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Applicant: **AMP INCORPORATED**
Eisenhower Boulevard
Harrisburg, Pennsylvania(US)

Inventor: **Harner, Richard Donald**
99 Oneida Road
Camp Hill Pennsylvania 17011(US)

Inventor: **Kaley, Robert Clark**
65 Stanley Avenue
Landisville Pennsylvania 17538(US)

Inventor: **Crawford, Christopher Lon**
4034 Raleigh Street
Harrisburg Pennsylvania 17109(US)

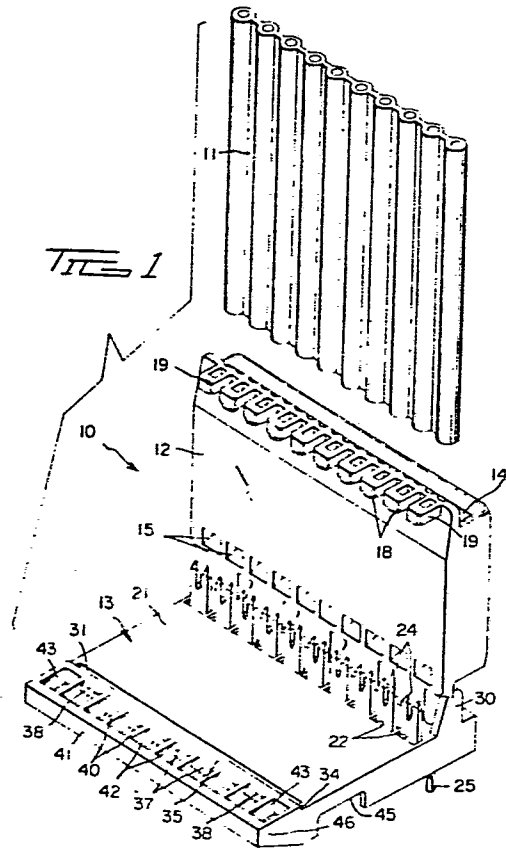
Representative: **Wayte, Dennis Travers et al,**
20 Queensmere
Slough, Berkshire SL1 1YZ(GB)

Electrical connector for flat cable.

An electrical connector housing (10) for flat cable (11) comprising a base member (13) and a cable locating member (12) pivoted together at adjacent ends for movement between an open, cable-locating condition, and a closed terminating condition in which a row of terminals (13) on the base member (12) terminate the cable (11). The terminals (13) are located adjacent the pivot and the cable locating member (12) comprises a pocket (14) penetrated by the terminals (13) on closing the housing (10). A latching means (35, 41) comprises a resiliently flexible bar (35) and release bar (41) supported for deflection adjacent an end of the base member (13) and extending spaced apart in side-by-side relation. A catch (18) on the cable locating member (12) engages catch portions (37, 38) on the latch bar (35) in the closed condition of the connector housing (10). Deflection of the release bar (41) towards the base member (13) flexes the latch bar (35) to disengage the catch (18) from the catch portions (37, 38). The catch portions adjacent lateral ends of the latch bar (35) are located rearwardly, in the direction of deflection, of catch portions (37) adjacent central portions of the bar (35).

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ELECTRICAL CONNECTOR FOR FLAT CABLE

The invention relates to electrical connector housings and, in particular, to an electrical connector housing for flat cable.

In view of the increasing miniaturization of electrical packages and components, particularly for printed circuit board applications, there is a requirement for electrical connector housings which are of small size but which are capable of terminating flat cable which comprises a series of insulated conductors located together in planar parallel relation by a web of insulation.

U.S. Patent Specification 4,062,616 discloses a prior electrical connector housing for terminating flat cable comprising a base member and a cable locating member pivotally connected together at adjacent ends, a row of electrical terminals being mounted on the base member and having insulation penetrating conductor engaging portions projecting towards the cable location member so that, with the connector in an open condition in which the cable locating member is remote from the base member, flat cable can be located by the cable locating member and subsequent pivotal movement of the cable locating member towards the base member to place the connector in a closed condition will drive the conductor engaging portions into the cable to establish electrical connections with respective conductors of the cable.

