

A Flat Connector Socket for an Electrical Connection

The invention relates to a flat connector socket for electrical connection with a flat plug to be slid from one end into an accommodating space or receiving cavity formed by a base and a pair of facing upright sidewalls, with the outer edge portions of the sidewalls being bent inwardly (coiling) above the base and with latch means formed at the base, which latch means comprise a retention key coacting with a recess in the flat plug.

Such a flat connector socket is known. The latched junction which is obtained with the flat plug with the aid of the latch means cannot be unlatched in many embodiments. In addition there are known latchable flat connector sockets of the above-described kind in which, for example according to FR-A-2,269,802, at the inner end of the base there are provided unlatching or release means formed by a tongue projecting vertically from the base. If the extremity of this tongue is depressed, the retaining key moves out of its position of locking in the recess of the flat plug and releases the same so that the flat plug can be pulled out of the flat connector socket.

It is the disadvantage of this prior art that the flat plug can be pushed into the flat connector socket so far that it bears against the unlatching element and bends the same. In this way there is the risk of damaging not only the release means but also the latch mechanism so that the electrical connection itself is affected. The electrical connection becomes unsafe and unusable.

In order to counter this problem, it has been suggested in European Patent EP 0 043 655 to provide the unlatching element with a protrusion which points toward the entry end of the flat plug in the accommodating region and is positioned so that the frontal extremity of the flat plug connected with the socket contacts the unlatching element between the foot of the unlatching element and the projection, with the projection serving to prevent movement of the flat plug's extremity along the unlatching element toward the free extremity of the same and, hence, to limit the insertion of the flat plug in the accommodating region. It is the disadvantage of this suggestion that application at non-unlatchable flat

connector sockets is not possible, so that there remains the basic problem of pushing the flat plug in too far. In view of the possibility of inserting the flat plug not deep enough or farther than necessary in the accommodating space of the flat connector socket, secure positioning and, hence, latching is not guaranteed. In this way the safety of the electrical connection is affected or there is the risk of damaging parts of the connection. In the case of unlatchable flat connector sockets, the manufacture becomes complicated and more expensive because of the need to provide a protrusion. In order to produce the boss on the unlatching element there are required additional machining operations which can be carried out only with complicated tools, such as, for example, clipping punches, forming punches and/or plying tools. As far as the principle is concerned, it is an additional disadvantage that the flat plug still bears on the unlatching element and that therefore there act forces which may cause damage on both the unlatch means and the latch means.

In view of this state of the art, the problem underlying the invention is to improve a flat connector socket of the above-specified kind while avoiding the above-listed shortcomings so that the insertion movement of the flat plug is limited within the accommodating space in a technologically simple fashion and that, more particularly, movement beyond the position of latching is prevented.

According to the invention, the problem is solved by providing, on at least one sidewall and/or the base, a stop which is effective in the position of latching the flat plug and limits its insertion movement into the accommodating space. Preferably, one stop is provided on each of the sidewalls. In this way it is ensured in the case of the standard, non-unlatchable flat connector socket that the movement of the flat plug into the accommodating space is limited and that insertion beyond the position of latching is not possible. In this way, safety of the connection is increased in a very simple manner without increased cost of manufacture, particularly without additional machining operations. In the use with a latchable flat connector socket, any contact of the unlatching element with the flat plug is prevented, with the flat plug being unable to abut there so that the risk of deforming the unlatching element is there avoided. Latching is improved there because it is impossible to slide the flat plug beyond the required measure into the flat connector socket and that in this way it is unlatched toward the rear. As an additional

achievement, no complicated supplementing machining operations are required and one can do with the simple, conventional tools. The depth of insertion is limited in a well-defined and extraordinarily simple manner.

In accordance with an expedient embodiment of the invention, the stop at the free inner edge of the sidewall is at the end of the coiling integral with the sidewall and extends into the region of contact. For reasons of strength, dimensions $> 0.4 \text{ mm} \times > 0.3 \text{ mm}$ proved to be convenient for the stop. The stop advantageously extends from the free end portion of the sidewall vertically into the accommodating space.

