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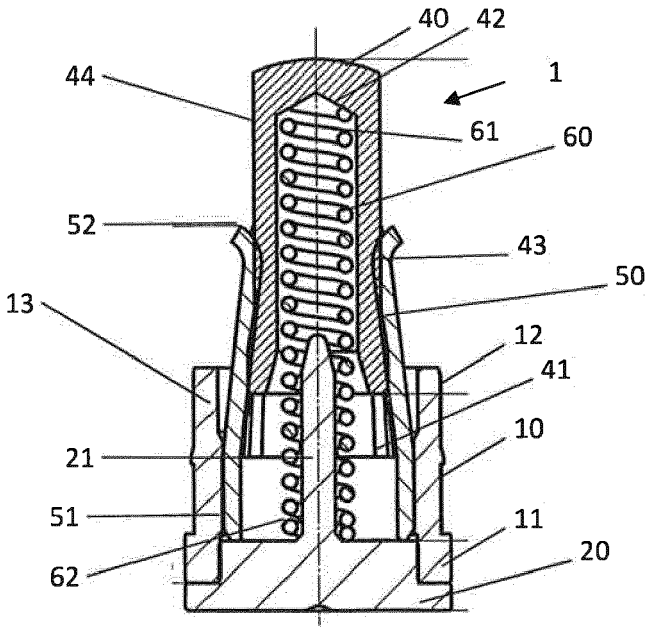
(54) ELECTRICAL CONNECTION DEVICE

(57) Invention is related to an electrical connection (1) device comprising
- a barrel (10) comprising a first end (11) on which a cap (20) is mounted,
- a hollow piston (40) comprising an open end (41)and a blind end (42), the hollow piston (40) being slidably mounted in the barrel (10) so that the blind end (42) extends beyond a second end of the barrel (10)
- and a helical spring (60)
characterized in that the electrical connection device comprises a spring clip (50) mounted between the barrel (10) and the hollow piston (40) so as to provide electrical continuity between the barrel (10) and the hollow piston (40), the first end (61) of the helical spring (60) being housed in the hollow piston (40) and a second end (62) of the helical spring (60) bearing on the cap (20) so that the maximum insertion position of the hollow piston (40) into the barrel (40) is obtained when the open end (41) of the hollow piston (40) comes into contact with the cap (20).

[Fig. 1]



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Description

[0001] This invention generally concerns an electrical connector used in particular in electronic devices such as portable video cameras.

[0002] In the anterior art there are electrical connectors with a barrel on one end of which a rod is mounted, the other end of the barrel being open. A hollow piston is mounted on the rod by means of a spring clip. The spring clip also provides electrical continuity between the hollow piston and the rod. An elastic means such as a helical spring is mounted between the barrel and the hollow piston to provide the elastic return function of the hollow piston. The elastic spring is mounted around the hollow piston. A first end is supported on the first end of the barrel and the second end is supported by a shoulder on the outer surface of the hollow piston. This type of mounting is sensitive to lateral vibrations of the connector. In addition, the stroke of the hollow piston, in particular the maximum insertion position is limited by the rod.

[0003] One purpose of this invention is to address the disadvantages of the above-mentioned prior art document and in particular, to provide an electrical connector with a higher operating stroke.

[0004] To this end, a first aspect of the invention concerns a Electrical connection device comprising a barrel comprising a first end on which a cap is mounted, a hollow piston comprising an open end and a blind end, the piston being slidably mounted in the barrel so that the blind end extends beyond a second end of the barrel and a helical spring characterized in that the electrical connection device comprises a spring clip mounted between the barrel and the hollow piston so as to provide electrical continuity between the barrel and the hollow piston, the first end of the helical spring being housed in the hollow piston and a second end of the helical spring bearing on the cap so that the maximum insertion position of the hollow piston into the barrel is obtained when the open end of the hollow piston comes into contact with the cap.

[0005] According to another feature, the cap includes a centering pin on the second end of the helical spring.

[0006] According to another feature, a free end of the centering pin extends beyond the second end of the barrel.

[0007] According to another features, the spring clip is fixedly mounted with respect to the barrel.

