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(54) **Plug and socket connector for flexible and rigid cables with rotary opening mechanism**

(57) The patent concerns a new plug/socket connector for flexible and rigid cables, comprising a roughly triangular-shaped metal lamina (E), having a mobile side (E2) featuring a window (E21) or rectangular hole and a flexion side (E3), joined to a plate (C1) of an electrical contact (C) so that the end of the plate (C1) of the electrical contact (C) locates in the window or hole (E21) of the elastic element (E); a cylindrical pin (A) designed to rotate, having on its lateral surface a groove or channel (A1) with roughly spiral portion shaped section and provided at the top with a slot (A2) designed to receive the tip of a screwdriver, adheres to the elastic element so that its lateral groove or channel (A1) rests on the side or on the corner of the elastic element (E) so that the rotation of said cylindrical pin (A) causes compression of the elastic element (E), thus opening its window (E21).

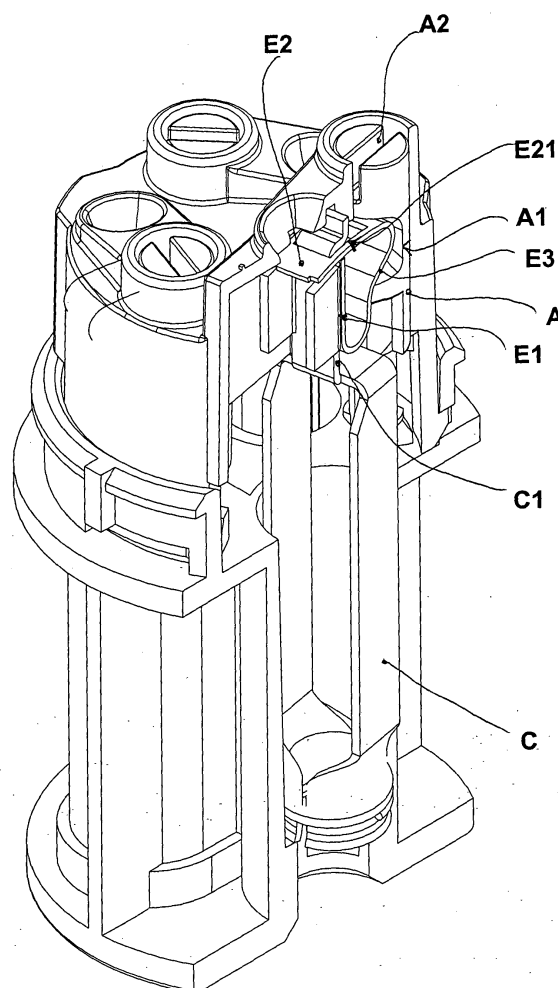


Fig. 3

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Description

[0001] This patent concerns plugs, sockets and similar, and in particular flexible devices for locking electrical cables to the contacts of said plugs, sockets and similar.

[0002] The electrical cables consist of an outer insulating sheath made of flexible plastic material wrapped around one or more copper electric wires, each of which in its turn is coated by a flexible plastic insulating sheath.

[0003] The plugs, sockets and similar are provided internally with suitable retainers to each of which one of the electrical cable wires is connected.

[0004] The end of the electrical cable is without outer sheath so that the wires are independent; the latter, in their turn, are stripped of their sheath at the ends so that they can be mechanically and electrically connected to each electrical contact.

[0005] Terminals are known, consisting of a body with hole and right-angle screw, for connection of the cable to the electrical contact. In said terminals the stripped cable is inserted into the hole and fastened by tightening the screw which presses the cable wires against the terminal hole wall.

[0006] These terminals have various disadvantages: the screw must be fastened by exerting a certain pressure; if the screw is not sufficiently tightened, the cable wires may come out of the terminal with consequent overheating; if the screw is overtightened, the cable wires may be cut by the torsion-pressure of said tightening screw.

[0007] Systems for locking the cable to the electrical contact are known using an elastic element consisting of a metal band in a roughly triangular shape, preferably a right-angled triangle: on one of the sides of the triangular shape, subsequently called mobile side, the metal band has a window or rectangular hole while the adjacent side, subsequently called adhesion side, has a tapered or narrower end so that it can pass through said window or rectangular hole.