In order to facilitate the insertion of the flat plug, it may be provided to bend backward the free inner edges of the coiled sidewalls into a horizontal position or beyond for creating a rounded guiding edge with improved sliding features. It is provided in advantageous fashion in this embodiment of the flat connector socket to configure the stop as an integral boss prolonging the inner edge axially or as a cut-out tongue which is bent into the accommodating space.

When the invention is employed in a flat connector socket adapted to be unlatched by means of an unlatching element, the stop is placed so that during its insertion movement into the accommodating space, the flat plug does not bear on the unlatching element. In principle, it may be provided to improve the guiding of the flat plug during the insertion movement by forming on the sidewalls at least two additional facing lateral guides arranged toward the accommodating space.

Furthermore, in order to prevent overexpansion or to increase the strength at the unlatching element, an embossing adjacent the side of crimping may be provided.

Other details, features, and advantages of the object of the invention will be obvious from the ensuing description of a preferred embodiment illustrated in the drawing. In the drawing, there show:

Figure 1, a partially sectional elevation of a flat connector socket of an electrical connection;

Figure 2, a top view of this flat connector socket;

Figure 3, a sectional view along line C-C of Figure 2; and

Figure 4, a sectional view of the accommodating space of the flat connector socket with an inserted flat plug.

Figures 1 to 4 show that the connection 1, which is made of an electrically conductive material, is composed of a flat connector socket 2 and a flat plug 3 inserted into the flat connector socket. The electrical connection 1 can be latched. Latching of the flat connector socket 2 and the flat plug 3 is obtained by means of a retaining key 4 which protrudes from the flat connector socket 2 and enters into a recess 5 provided in the flat plug 3. This retaining key 4, which is made from the base of the flat connector socket 2, has a certain inclination and protrudes inwards into the accommodating space for the flat plug 3. The latter has a bevelled front edge 7 which, upon insertion of the flat plug 3 into the flat connector socket 2, slides along the inclined upper surface 8 of the retaining key 4, with the key 4 being pressed downward because of its flexibility. Upon further insertion, the biased key 4 becomes situated opposite the recess 5 and locks into the recess 5. In this way the flat plug 3 is latched in its inserted position in the accommodating space of the flat connector socket 3 as the transverse edge 9 of the key 4 hits the front wall 10 of the recess 5 if a tensile force acts upon the flat plug 3. Release means 11, which facilitate unlatching the key 4, are provided for undoing the connection 1.

As shown in the drawing, the base 6 of the flat connector socket 2 extends to the socket half 13 which forms the crimped portion enclosing the wire end (not shown). Together with its two sidewalls 14, 15, which serve as lateral guide means for the lateral edges of the flat plug 3, the base 6 forms an accommodating space 23. In order to improve the guiding of the flat plug 3, in the sidewalls 14, 15 there are embossed four facing protrusions 16, 17 which ensure a securely guided insertion movement of the flat plug 3 without the risk of tilting within the accommodating space 23. The exposed legs 18, 19 of the sidewalls 14, 15 are bent backwards (coiling) above the base 6, and the outer edges 20, 21 of the exposed legs 18, 19 are arranged to point toward the upper surface 22 of the flat plug 3 to prevent any play between the flat plug 3 in the accommodating space 23. The accommodating space 23 is defined by the base 6, the two sidewalls 14, 15 with their protrusions 16, 17 and the outer edges 20, 21 of the exposed legs 18, 19, whereby a secure mechanical and electrical contact between the flat connector socket 2 and the flat plug 3 is ensured.

In order to counter the risk of pushing the flat plug 3 in too far and, hence, of damaging the release means 11, at the inner extremity of the accommodating space 23 on the two sidewalls 14, 15 there are provided stops 12 which are effective in the position of latching the flat plug 3 and limit the insertion movement of the flat plug 3 in the axial direction of motion within the accommodating space 23. As shown in Figure 4 of the drawing, the front edge 7 of the flat plug 3 bears against the stops 12 of the sidewalls 14, 15 by the end of the insertion movement. Contact with the release means 11 is avoided.