[0008] According to another features, the second end of the barrel includes a flange arranged to form a means of guiding the sliding movement of the hollow piston.

[0009] According to another features, the spring clip forms a tube, so a first end of the spring clip rests on the cap and a second end extends beyond the second end of the barrel.

[0010] According to another features, the spring clip comprises at least one elastic finger pressing an external surface of the hollow piston.

[0011] According to another features, elastic finger extends beyond the second end of the barrel.

[0012] According to another features, elastic finger extends outwardly relative to the hollow piston.

[0013] According to another features, the external surface of the hollow piston comprise a groove receiving the spring clips

[0014] According to another features, the spring clip forms a tube, so a first end of the spring clip rests on the cap and a second end has a tronconical shape.

[0015] Other characteristics and advantages of the present invention will become clearer when reading the following detailed description of a method of making the invention given by way of example, which is not exhaustive and is illustrated by the annexed drawings, in which :

[Fig. 1] represents a longitudinal cross-sectional view of an electrical connector in a first embodiment of the invention ,

[Fig. 2] represents a longitudinal cross-sectional view of an electrical connector in a second embodiment of the invention in an extended position;

[Fig. 3] represents a longitudinal cross-sectional view of an electrical connector in the second embodiment of the invention in a pressed position;

[Fig. 4] represents an exploded perspective view 7 of an electrical connector according to the second embodiment of the invention;

[0016] As shown in figure 1 in a first embodiment of the invention, the electrical connector 1 according to the invention includes a barrel 10, for example cylindrical in shape. A first end 11 of barrel 10 includes a cap 20 mounted, for example, by stamping on the barrel 10. Another method of assembling the cap 20 to the first end 11 of the barrel 10 can be used such as crimping or welding. Electrical continuity is then ensured between the barrel 10 and the cap 20.

[0017] Connector 1 also includes a hollow piston 40 mounted sliding in the barrel 10. The hollow piston 40 has, in a known manner, a blind end 42 and an open end 41.

[0018] According to the invention, a helical spring 60 is mounted inside the hollow piston 40. A first end 61 of the helical spring 60 is supported at the bottom of the hollow piston 40 at the blind end 42 while a second end 62 of the helical spring 60 is supported on the cap 20.

[0019] A centering pin or stud 21 of the helical spring 60 can be formed in an orthogonal direction on the cap 20. The helical spring 60 is then inserted on the centering pin or pin 21. The centering pin or pin 21 prevents the helical spring 60 from deforming laterally during compression. The helical spring 60 can be replaced by any other elastic means of similar geometry and performing the elastic return function.

[0020] According to the invention, electrical connector 1 also includes a spring clip 50 mounted between barrel

10 and hollow piston 40. In other words, the spring clip 50 is mounted on the one hand against the inner surface 13 of the barrel 10 and on the other hand against the outer surface 44 of the hollow piston 40. The spring clip 50 therefore ensures electrical continuity between barrel 10 and hollow piston 40. The spring clip 50 is fixed to the barrel 10 and can be mounted in the barrel 10 by press-fitting or any other method known per se such as crimping or welding. Thus, it is understood that the sliding movement of the hollow piston 40 is carried out by sliding on the spring clip 50.

[0021] According to the first embodiment of the invention shown in Figure 1, the spring clip 50 is tubular in shape. A first end 51 of the spring clip 50 is mounted against the cap 20, a second end 52, for example in a frustoconical/tronconical shape, forms the sliding area of the hollow piston 40. The second end can be formed by fingers 23 or tabs forming the frustoconical/tronconical shape, for example. The fingers 23 or tabs increase the elasticity of the spring clip 50 at the contact interface with the piston, which improves the guidance of the hollow piston 40 in its sliding movement.

[0022] The fingers 23 comprise a first end integral with a substantially cylindrical portion of the spring clip 50 and a second free end in contact with the hollow piston 40. The second free end can be bent outwards, i. e. away from the outer surface 43 of the hollow piston 40. Thus, the contact surface between the spring clip 50 and the hollow piston 40 is rounded, which facilitates sliding and improve electrical contact.