Disadvantages of the prior electrical connector housing are that a considerable force is necessary to drive all the conductor engaging portions simultaneously into the cable particularly, as the conductor

engaging portions are remote from the pivot. In addition, it is necessary to bend the leading end of the flat cable through a right angle when in a confined space adjacent the connector and to thread the leading end through a slot in the locating member, effectively to position the connector in the locating member. This is a time consuming step and difficulties would be experienced in manipulating the flat cable particularly if the connector were used in an environment where space was restricted. A further disadvantage is that the prior connector is constructed from many parts and, in consequence, is relatively expensive to manufacture and assemble.

It is an object of the invention to provide an electrical connector housing which ameliorates or overcomes one or more of the above-noted disadvantages.

According to the invention, the connector referred to above is characterized in that the conductor engaging portions are located adjacent the pivotal connection so that a mechanical advantage is obtained when applying a closing force to the housing at locations spaced from the pivotal connection.

This enables a very simple closing tool to be used and, in some applications, finger pressure may be sufficient to close the housing to effect connection.

Preferably, the cable locating member comprises a cable receiving pocket extending from the pivotal connection to a cable-receiving mouth at an end remote from the pivotal connection, the cable receiving pocket being intersected by slots aligned to receive and guide the conductor-engaging portions on closing the housing.

The pocket-form ensures ease of insertion and accuracy of location of the flat cable throughout the termination.

In addition, the housings of the insertion can be made from very few components, each of which can be produced by mass production techniques and readily assembled at low cost. The housings can be of very small size and ease of cable manipulation and termination facilitates their use on printed circuit boards.

There is also a requirement reliably to latch the housings in closed condition when mounted in the close confines of a printed circuit board, but that the housings be readily openable when required to release the cable. At the same time, it is important that
5 the housings are not unlatched inadvertently.

According to the invention, the base member and the cable locating member are provided with interengageable latching means comprising a latch bar and a release bar extending spaced apart in side-by-side relation and supported for deflection adjacent a free end
10 of one member and interconnected by a plurality of transverse struts defining an eye, and catch means on the other member, receivable in the eye in latching engagement with the latch bar in the closed condition, movement of the release bar in the direction of the latch bar deflecting the release bar thereby to disengage the latch from the
15 release bar.

Movement of the release bar in other directions will not disengage the latch from the release bar, avoiding inadvertent unlatching, but movement of the release bar in the correct direction will readily release the latch.

The latch and release bars may be formed at the free end and extend in the same place as the one member. A very compact latching mechanism may be obtained. If desired, the housing may be mounted with the latching mechanism protruding beyond an edge of a printed circuit board so that no board space is obstructed by the
20 latching mechanism.
25

Preferably, the latch bar is spaced from the one member by an elongate slot extending for a majority of the length of the latch bar.

The provision of the slot enables the latch bar to be formed conveniently during moulding the one member.

Desirably, the latch bar and release bar are resiliently flexible and the latch bar is joined at respective opposite ends of the slot to the one member by relatively rigid webs, deflection of the release bar towards the one member flexing the latch bar to disengage the catch member from the latch bar.
30

The provision of the rigid webs prevents inadvertent pressure on the bar in directions other than a release direction from breaking the latch bar away from the member.

5 More specifically, the struts define with the latch bar and the release bar a series of eyes and the latch bar has catch portions adjacent respective eyes, the catch portions adjacent lateral ends of the bar being located rearwardly, in the direction of deflection, of catch portions adjacent central portions of the bar.

10 Depression of the release bar in the release direction causes bowing of the latch bar into the slot which bowing is accommodated by the rearward staggering of the catch portions. Thus, although the central portion of the latch bar is deflected more than lateral portions, secure latching and ready release are assured.

