote from the open side of the channel, a portion of the lever being engaged about the free ends of the contact members, and a cam mounted between the lever and the first side wall, the cam being movable to pivot the lever between a first angular position in which the contact portions are withdrawn from the insertion path of the circuit board and a second angular position in which the contact portions intersect such path.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a fragmentary perspective view of a circuit board edge connector assembly comprising a board on which is mounted an edge connector comprising an insulating housing containing two rows of contact members and showing a circuit board prior to its being mated with the connector;

Figure 2 is a cross-sectional view of the connector with contact members of the two rows flexed apart;

Figure 3 is a cross-sectional view similar to Figure 2 showing the contact members of the two rows in an unflexed contact-making position;

Figure 4 is a cross-sectional view of a contact member taken along line A - A of Figure 2;

Figure 5 is a fragmentary cross-sectional view similar to Figure 3, but showing a circuit board mated with the connector;

Figure 6 is a cross-sectional view taken along line B - B of Figure 2;

Figure 7 is a cross-sectional view taken along line C - C of Figure 3; and

Figure 8 is a cross-sectional view of the insulating housing prior to the removal and reassembly of a pair of levers formed integrally with the housing and the inclusion of the housing in the edge connector assembly.

The housing 1 (see Figures 1 and 8) which has been moulded from a hard plastics insulating material is of substantially rectangular shape with spaced parallel side walls 3 and end walls 5 only one of which is shown. The side walls 3 define a channel having a open side for receiving a circuit panel board 2 in the direction of the arrow A in Figure 1. For guiding the board 2, a plurality of longi-

tu­dinally spaced partitions 7 extend be­
tween the side walls of the housing and are
integrally formed therewith, as best seen in
Figures 6 and 7. Each partition 7 has a
5 central recess 9 at its upper end, for guid­
ing of the board 2, the bottom wall 11 of
the recess 9 providing a base or seat for
the leading edge of the board 2, such bot­
tom wall being the upper (as seen in
10 Figures 2, 3 and 5) face of a central por­
tion 13 of the partition 7. Between each
pair of partitions 7 on each side of the
housing 1 is a groove 15 which re­
ceives an elongate, spring electrical contact
15 member 17 having lateral projections 19
frictionally engaging the sides of the pair of
partitions 7 as shown in Figures 6 and 7
and a tongue 21 on each contact member
17 resiliently abuts the inner surface of one
20 of the side walls 3. The contact member 17
is thus firmly retained in its recess 15. The
contact members 17 extend upwardly
beyond the partitions 7, each member 17
having a contact portion 25 bowed in­
25 wardly of the housing. The members 17
and thus the contact portions 25 of op­
posite members 17 are biased resiliently
towards each other by virtue of the en­
gagement of the tongues 21 with the walls
30 3. The outer face of each wall 3 is formed
towards its lower end with a plurality of
longitudinally spaced ledges 27 each having
a depending outer edge wall 29, the lower
surface 30 of the wall 29 being undercut as
35 shown in Figures 2 and 3 to form a
groove. Two plate-like plastics levers 31
(initially removed from the housing 1 as
described below) are pivotally mounted at
their lower ends on the ledges 27 which
40 are received in openings 33 in the levers
31. Each lever 31 is formed with openings
at its upper end for receiving the free ends
23 of the contact members. A lower wall
34 of each opening 33 is inclined in the
45 same direction as the surface 30 of the
wall 29. The upper end of each lever 31 is
formed with a narrow downwardly facing
ledge 35 (Figures 2 and 3) and has hooked
extensions 36 each having two oppositely
50 directed flanges 37 at its free end. The free
ends 23 of the contact members 17 extend
into the spaces between the extensions 36
and engage the flanges 37 normally to bias
the levers 31 against the side walls 3 upon
55 which they are mounted, while locating the
contact portions 25 of the contact members
17 inwardly of the housing 1, as shown in
Figure 3.

Two plate cams 39 are provided, each
60 for moving one of the levers 31 towards
and from the side wall 3 on which it is
mounted. Each cam 39 is slidably sup­
ported on a plurality of ledges 27 spaced
along its side wall 3, for longitudinal
65 movement between the side wall 3 and the

adjacent lever 31 during which movement
an upper edge 41 of wall 34 of the opening
33 pivots in the groove under the ledge 27
compare the positions of the lever 31 in
Figures 2 and 3). The inner surface of each
70 cam 39 is provided with ramps 43 which
engage protuberances 45 on the associated
wall 3 on longitudinal movement of the
cam 39 in direction Y (Figure 1) to pull
75 the contact portions 25 against the bias of
the tongues 21 out of the insertion path of
the circuit board 2, in direction X (Figure
1). Movement of the cams 39 in the op­
posite direction permits the contact mem­
bers 17 to return to engage the tracks on
80 the inserted circuit board 2 (Figure 5). A
stop (not shown) may be provided on the
opposite longitudinal end of each cam 39
from that end which is shown in Figure 1,
to limit the movement of the cam to the
85 length of one ramp 43. The protuberances
45 may be located on the lever 31, instead
of on the housing 1, the cam then facing
the lever.