[0023] According to the first design, the second end 52 of the spring clip 50 extends beyond the second free 12 end of the barrel 10, i.e. the second end of the spring clip 50 is not facing a portion of the barrel 10. Thus, the antenna effect that could occur when the power is switched on by the presence of 2 conductive surfaces facing each other is reduced.

[0024] According to a variant, the bottom of the hollow piston 40 has a concave conical surface against which the second end of the helical spring is supported. In addition, the rod or stud 21 can extend beyond the second end 12 of barrel 10. By lengthening, the length of the rod or pin 21 improves the centering and holding of the first end 61 of the helical spring 60.

[0025] The external diameter of the open end 41 of the hollow piston 40 could be greater than the internal diameter of the second end 52 of the spring clip 50. Then, the friction force of the spring clip 50 higher in this area than the ejection force of the helical spring 60. This will avoid ejection of the hollow piston 40 from the spring clip 50 due to the helical spring 60.

[0026] Figures 2 to 4 represent a second embodiment of the electrical connector 1. This embodiment differs from the first one by a barrel 10 of different structure. According to this second embodiment of the electrical connector 1, the spring clip 50 is fully housed in the inner volume of the barrel 10, in other words, the second end 12 of the barrel extends beyond the second end 52 of the spring clip 50.

[0027] In order to improve the guidance of the hollow piston 40 during its sliding, the second end comprises, for example, a lip 14 extending towards the inside of the barrel 10 in a plane substantially perpendicular to the longitudinal axis of the barrel 10. This lip actually closes the opening at the second end 12 of the barrel 10 so that the clearance between the outer surface of the hollow piston 40 and the lip 14 is as small as possible.

[0028] In this second embodiment, the first end 51 of spring clip 50 is spaced from the cap 20.

[0029] Barrel 10, cap 20 and hollow piston 40 can be produced by processes known per se, such as deep drawing, forging, cold heading. The material used is a conductive metal alloy such as brass, phosphor bronze, beryllium-copper alloy. Barrel 10, cap 20 and hollow piston 40 may include a coating to improve their electrical contact, wear and corrosion resistance.

[0030] Spring clip 50 is generally manufactured using a deep-drawing/forming process on a progressive deep-drawing die using a high-temperature copper alloy, such as beryllium-copper or another high-conductivity, high-temperature alloy.

[0031] The helical spring 60 is a compression spring that is made from a variety of materials, such as stainless steel, beryllium-copper, other alloys, including high temperature alloys. The helical spring 60 can be plated or not.

[0032] Figures 2 and 3 represent the two extreme positions of the hollow piston 40 of the electrical connector according to the invention: extended - pressed. Thus, it is understood that in the maximum insertion position of the hollow piston 40 (figure 3), the open end 41 of the hollow piston 40 comes to rest against the cap 20. The maximum deployment position is defined, for example, by the position of the grooves 43 of the hollow piston 40. The stroke of the hollow piston 40 is therefore increased compared to the connector of the anterior art.

[0033] It will be understood that various modifications and/or improvements obvious to the skilled person may be made to the different modes of making the invention described in this description without going beyond the scope of the invention.

Claims

1. Electrical connection (1) device comprising

- a barrel (10) comprising a first end (11) on which a cap (20) is mounted,
- a hollow piston (40) comprising an open end (41)and a blind end (42), the hollow piston (40) being slidably mounted in the barrel (10) so that the blind end (42) extends beyond a second end of the barrel (10)
- and a helical spring (60)

characterized in that the electrical connection de-

vice comprises a spring clip (50) mounted between the barrel (10) and the hollow piston (40) so as to provide electrical continuity between the barrel (10) and the hollow piston (40), the first end (61) of the helical spring (60) being housed in the hollow piston (40) and a second end (62) of the helical spring (60) bearing on the cap (20) so that the maximum insertion position of the hollow piston (40) into the barrel (40) is obtained when the open end (41) of the hollow piston (40) comes into contact with the cap (20).

2. The electrical connection device according to claim 1 according to which the cap (20) includes a centering pin (21) on which the second end (62) of the helical spring (60) is inserted.

