

Multipolar connector

Field of the invention

The present invention relates to connectors, in
5 particular electrical connectors.

State of the art

In most cases, the use of a multipole connector
requires the two main components (e.g. one component
10 containing male contacts and one component with female
contacts) to be fixed to one another according to a
specific angular orientation.

The fact of having to align one component relative to
the other, prior to connection, constitutes a nuisance.
15 There is therefore a need to be able to eliminate this
nuisance.

General description of the invention

According to an aspect of the present invention, there
20 is provided a connector comprising a socket of
substantially cylindrical form, and a plug that can be
removably connected to the socket, in which there are
arranged a plurality of contacts; the socket comprising
a conductive face on or in which there is arranged at
25 least one conductive track forming at least one
circular arc whose center substantially coincides with
the center of the conductive face; said track being
also arranged so as to allow a mechanical electrical
coupling with one of said contacts, connector in which
30 each contact is mounted to be axially mobile,
independently of the other contacts, the contacts being
arranged through a flexible membrane, said membrane
being seal-tight, the connector comprising a mechanism
exerting a return force on each contact by an elastic
35 element inducing a return mechanism toward the socket

making it possible to exert an individual pressure on each contact, said elastic element being formed by the membrane.

5 There is also disclosed a connector comprising a socket of substantially cylindrical form and a plug, that can be removably connected to the socket, in which there are arranged a plurality of contacts. The socket comprises a conductive face in the form of a disk on or in which there is arranged at least one conductive track forming at least one circular arc whose center
10 substantially coincides with the center of the conductive face, said track being also arranged so as to allow a mechanical electrical coupling with one of said contacts.

15 In the connector according to embodiments of the invention, the socket and the plug constitute the two main components which form the connector.

20 In the particular configuration which comprises only a single circular track, the center of the face of the socket is a conductive disk, which is arranged so as to allow an electrical coupling with a contact of the plug

arranged at the center thereof.

Preferably, the connector comprises at least two
circular conductive tracks which are arranged
5 concentrically.

Advantageously, each contact of the plug is mounted to
be axially mobile, independently of the other contacts.
This may ensure a permanent mechanical contact with the
10 conductive tracks of the socket.

A mechanism can be provided to exert a return force on
each contact.

15 According to an embodiment of the invention, the
contacts are arranged through a flexible membrane, for
example made of rubber, which is preferably seal-tight.

The plug, overall, can be oriented in a single
20 direction. Alternatively, it can be bent.

The plug can be connected to be free to rotate about
the socket, or according to a limited number of angular
orientations.

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Detailed description of the invention

The invention will be better understood from the
following description which in particular contains a
few illustrated examples.

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Brief description of the figures

Figure 1 represents a variant of the invention with a
socket designed for a free orientation of the plug.

Figure 2 represents another variant of the invention
35 with a socket designed for limited angular orientations
of the plug.

Figure 3 represents a side view of the socket.

Figure 4 represents a cross-sectional view of a socket.

Figure 5 represents a plug (bent)-socket pair connected together.

5 Figure 6 represents another view of a bent plug.

Figure 7 shows the wiring of a plug.

Figure 8 represents a plug comprising several outputs.

Figure 9 represents a stack of plugs/sockets.

Figure 10 represents a spring ring.

10 Figure 11 represents the incorporation of a spring ring in a plug.

Numeric references used in the figures

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1. Socket

2. Plug

3. Contact

4. Conductive face

20 5. Conductive track

6. Center of the conductive face

7. Nut

8. Contact

9. Membrane

25 10. Output

11. Spring ring

12. Ball

13. Circular groove

14. Ball housing

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According to the embodiment illustrated in the present document, the connector comprises seven contacts.

It goes without saying that the invention is not limited to this configuration. It also covers all the

35 connectors comprising at least two contacts.

Likewise, the dimensions of the connector according to the invention can be any dimensions.

The connector according to the invention has the particular feature of not requiring prior orientation of the plug **2** (e.g. a wired element) relative to the socket **1** (e.g. a unit housing element). This advantage
5 results from the cylindrical/circular geometry of the socket and of its conductive face **4** (see for example figure 1). Once connected, the relative rotation between the socket **1** and the plug **2** can be free or blocked via a bistable-type system, for example a
10 locking by lateral pressure and unlocking by axial pressure).

An orientation can nevertheless be given and limit the plugging-in possibilities to a finite number of different angular positions (e.g. four positions
15 separated by 90° or 12 positions separated by 30°) as described in figure 2.

The socket **1** is composed of a body that can be fixed onto an external device via a fixing element such as a
20 nut **7** (figure 1) or rivets or any other suitable means making it possible to durably fix these two elements (e.g.: socket sewn onto a fabric/clothing item).

The socket **1** can be connected to the device via
25 metallic contacts **8** which interconnect directly with the device (that can be a fabric incorporating conductive parts incorporated or not in the fabric) or through an electrical circuit (PCB, flex, etc.) welded to the socket and interfacing with the device (figure
30 3).