15 According to another aspect of the invention, there is provided an electrical connector housing comprising first and second members movable between mutually adjacent and remote positions corresponding to closed and open conditions of the housing respectively, latching means comprising a latch bar and a release bar supported for deflection adjacent an end of one member and extending spaced apart
20 in side-by-side relation interconnected by a plurality of transverse struts to define an eye, and a catch on the other member receivable in the eye in latching engagement with the latch bar in the closed condition, movement of the release bar towards the latch bar deflecting the latch bar, thereby to disengage the catch from the
25 release bar.

A particular example of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the connector in an open condition with a holder for ribbon cable remove from a base;

30 Figure 2 is a plan view of a connector base with terminals omitted;

Figure 3 is a cross-sectional view of the base with terminals omitted taken along lines III-III of Figure 2;

Figure 4 is a cross-sectional view of the connector in a closed condition terminating a ribbon cable;

Figure 5 is a front elevation of the connector; and

Figure 6 is a cross-sectional view of a modified connector in a closed condition terminating a ribbon cable.

As shown particularly in Figures 1 to 4, electrical connector 10 for terminating ribbon cable 11 comprises a cable holder 12 and a base member 13 each molded in one piece from suitable plastics material and pivotally connected together along a rear end.

The cable holder 12 is formed with a blind-ended pocket 14 having a cable receiving mouth at a front end and intersected by a series of guide slots 15 adjacent the blind end. A row of hooks 16 extend along the rear end. A row of apertured lugs 17 depend from a central part of the front edge of the holder and carry at free ends respective catches 18. An apertured guiding lug 19 depends from the front edge of the holder adjacent respective opposite ends of the row of lugs 17.

The base 13 comprises a central platform 21 rearwardly of which are formed sockets 22 receiving terminals 23 arranged in a row and having bifurcated conductor engaging portions 24 at upper ends and legs 25 at lower ends for receipt in apertures in a printed circuit board 26. The terminals may each be formed with dimples, shoulders or other conventional adaptations to facilitate retention in the sockets 22 as an interference fit. After receipt of the contacts in the sockets, the legs may be deformed to the desired configuration using the lips of the sockets as a former. A hinge pin 28 extends along the rear end supported at intervals along its length by flanges 30 and in pivotal engagement with the hooks 16.

A slot 31 extends downwardly into the platform adjacent the front end for substantially the entire depth of the platform so that only a thin web 32 remains at the slot base, the web being perforated at intervals by apertures 33. The slot defines a resiliently flexible latch bar 35 extending along the front end and integrally joined at respective opposite ends by webs 34 to the platform 21.

The latch bar 35 is connected at intervals by transverse bridges or struts 40 to a resiliently flexible release bar 41 extending in parallel relation with the latch bar 35. The struts 40 stiffen the latch and release bars and define between them, eyes 42 and 43 aligned with
5 the respective lugs 17 and 19 depending from the holder 12 and catch portions 37 and 38 extend from the front edge of the latch bar 35 into each eye 42. It should be noted that the most lateral catch portions 38 are located rearwardly of the central catch portions 37.

A series of elongate feet 44 extend from the front to the rear of
10 platform 21 located in spaced apart parallel relation.

Tool receiving recesses 45 are provided adjacent lateral edges of the base.

In operation of the connector 10 to terminate a ribbon cable 11, the connector 10 is mounted on a printed circuit board and the
15 cable end simply pushed into the pocket 14 with the holder 12 remote from the base 13. A simple tool is then used to urge the holder 12 towards the base 13 during which movement the conductor engaging portions 24 of the terminals 23 pass through the guide slots 15 and into engagement with the conductors of the ribbon cable. During the
20 final stages of movement, the catches 18 on the holder and the catches 37 and 38 on the base interengage with a snap action securely to latch the holder and the base together.

Release of the holder from the base is achieved by depressing the release bar 41 towards the latch bars, that is, in the plane of the
25 base in a rearward direction. The release force is transmitted from the release bar to the latch bar 35 by the struts 40 causing the latch bar to bow rearwardly into the slot 31 withdrawing the catches 37 and 38 from catches 18. The above-mentioned staggering of the catches 37 and 38 permits ready release although, the linear displacement of
30 the lateral portions of the release bar is less than that of the central portion as a result of the presence of strengthening webs 34. As the staggering of the catches accommodates the non-linear displacement of the latching bar, the catches 37 can be located sufficiently forward to provide optimum latching security.

