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ELECTRICAL CONNECTOR

The present invention relates to an electrical connector.

In order to facilitate and automate the assembly of the electrical
5 connections of the electrical/electronic components of a generic machine or
device, connectors for accommodating electrical terminals to be connected
to electrical connecting wires are currently used increasingly.

In particular, connecting assemblies thus formed are used in wiring to
be mass-manufactured.

10 These known electrical connectors are constituted generally by a box-
like body, which has a closure cover which is associated therewith by means
of a film hinge; inside the box-like body there are one or more seats, with
access from the cover side, for a corresponding number of female electrical
connection terminals for a respective electrical cable, and optional
15 contiguous second seats, which are open onto a corresponding first seat, for
male electrical terminals to be mated with the female terminals.

The free end of the cover has tabs, on each of which there is an
engagement slot for a corresponding tooth which protrudes from the box-
like body in order to close the cover with a snap action.

20 The edge of the box-like body located between the film hinge and the
openings for accessing the first seats is generally in relief with respect to the
rest of the edges of the openings and has a curved contact surface for the
film hinge in the configuration in which the cover is closed.

If, due to production problems, for example related to the dimensional
25 tolerances of the connector, the contact of the hinge against the curved
surface of the edge is not ideal, unwanted situations can occur for the
integrity of the hinge and for the functionality of the connector as a whole.

A first unwanted situation can occur if the hinge, when the cover is
closed, is placed under tension because it is "shorter" than the extension of
30 the arc of the profile of the curved surface, whereas instead a second

inconvenient situation can be caused by the "greater" length of the hinge with respect to the arc; in this case, the cover might be closed with a certain play and therefore may open in case of excessive stresses, which a connector undergoes if, for example, it belongs to an electric motor of a washing machine or of a car or of another device which is subjected to vibrations, jolts, impacts or other similar stresses.

The opening of the cover, either due to breakage of the hinge or due to disengagement caused by loose closure, allows the penetration of dirt into the connector and places at risk the stability of the contact, since the cable, which is normally locked in the connector by the closed cover, is no longer stably retained in its seat.

The aim of the present invention is to provide an electrical connector which is capable of obviating the drawbacks shown by similar known types of connector.

Within this aim, an object of the present invention is to provide a connector whose structure allows to protect in the best possible way the integrity of the film hinge and accordingly ensure optimum closure of the cover on the box-like body of the connector.

Another object of the present invention is to provide a connector which is adapted to be fitted on preset elements of a known type so as to accommodate known terminals and be installed by means of known equipment.

Another object of the present invention is to provide an electrical connector which can be manufactured cheaply with known systems and technologies.

This aim and these and other objects, which will become better apparent hereinafter, are achieved by an electrical connector, of the type constituted by a box-like body with a closure cover which is associated therewith by means of a film hinge, inside said box-like body there being at

least one first seat, with an opening for access on the part of the cover, for a female electrical connection terminal for an electrical cable and at least one optional contiguous second seat, which is open onto a corresponding first seat, for a male electrical terminal to be mated with said female terminal, the
5 free end of said cover having at least one tab in which there is an engagement slot for a corresponding tooth which protrudes from the box-like body, said connector being characterized in that at the edge of the box-like body arranged between said film hinge and the at least one opening for accessing the corresponding first seat there is a space for the free flexing of
10 said film hinge.

Further characteristics and advantages of the invention will become better apparent from the following detailed description of two preferred but not exclusive embodiments thereof, illustrated by way of non-limiting
15 example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a connector according to the invention in a first embodiment thereof;

Figure 2 is a front view of the connector of Figure 1;

Figure 3 is a sectional view, taken along the line III-III of Figure 2,
20 related to the connector in the closed condition;

Figure 4 is a sectional view, taken along the line IV-IV of Figure 2, with the connector in the open condition;

Figure 5 is a perspective view of a connector according to the invention in a second embodiment thereof.

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With reference to the figures, an electrical connector according to the invention is generally designated by the reference numeral 10.

The connector 10, the first embodiment of which is shown in Figures 1 to 4, is of the type constituted by a box-like body 11 with a closure cover
30 12 which is associated therewith by means of a film hinge 13.

In this embodiment, which is described by way of non-limiting example of the invention, inside the box-like body 11 there are three first seats 14, with an opening 15 for access from the side of the cover 12, for a female electrical terminal 16 for connection of an electrical cable 17.

5 Each first seat 14 is matched by a contiguous second seat 18, which is open onto the first seat 14, for a male electrical terminal 19 to be mated with the female terminal 16.

The free end of the cover 12 is provided with two tabs 20, on each of which there is an engagement slot 21 for a corresponding tooth 22 which
10 protrudes from the box-like body 11.

A space 24 for the free flexing of the film hinge 13 is formed at the edge 23 of the box-like body 11 located between the film hinge 13 and the opening 15 for accessing the first seats 14.

The edge 23 is substantially flat, and the film hinge 13, in the
15 configuration in which the cover 12 is closed, is not in contact with it.

This solution allows the hinge 13 to have greater freedom in adapting to the shape given to it by the cover 12 in the closed configuration, without having to adapt to a shape imposed by a curved surface of an edge in relief, as in known types of connector.

20 In this manner, the hinge 13 cannot be under tension because it is "shorter" than the extension of the arc of the profile of the curved surface of the edge, and this cause of breakage is eliminated.