[0008] The electrical contact also comprises a plate on which said roughly triangular-shaped elastic element is applied so that the adhesion side of the elastic element adheres to said plate of the electrical contact and so that both said adhesion side of the elastic element and said wall or plate of the electrical contact cross the window or hole of the side of the elastic element.

[0009] The third side of the elastic element, subsequently called flexion side, is shaped so that it can be bent and bring said flexion side of the elastic element closer to the tapered side and to the plate of the electrical contact. In this way the window or rectangular hole of the elastic element is shifted and opens on the side of the electrical contact plate opposite the elastic element.

[0010] By inserting the cable in the window or rectangular hole, thus opened, of the elastic element, said elastic element keeps said cable pressed on the wall or plate of the electrical contact.

[0011] The current sockets, plugs and similar provided with elastic element for locking the cable to the electrical contact are also provided with a mechanism for flexion of the elastic element comprising a cursor for flexion-opening of the elastic element.

[0012] Said cursor has a roughly linear shape with a channel on one side and a crack or recess at one end.

[0013] The corner between the mobile side and the flexion side of the elastic element locates in the cursor groove.

[0014] The linear translation of the cursor bends the flexion side of the elastic element, shifting the window or rectangular hole to the opposite side of the electrical contact plate.

[0015] The cursor is moved by inserting a screwdriver or other tool in the crack or recess at its top end.

[0016] The cursor mechanism for opening the elastic element has various disadvantages.

[0017] There must be sufficient space around the cursor for inserting a pair of pliers or a screwdriver into the crack or recess of the cursor and raising it accordingly.

[0018] Axial operation of the cursor can cause partial or total detachment of the wire.

[0019] The socket or plug or similar must be somehow retained, with one hand gripping the screwdriver and pulling the cursor and the other hand inserting the cable, in the opposite direction to the pulling force of the screwdriver, into the window or rectangular hole of the elastic element; the cursor is then released and returns to the rest position due to the effect of the elastic element. This operation is particularly inconvenient as the socket or plug has to be retained somehow until the cable is inserted.

[0020] In the same way, to remove the cable from the window or rectangular hole of the elastic element, the socket or plug has to be retained with one hand until the cursor is shifted and the cable can be taken out.

[0021] In both these operations there is the possibility of the screwdriver slipping while pulling the cursor, with the need to repeat the operation even several times and with the danger of injury or the risk of damaging surrounding objects.

[0022] To overcome all the above-mentioned disadvantages a new plug and socket connector for flexible and rigid cables with rotary opening mechanism has been designed and produced.

[0023] The aim of the new opening mechanism is to facilitate opening of the cable locking elastic element.

[0024] A further aim of the new opening mechanism is to permit opening of the cable locking elastic element without having to pull or push in any way.

[0025] A further aim of the new opening mechanism is to keep the cable locking elastic element open without having to exert any force, either traction, pressure or torsion.

[0026] These and other aims, direct and complementary, are achieved by the new plug connector for flexible and rigid cables with rotary opening mechanism, com-

prising a cylindrical pin provided with a channel or groove with increasing diameter, on the surface of which the elastic element rests.

[0027] In particular said lateral channel or groove connects an area with minimum radius, roughly half of the radius of the cylindrical pin, to the lateral surface of the cylindrical pin on a perpendicular plane to the axis of the cylindrical pin.

[0028] Said cylindrical pin is housed in the socket, plug or similar beside the cable locking elastic element, so that its lateral groove or channel adheres to the corner between the mobile side and the flexible side of the elastic element.

[0029] To bend the elastic element, simply insert a screwdriver into the upper slot of the cylindrical pin and rotate it so that the part of the lateral groove or channel with the largest radius rests on the corner of the cable locking elastic element, opening the window or rectangular hole of the elastic element.

[0030] The characteristics of the new plug connector for flexible or rigid cables with rotary opening mechanism will be better illustrated by the following description with reference to the drawings attached as a non-restrictive example.