3. An electrical connection device according to one of claims 1 or 2 according to which a free end of the centering pin (21) extends beyond the second end (12) of the barrel (10).

4. An electrical connection device according to one of claims 1 to 3 according to which the spring clip (50) is fixedly mounted with respect to the barrel (10).

5. An electrical connection device according to one of claims 1 to 4 according to which the second end (12) of the barrel (10) includes a lip (14) arranged to form a means of guiding the sliding movement of the hollow piston (40).

6. An electrical connection device according to one of claims 1 to 5 according to which the spring clip (50) forms a tube, so a first end (51) of the spring clip (50) rests on the cap (20) and a second end (52) extends beyond the second end of the barrel (10).

7. An electrical connection device according to one of claims 1 to 6 according to which the spring clip (50) comprises at least one elastic finger (53) pressing an external surface (44) of the hollow piston (40).

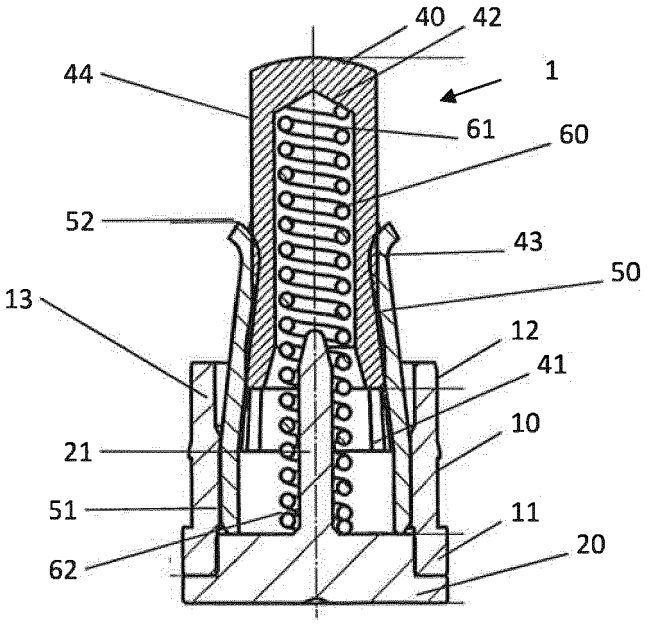
8. An electrical connection device according to one of claims 6 and 7 according to which elastic finger (53) extends beyond the second end of the barrel (40)

9. An electrical connection device according to one of claims 7 or 8 according to which elastic finger (53) extends outwardly relative to the hollow piston (40).

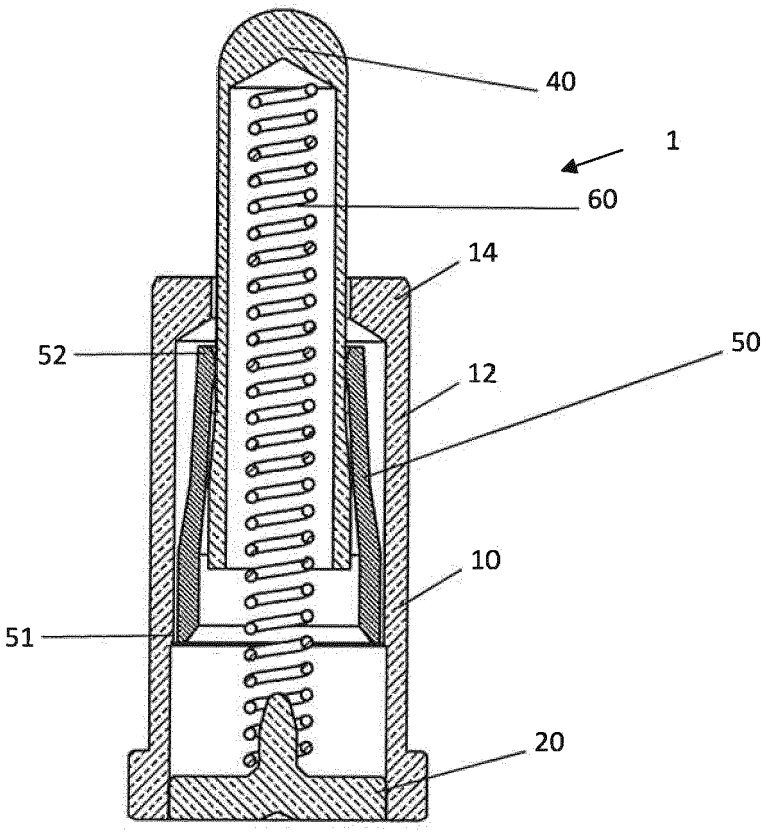
10. An electrical connection device according to one of claims 1 to 8 according to which the external surface (44) of the hollow piston (40) comprise a groove receiving the spring clips (50).