The spring contact members 17 have
90 posts 49 which extend from the housing
through openings 51 in a rigid board 50
and are maintained thereagainst by en­
larged portions 53 of the posts 49 which
are a friction fit in the openings 51
95 as shown in Figure 4. The walls of the op­
enings 51 may be strengthened by coating
them with metal.

The housing 1 and levers 31 may be in­
jection moulded in one piece, as shown in
Figure 8, and the levers later broken off at
100 attenuated web portions 55 connecting the
levers to the housing. All parts of the con­
nector except the contact members 17 and
the cams 39, which may be of metal, can
thus be formed in a single moulding step.
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To produce the edge connector assembly,
the contact members 17 are first mounted
on the board 50 in two parallel rows with
corresponding contact portions 25 in align­
ment (as in the finished assembly). Start­
ing with the housing as shown in Figure 8, the
levers 31 are snapped off from the re­
mainder of the housing and are then
mounted on their respective side walls 3 of
the housing by inserting the ledges 27 of
110 the side walls 3 into the openings 33 of the
levers 31 and snapping overhanging lips
100 and 101 (Figure 2) of the levers 31
over respective upwardly extending edges
102 and 103 of the side walls 3, to ensure
120 that the edges 41 of the levers seat in the
said grooves under the ledges 27 of the
side walls 3. When so assembled, the hous­
ing 1 is placed over the members 17 on
the board 50 and the members 17 enter
125 the recesses 15 so that the housing is
secured to the board 50 by the engagement
of the projections 19 of the members 17
with the partitions 7 and of the tongues 21
with the side walls 3. In this position of
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the parts of the assembly, the free ends 23 of the contact members 17 are located behind the flanges 37, the contact members biasing the levers 31 towards the walls 3.

5 Although the board 50 may now be removed, it is preferably retained as a support for the contact members 17. The cams are finally inserted.

10 Individual contact members 17 can be withdrawn from the board 50 without removing the housing 1. New contact members can then be inserted through the openings defined by the extensions 36 into the board 50.

15 The connector is simple and economical to manufacture having few separate parts and is of compact size.

20 Contact between the contact portions 25 and the tracks of the inserted circuit board 2 is maintained by virtue of the resilience of the contact members 17 rather than by means of the plastics housing.

25 Where contact is to be made with tracks on only one side of a circuit board, one row of the contact members, and thus one of the cams and one of the levers, may be omitted.

WHAT WE CLAIM IS:—

30 1. A circuit board edge connector comprising an insulating housing including first and second elongate side walls secured in spaced parallel relationship and defining a channel having an open side, means being provided in the channel to guide a circuit board inserted into the channel from the open side, a row of elongate resilient contact members positioned in the housing, each such member having a root end remote from the open side of the channel, an intermediate contact portion in the channel for engagement with an inserted circuit board and a free end in the vicinity of the open side, a lever in the form of a plate extending along the exterior of the first side wall and being pivoted thereto at a position remote from the open side of the channel, a portion of the lever being engaged about the free ends of the contact members, and a cam mounted between the

lever and the first side wall, the cam being 50 movable to pivot the lever between a first angular position in which the contact portions are withdrawn from the insertion path of the circuit board and a second angular position in which the contact portions intersect such path. 55

2. A connector as claimed in Claim 1, in which the lever is supported on a ledge formed in the first side wall, a hooked marginal portion of the lever engaging in an undercut groove in the first side wall, a portion of the first side wall in which portion the ledge and the groove are formed protruding into an opening in the lever, and the cam being formed with a series of ramps engageable with the housing or the lever to bring about the pivotal movement of the lever. 60 65

3. A connector as claimed in Claim 1 or 2, in which the lever is provided with pairs of flanges, the flanges of each pair extending in opposite directions lengthwise of the side walls, a free end of each contact member being urged resiliently against facing flanges of adjacent pairs of flanges. 70 75

4. A connector as claimed in Claim 3, in which each contact member has a projecting tongue between its root end and its contact portion, the tongue resiliently engaging the first side wall to urge the contact portion of the contact member towards the second side wall and the free end of the contact member against its flanges, the contact members also having a pair of projections between the tongue and the root end of the contact member, each of these projections frictionally engaging one of a pair of opposed partitions extending from the first side wall transversely of the length of the side walls on each side of the contact member. 80 85 95

5. A circuit board edge connector, substantially as hereinbefore described with reference to the accompanying drawings.

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65 ramps engageable with the housing or the lever to bring about the pivotal movement of the lever.

3. A connector as claimed in Claim 1 or 2, in which the lever is provided with 70 pairs of flanges, the flanges of each pair extending in opposite directions lengthwise of the side walls, a free end of each contact member being urged resiliently against facing flanges of adjacent pairs of flanges. 75

4. A connector as claimed in Claim 3, in which each contact member has a projecting tongue between its root end and its contact portion, the tongue resiliently engaging the first side wall to urge the contact 80 portion of the contact member towards the second side wall and the free end of the contact member against its flanges, the contact members also having a pair of projections between the tongue and the root end of the contact member, each of these projections frictionally engaging one of a pair of opposed partitions extending from the first side wall transversely 85 of the length of the side walls on each side of the contact member. 95

5. A circuit board edge connector, substantially as hereinbefore described with reference to the accompanying drawings.

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