It should also be noted that the catches can only be released by depression of the release bar rearwardly of the base and not by a force applied to the bar perpendicularly to the base, ensuring that release is only obtained by a deliberate action and avoiding
5 inadvertent release possibly otherwise caused by mounting or removing other components from a printed circuit board.

The provision of the strengthening webs 34 at respective opposite lateral ends of the slot ensures that the latch and release bars cannot be broken away from the platform 21 by an inadvertent
10 force applied perpendicularly to the platform. Additional strength is added by the gussets 46 at respective opposite lateral sides of the front end of the base.

Further security may be obtained by arranging the terminated cable to overly the release bar.

15 The connector latching mechanism occupies very little space which is an important factor when using printed circuit boards in view of the requirement for miniaturization in modern electrical equipment.

The modified connector shown in Figure 5 is closely similar to
20 the connector of Figures 1 to 4 and similar parts are indicated by primed reference numerals. However, in the modified connector, the base is adapted to upstand from the printed circuit board by the provision of feet 48 extending transversely from opposite lateral edges of the base.

CLAIMS:

1. An electrical connector housing (10) for terminating flat cable (11) comprising a base member (13) and a cable locating member (12) pivotally connected together at adjacent ends, a row of electrical terminals (23) being mounted on the base member (13) and having insulation penetrating conductor engaging portions (24) projecting
5 towards the cable locating member (12) so that, with the connector (10) in an open condition, in which the cable locating member (12) is remote from the base member (13), flat cable (11) can be located by the cable locating member (12) and subsequent pivotal movement of
10 the cable locating member (12) towards the base member (13) to place the connector housing (10) in a closed condition will drive the conductor engaging portions (24) into the cable (11) to establish electrical connections with respective conductors of the cable, characterized in that the conductor engaging portions (24) are located
15 adjacent the pivotal connection so that a mechanical advantage is obtained when applying a closing force to the housing (10) at locations spaced from the pivotal connection.

2. An electrical connector housing (10) according to Claim 1, characterized in that the cable locating member (12) comprises a cable
20 receiving pocket (14) extending from the pivotal connection to a cable-receiving mouth at an end remote from the pivotal connection, the cable receiving pocket (14) being intersected by slots (15) aligned to receive and guide the conductor-engaging portions (24) on closing the housing (10).

25 3. An electrical connector housing (10) according to Claims 1 or 2 characterized in that, the cable locating member (12) and the base member (13) are pivotally connected together by engagement of a row of hooks (16) extending along the adjacent end of the cable locating member (12) with a hinge pin (28) extending along the adjacent end
30 of the base member (13) and integrally joined at intervals along its length to the base member (13) by flanges (30).

4. An electrical connector housing (10) according to any one of Claims 1 to 3, characterized in that the base member (13) and the cable locating member (12) are provided with interengageable latching means (35, 41) comprising a latch bar (35) and a release bar (41) extending spaced apart in side-by-side relation and supported for deflection adjacent a free end of one member (12 or 13) and interconnected by a plurality of transverse struts (40) defining an eye (42 or 43), and a catch (18) on the other member (13 or 12) receivable in the eye (42 or 43) in latching engagement with the latch bar (35) deflecting the release bar (41) thereby to disengage the catch (18) from the release bar (41).

5. An electrical connector housing (10) comprising first and second members (12 and 13) movable between mutually adjacent and remote positions corresponding to closed and open conditions of the housing (10) respectively, latching means (35 and 41) comprising a latch bar (35) and a release bar (41) supported for deflection adjacent an end of one member (12 and 13) and extending spaced apart in side-by-side relation interconnected by a plurality of transverse struts (40) to define an eye (42 or 43), and a catch (18) on the other member (13 or 12) receivable in the eye (42 or 43) in latching engagement with the latch bar (35) in the closed condition, movement of the release bar (41) towards the latch bar (35) deflecting the latch bar, thereby to disengage the catch (18) from the latch bar (35).