11. An electrical connection device according to one of claims 1 to 9 according to which the spring clip (50) forms a tube, so a first end of the spring clip (50) rests on the cap and a second end has a tronconical shape.

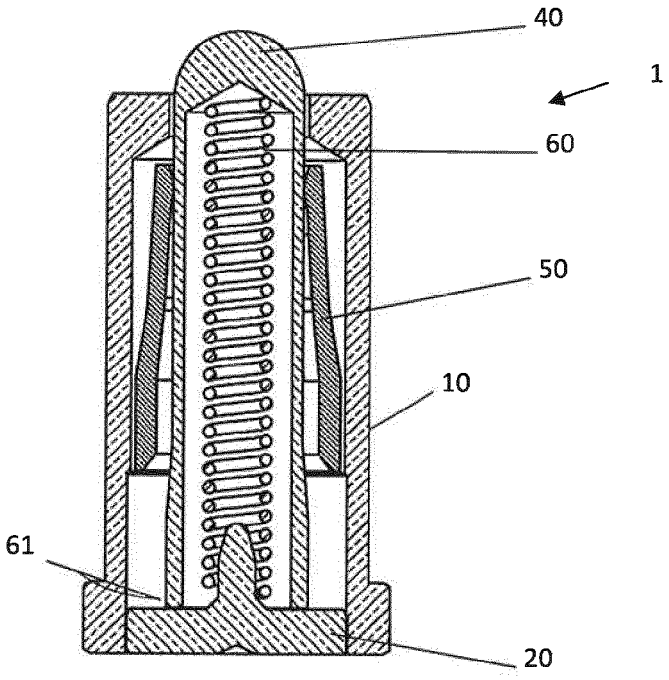
[Fig. 1]


40
42
44
1
61
60
52
43
50
13
12
41
10
21
51
11
20
62

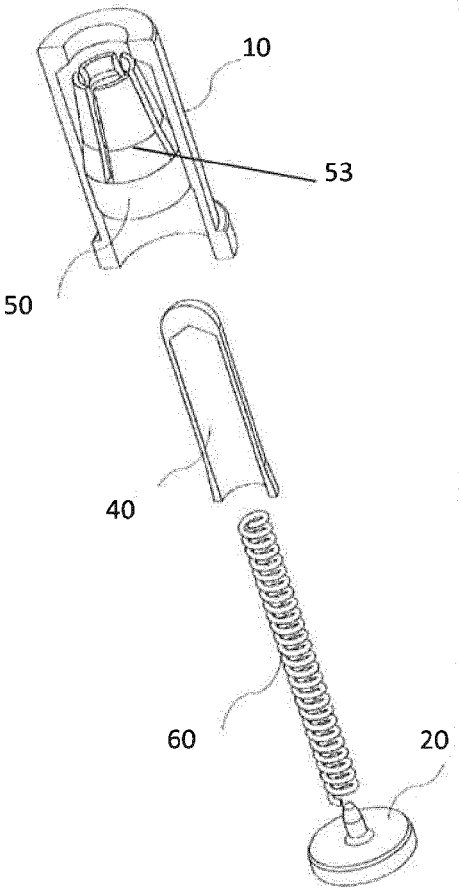
[Fig. 2]


40
1
60
14
52
50
12
10
51
20

[Fig. 3]



[Fig. 4]



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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 5320

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC) H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 November 2019	Mateo Segura, C

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EPO FORM 1503 03.82 (P04C01)

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04-11-2019

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