The plug **2** is composed of electrically conductive parts separated by electrically insulating parts. It can be composed of any type of assembly of parts making it
35 possible to ensure the function of signal transmission and of electrical insulation (figure 1 and figure 4). The plug **2** and the socket **1** are preferably "cleanable"

in as much as it is easy to access the surface in order to eliminate dirt/deposits/particles without a specific cleaning tool.

5 Advantageously, the plug **2** connects to and disconnects from the socket **1** by a single hand.

The connection/disconnection can be performed by simple pressure/pulling force on the plug **2** (variant without locking) (figure 5). According to another variant, the
10 connector comprises a locking and a lateral pressure on the two sides (or any other deliberate action) is necessary in order to free the locking mechanism.

Preferably, the plug **2** should exhibit a certain
15 elasticity in order to guarantee the electrical contact with the socket **1**. To this end, each contact **3** can be mounted to be axially mobile independently of the other contacts **3** in order to guarantee that each contact **3** is pressed onto the corresponding track **5** of the socket **1**.

20 Advantageously, the contacts **3** pass through a flexible membrane **9**, obtained for example by overmolding a rubber over the contacts **3** or any other means in order to constitute a subassembly allowing the individual mobility of the contacts **3** relative to one another
25 (figure 5).

The membrane **9** also makes it possible to guarantee the seal-tightness of the assembly.

An elastic element (not represented in the illustrations), inducing a return mechanism toward the
30 socket **1**, makes it possible to exert an individual pressure on each contact **3** in order to guarantee the electrical continuity on each contact **3**. It should be noted that the membrane **9** can exert this elastic element function.

35 The quasi-smooth surface of the membrane **9** and of the contacts **3** makes it possible to also guarantee a perfect "cleanability", similar to that of the socket **1**

(figure 6).

The wires of the cables or any other link means, e.g. PCB (not illustrated), are connected (e.g. horizontally welded) onto the rear face of each contact **3** in order
5 to guarantee the electrical link while limiting the bulk. A cap covers the assembly in order to mechanically protect the system and render it seal-tight (figure 7).

10 According to another variant (not illustrated) of the invention, the concentric tracks form circular grooves in the face of the socket.

The number of outputs **10** of the plug **2** and of the
15 socket **1** can be multiple (figure 8).

The plug **2** can include a "socket" part in order to allow a stacking of several plugs/sockets (figure 9).

20 The locking and/or the acknowledgement of plugging-in of the connector can be produced by means of a spring ring **11** exhibiting a certain elasticity, the ring **11** bearing on balls **12** which have themselves come to be housed in a groove **13** formed on the socket (figures 1
25 and 3).

A possible illustration of the spring ring **11** is illustrated in figure 10 and its incorporation in the plug **2** is illustrated in figure 11.

30 The position of the ball housings **14** (figure 2) can be multiple and offer several locking points in order to avoid the rotation once plugged in.

Claims

1. A connector comprising a socket of substantially
cylindrical form, and a plug that can be removably
5 connected to the socket, in which there are
arranged a plurality of contacts; the socket
comprising a conductive face on or in which there
is arranged at least one conductive track forming
at least one circular arc whose center
10 substantially coincides with the center of the
conductive face; said track being also arranged so
as to allow a mechanical electrical coupling with
one of said contacts, connector in which each
contact is mounted to be axially mobile,
15 independently of the other contacts, the contacts
being arranged through a flexible membrane, said
membrane being seal-tight, the connector
comprising a mechanism exerting a return force on
each contact by an elastic element inducing a
20 return mechanism toward the socket making it
possible to exert an individual pressure on each
contact, said elastic element being formed by the
membrane.
- 25 2. The connector as claimed in claim 1, wherein the
conductive face of the socket comprises at least
two circular conductive tracks arranged
concentrically.
- 30 3. The connector as claimed in any one of the
preceding claims, in which the plug is bent.
4. The connector as claimed in any one of the
preceding claims, in which the plug can be
35 connected to be free to rotate about the socket.

5. The connector as claimed in any one of the preceding claims, in which the plug can be connected according to a limited number of orientations about the socket.
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6. The connector as claimed in any one of the preceding claims, in which the contacts are distributed asymmetrically on the surface of the conductive face upon connection.
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7. The connector as claimed in one of the preceding claims, in which the plug comprises a "socket" part allowing a stacking of several plugs/sockets.
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8. The connector as claimed in one of the preceding claims, the plug comprising a spring ring producing the locking and/or the acknowledgement of plugging-in of the socket.
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9. The connector as claimed in claim 8, in which the ring bears on balls which are housed in a groove of the socket upon connection.
- 25 10. The connector as claimed in one of the preceding claims, in which the socket is fixed to an external device by a fixing element and is connected to the device by contacts interconnecting directly with the device or
30 through an electrical circuit welded to the socket and interfacing with the device.