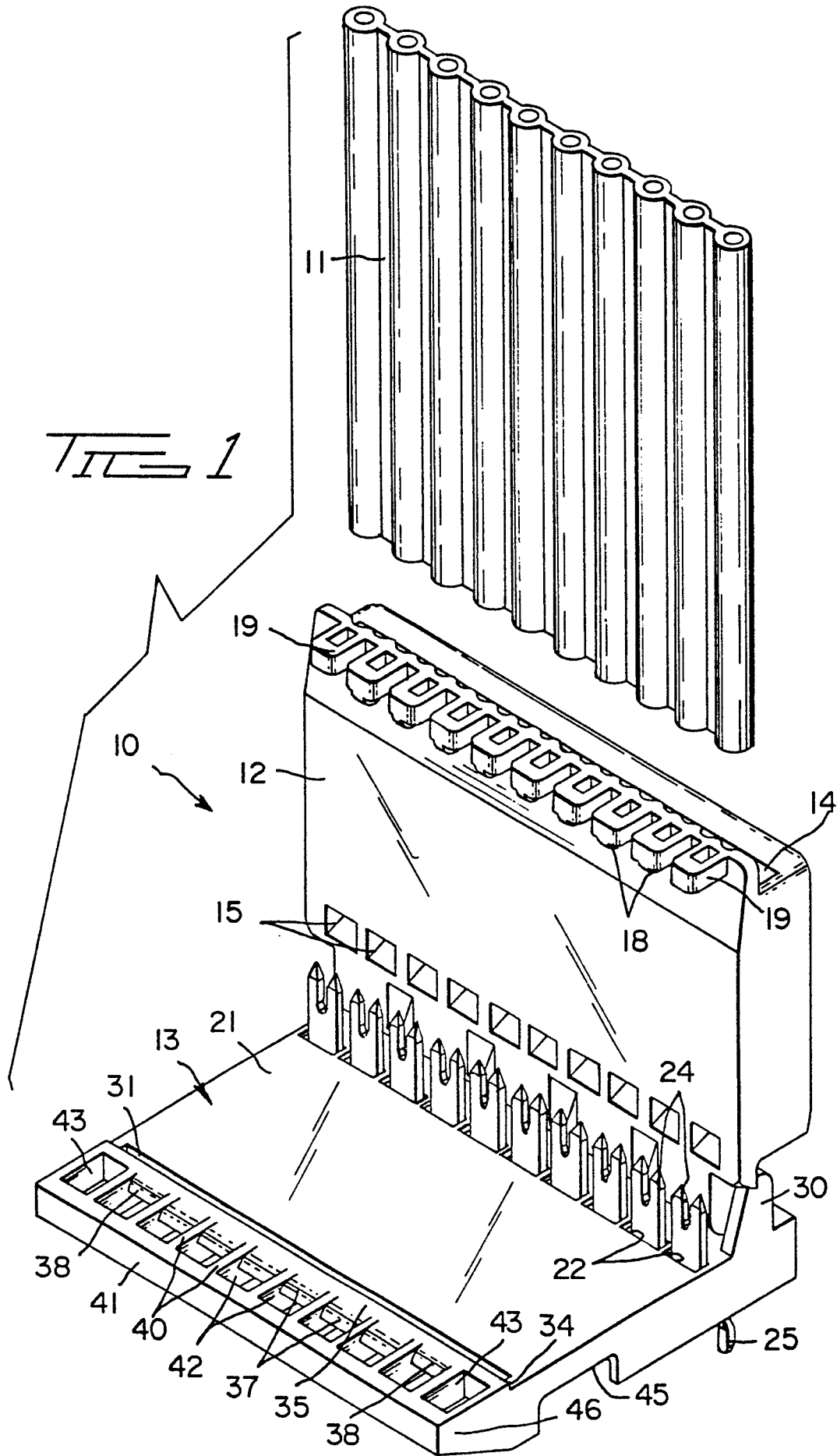
6. An electrical connector (10) according to Claim 4 or Claim 5 in which the latch bar (35) is spaced from the one member (12 or 13) by an elongate slot (31) extending for a majority of the length of the latch bar (35).