Each of the stops 12 is integral with the associated sidewall 14 or 15 and is situated on the exposed inner edge of the sidewall at the extremity of the coiling. Each of the stops 12 is a protrusion which extends vertically downward into the contact region or insertion region of the flat plug. Its width is 0.5 mm and its height 0.4 mm in the preferred embodiment.

An approximately U-shaped recess 24, 25, 26 is formed in the base 6 on the level of the sidewalls 14, 15. The partial frontal recess 24 faces the front edge 7 of the flat plug 3, whereas the lateral recesses 25, 26 are parallel to the sidewalls 14, 15. In this way there is obtained a latch member 27 which is curved to some extent in the flexure region 28 so that the latch member 27 extends parallel to, and above, the base 6 if the accommodating space 23 is empty. Close to the flexure region 28 there is formed a cut 29 to render the retaining key 4.

In order to form the release means 11, in the latch member 27 there is provided a second U-shaped cut 30 the front side 31 of which is situated on the side of the retaining key 4. The material of the front side 31 is bent upwards along the flexure line 33 to configure a tongue 32 of the release means 11, with the tongue extending substantially perpendicular to the latch member 27 and, hence, to the base 6.

List of reference numbers

- 1 Electrical connection
- 2 flat connector socket
- 3 flat plug
- 4 retaining key
- 5 recess
- 6 base
- 7 front edge
- 8 inclined upper surface
- 9 transverse edge
- 10 front wall
- 11 release means
- 12 stops
- 13 socket half
- 14 sidewall
- 15 sidewall
- 16 protrusions
- 17 protrusions
- 18 exposed leg
- 19 exposed leg
- 20 outer edge
- 21 outer edge
- 22 upper surface
- 23 accommodating space
- 24 frontal recess
- 25 lateral recess
- 26 lateral recess
- 27 latch member
- 28 flexure region
- 29 cut
- 30 U-shaped cut
- 31 front side
- 32 tongue
- 33 flexure line
- 34 embossing

Claims

1. A flat connector socket (2) for the electrical connection with a flat plug (3) which is adapted to be slid from one end into an accommodating space (23) or receiving cavity formed by a base (6) and a pair of facing upright sidewalls (14, 15), with the outer edge regions (18, 19) of the sidewalls (14, 15) being bent inwardly (coiling) above the base (6) and with latch means (4, 27) formed at the base (6) to coact with a recess (5) in the flat plug (3), characterised in that on at least one of the sidewalls (14, 15) and/or the base (6) there is formed a stop (12) which is effective in the position of latching the flat plug (3) and limits its insertion movement into the accommodating space (23).
2. The flat connector socket according to Claim 1, characterised by a stop (12) situated on each of the sidewalls (14, 15).
3. The flat connector socket according to Claim 1 or 2, characterised in that the stop (12) is formed on the exposed inner edge of the sidewall (14, 15) at the end of the coiling, is integral with the sidewall (14, 15) and protrudes into the contact region.
4. The flat connector socket according to any one of Claims 1 to 3, characterised in that the stop (12) has a size of $> 0.4 \text{ mm} \times > 0.3 \text{ mm}$.
5. The flat connector socket according to any one of Claims 1 to 4, characterised in that the stop (12) extends from the exposed edge region of the sidewalls (14, 15) vertically into the accommodating space (23).
6. The flat connector socket according to any one of Claims 1 to 5, characterised in that the exposed edges of each of the sidewalls (14, 15) are coiled back to facilitate insertion and that the stop is configured as an integral extension which prolongs the inner edge (20, 21) axially or is cut out, with the extension being bent into the accommodating space.



7. The flat connector socket according to any one of Claims 1 to 6, characterised in that the latch means (27) are adapted to be unlatched by means of an unlatching element (11, 32) and that the stop (12) is situated so that during its insertion movement into the accommodating space (23), the flat plug (3) does not bear against the unlatching element (11, 32).

8. The flat connector socket according to any one of Claims 1 to 7, characterised by at least two facing lateral guide elements (16, 17) pointing toward the accommodating space (23) on the sidewalls (14, 15).

9. The flat connector socket according to any one of Claims 1 to 8, characterised by an embossing (34) near the crimped side of the unlatching element (11, 32).