Each tooth 22, being two in the first embodiment, protrudes from a plate-like portion 25 which extends from a partition 26 between two
25 laterally adjacent seats 14 for the terminals 16.

The plate-like portion 25 has a wider centering head 27 which, in the configuration in which the cover 12 is closed, is arranged proximate to, or in contact against, a translational motion-preventing abutment provided on the cover 12.

30 In this first embodiment of the invention, the abutment is provided by

a substantially vertical end face 28 of the slot 21; the face 28 prevents the unwanted movement of the cover 12 in the direction and with the orientation from the hinge 13 to the tooth 22.

The end portion of the tab 20, which has a substantially U-shaped contour, engages, in the configuration in which the cover 12 is closed, below the tooth 22 in a groove 29 which is designed to prevent, in cooperation with a transverse part 30 of the U-shaped portion, the unwanted movement of the cover 12 in the direction and with the orientation from the tooth 22 to the hinge 13, i.e., preventing the translational motion of the cover 12 in the opposite direction to what is done by the face 28 of the slot 21 with the wider head 27 of the plate-like portion 25.

In a second embodiment of the invention, which also is an exemplifying embodiment, the connector according to the invention, designated by the reference numeral 110, has a box-like body 111 which is preset to accommodate a single female terminal for the cable 117.

The cover 112 has two lateral tabs 120 with the slots 121 for two teeth 122.

The space 124 between the hinge 113 and the cover 112, at the edge 123, is clearly visible.

In this embodiment, the abutment is provided by a recess 129 which is provided to the rear of the slot 121 and proximate thereto, and a corresponding wider head 127 is inserted in the recess 129.

The tab 20 and 120 engaged on the corresponding tooth 22 and 122, in cooperation with the wider head 27 and 127 and the corresponding abutment, prevent the cover from being closed with a play which allows opening in case of excessive stresses.

The connector 10 and 110 according to the invention, thanks to the space 24 and 124 for the movement of the hinge 13 and 113, reduces the risks of unwanted opening of the cover, limiting the risks of breakage of the hinge and of disengagement due to loose closure, with all the advantages of

integrity and cleanness for the contacts provided in said connector.

It is noted that the embodiments described here are to be understood as exemplifying and non-limiting; the connector according to the invention can therefore be provided with a number of seats for terminals, and with a
5 number of engagement tabs and teeth, at will, depending on requirements and needs of the manufacturer and user; further, it should be understood that the seats 14 and 18 for the terminals can be provided to accommodate any type of terminal according to requirements and to the applications for which the connector according to the invention is provided.

10 In practice it has been found that the invention thus described solves the problems noted in similar known types of electrical connector.

In particular, the present invention provides a connector whose structure allows to protect in the best possible way the integrity of the film hinge and consequently ensure optimum closure of the cover onto the box-
15 like body of the connector.

Further, the invention provides a connector which is adapted to be fitted on preset elements of a known type, to accommodate known terminals, and be installed by means of known equipment.

Moreover, the present invention provides an electrical connector
20 which can be manufactured cheaply with known systems and technologies.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

25 In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

CLAIMS

1. An electrical connector, of the type constituted by a box-like body (11) with a closure cover (12) which is associated therewith by means of a film hinge (13), inside said box-like body (11) there being at least one first seat (14), with an opening (15) for access on the part of the cover (12), for a female electrical connection terminal (16) for an electrical cable (17) and at least one optional contiguous second seat (18), which is open onto a corresponding said first seat (14), for a male electrical terminal (19) to be mated with said female terminal (16), the free end of said cover (12) having at least one tab (20) in which there is an engagement slot (21) for a corresponding tooth (22) which protrudes from the box-like body (11), said connector being characterized in that at the edge (23) of the box-like body (11) arranged between said film hinge (13) and the at least one opening (15) for accessing the corresponding first seat (14) there is a space (24) for the free flexing of said film hinge (13).

2. The connector according to claim 1, characterized in that said edge (23) is substantially flat and the film hinge (13), in the configuration in which the cover is closed, is not in contact with it.

3. The connector according to the preceding claims, characterized in that each tooth (22) protrudes from a plate-like portion (25) which extends from the partition (26) between two laterally adjacent seats (14) for terminals (16).

4. The connector according to the preceding claim, characterized in that said plate-like portion (25) has a wider centering head (27) which, in the configuration in which the cover (12) is closed, is arranged proximate to, or in contact against, a translational motion-preventing abutment provided on said cover (12).

5. The connector according to the preceding claim, characterized in that said abutment is provided by the substantially vertical end face (28) of the slot (21), which prevents the unwanted movement of the cover (12) in

the direction and with the orientation from the hinge (13) to the tooth (22).

6. The connector according to claim 4, characterized in that said abutment is provided by a recess (129) which is provided to the rear of the slot (121) and proximate thereto.

5 7. The connector according to the preceding claims, characterized in that the end portion of said tab (20), which is substantially U-shaped, engages, in the configuration in which the cover (12) is closed, below said tooth (22) in a groove (29) which is designed to prevent, in cooperation with the transverse part (30) of the U-shaped portion, the unwanted movement of
10 the cover (12) in the direction and with the orientation from the tooth (22) to the hinge (13).