7. An electrical connector (10) according to Claim 6 in which the latch bar (35) and release bar (41) are stiffly resiliently flexible and the latch bar (35) is joined at respective opposite ends of the slot (31) to the one member (12 or 13) by relatively rigid webs (34), deflection of the release bar (41) towards the one member (12 or 13) flexing the latch bar (35) to disengage the catch (18) from the latch bar (35).

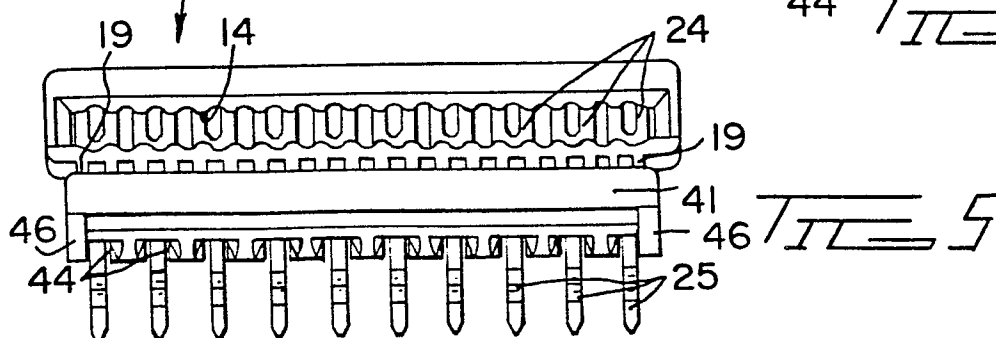
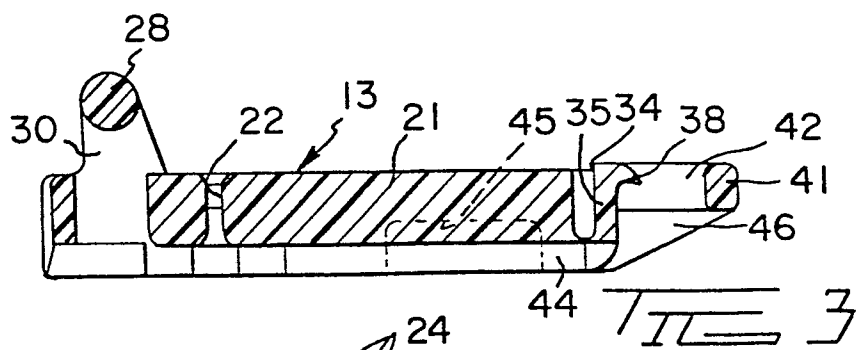
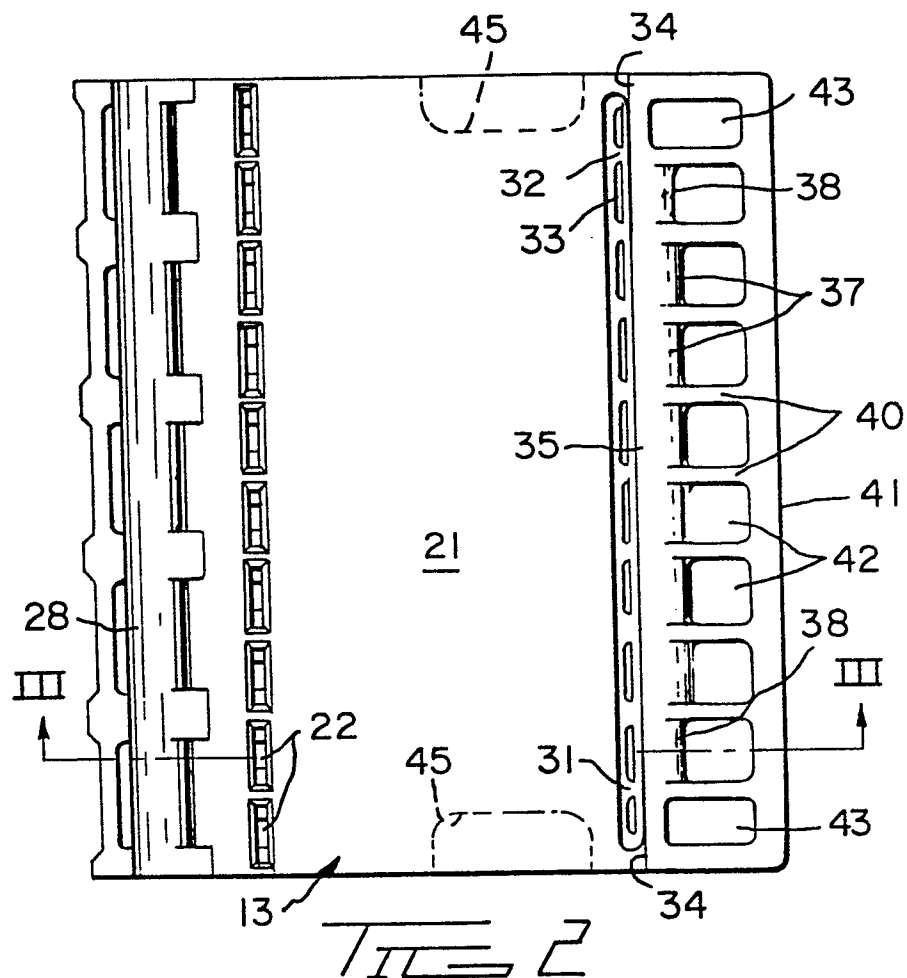
8. An electrical connector (10) according to Claim 7 in which the struts (40) define with the latch bar (35) and the release bar (41) a series of eyes (42) and the latch bar (35) has catch portions (37 and 38) adjacent respective eyes (42), the catch portions (38) adjacent lateral ends of the latch bar (35) being located rearwardly, in the direction of deflection, of catch portions (37) adjacent central portions of the latch bar (35).

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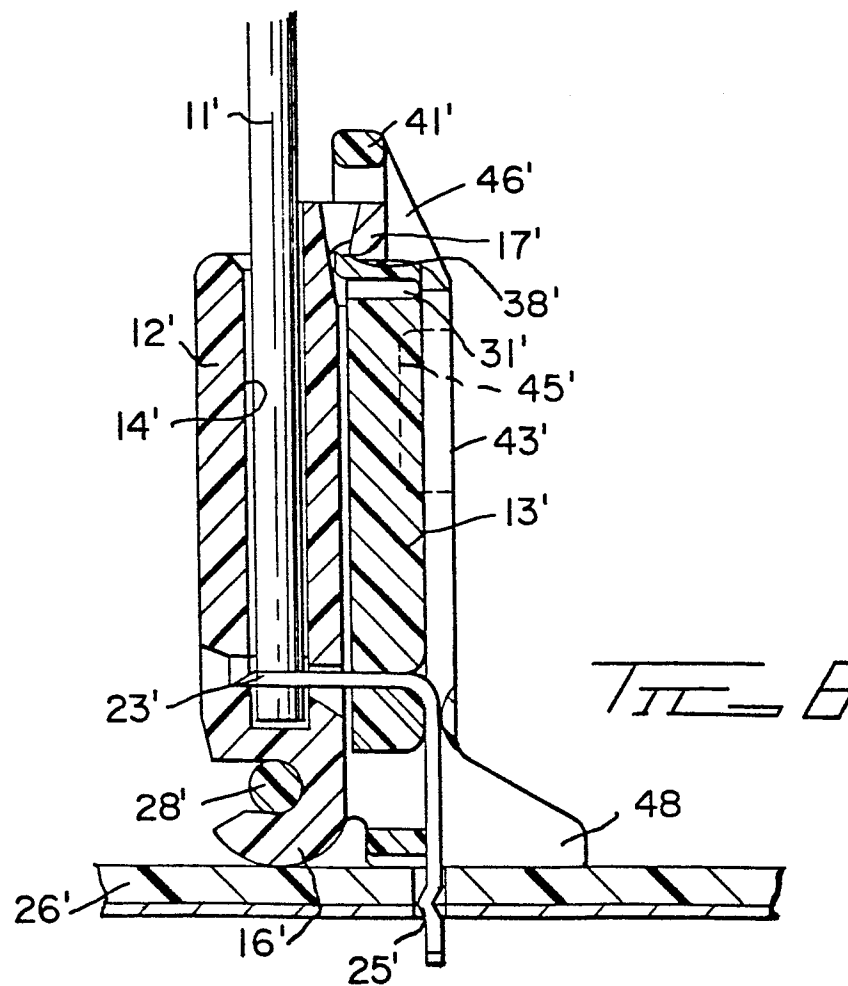
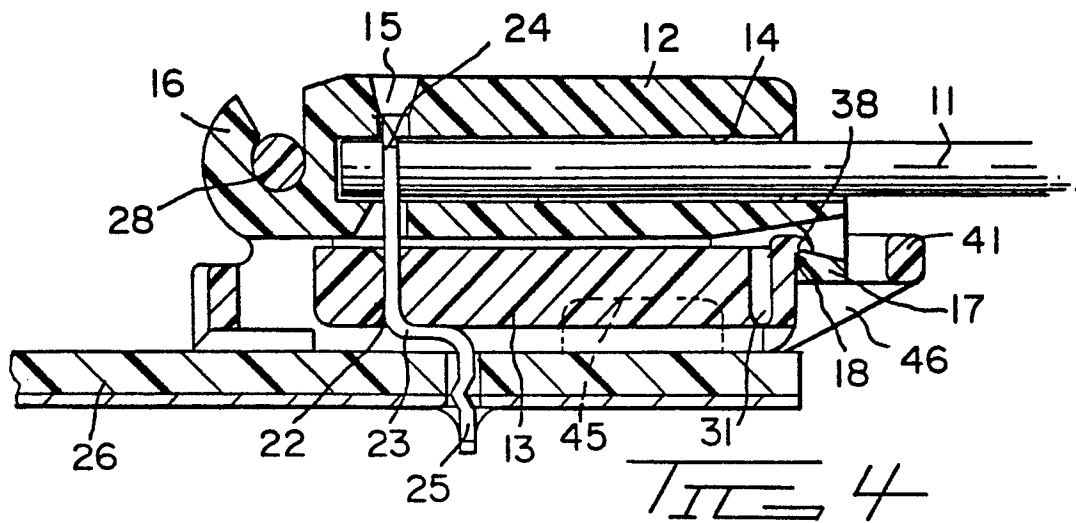
FIG 1



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	--- FR-A-1 324 140 (BURNDY) *Page 5, left-hand column, paragraph 2; figures 20,21* & US - A - 3 214 723 & US - A - 3 355 699	1	H 01 R 23/66 H 01 R 4/24
X	--- GB-A-1 214 316 (NAT. RESEARCH DEV.) *Page 3, line 115 to page 5, line 36; figures 6 to 10*	1	
A	--- FR-A-1 304 823 (BENDIX) *Page 2, left-hand column, paragraph 5 to right-hand column, paragraph 5; figures 4 to 7* & US - A - 3 149 896	1	
A	--- US-A-4 196 956 (HARVEY HUBBELL) *Column 9, line 48 to column 14, line 30; figures 11 to 21*	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
A	--- US-A-3 576 518 (3M) *Column 1, line 20 to column 3, line 56; figures 1-4*	1	H 01 R 23/00 H 01 R 13/00 H 01 R 4/00
A	--- US-A-3 879 099 (AMP) *Column 2, line 34 to column 4, line 58; figures 1-9*	1	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-11-1982	Examiner LOMMEL A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
E	GB-A-2 091 955 (LEGRAND) *Page 4, line 45 to page 8, line 21; figures 1-12*& FR - A - 2 498 821 & DE - A - 3 202 029 -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-11-1982	Examiner LOMMEL A.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	