[0031] Figures 1 and 2 show, respectively, a lateral view and a horizontal section of a contact (C) of the related elastic element (E) for locking the cable and of the cylindrical pin (A) of the new opening mechanism.

[0032] Figure 3 shows a section of a connector, in this example a socket connector, showing a contact (C) with the related plate (C1), an elastic element (E) for locking the cable and a cylindrical pin (A) of the new opening mechanism.

[0033] The contact (C) comprises a plate (C1) joining it to the cable.

[0034] The elastic element (E) consists of a metal lamina roughly triangular-shaped, generally a right-angled triangle, one side of which, called adhesion side (E1), has a narrower end (E11), a second side, called mobile side or side moving at right angles (E2) featuring a window (E21) or rectangular hole, and a third side (E3), called flexion side, shaped to permit the movement of said mobile side (E2).

[0035] The elastic element (E) is joined to the plate (C1) of the electrical contact (C) so that the adhesion part (E1) of the elastic element (E) adheres to the plate (C1) of the electrical contact (C) and so that the narrower end (E11) and the end of the plate (C1) of the electrical contact are housed in the window or hole (E21) of the mobile wall (E2) of the elastic element (E).

[0036] The cylindrical pin (A) of the new opening mechanism has a generally cylindrical shape, features a groove or channel (A1) on the lateral surface and is provided at the top with a slot (A2).

[0037] The upper slot (A2) is designed to receive the tip of a screwdriver thus permitting the rotation of said cylindrical pin (A).

[0038] The lateral groove or channel (A1) of the cylindrical pin (A) has a roughly spiral portion shaped section, connecting a portion near the axis of the cylindrical pin (A) to the lateral surface of the cylindrical pin (A) on a plane perpendicular to the axis of the cylindrical pin (A).

[0039] The cylindrical pin (A) is housed in the socket or plug so that its channel or groove (A1) rests on the corner of the elastic element (E) common to the mobile side (E2) and the flexion side (E3).

[0040] Said cylindrical pin (A) and/or its housing in the socket or plug can be provided with stop or stroke end elements designed to limit rotation of the cylindrical pin (A).

[0041] By inserting a screwdriver into the slot (A2) of the cylindrical pin and rotating it, the portion of channel or groove (A1) in contact with the elastic element (E) gradually decreases in depth, pushing said corner of the elastic element (E). Consequently the mobile side (E2) of the elastic element (E) is moved towards the plate (C1) of the electrical contact (C), permitting insertion of the cable in the window or rectangular hole (E21).

[0042] The new opening mechanism for flexible devices (E) for locking cables on the electrical contacts of plugs, sockets and similar produced as described above has considerable advantages.

[0043] To open the elastic locking element (E), i.e. move its mobile side (E2), simply rotate the cylindrical pin (A) by means of a screwdriver.

[0044] It is not necessary to push or pull in any way to insert the cable into the window or rectangular hole (E21) of the elastic element (E).

[0045] By adequately rotating the cylindrical pin (A) of the new opening mechanism, i.e. by bringing the outer cylindrical surface of said cylindrical pin (A) into contact with the elastic element (E), the window or circular hole (E21) of the elastic element (E) remains open, permitting insertion, removal, or repositioning of the cable with the greatest of ease. Subsequent rotation of the cylindrical pin (A) of the new opening mechanism in the opposite direction enables the elastic element (E) to return to the normal position in which it presses the cable on the wall (C1) of the electrical contact (C).

[0046] The opening mechanism of the elastic element (E) is accessible, even though located in depth and with other parts of the plug or socket around it and/or a protective edge.

[0047] With reference to the preceding description and the attached drawing the following claims are therefore made.

Claims

1. Plug/socket connector for flexible and rigid cables, comprising elastic elements (E) consisting of a roughly triangular-shaped metal lamina, with the first adhesion side (E1) having a narrower end (E11), the second mobile side, moving at right an-

gles to it (E2), featuring a window (E21) or rectangular hole, and a third flexion side (E3), and where said elastic element (E) is joined to a plate (C1) of an electrical contact (C) so that the adhesion part (E1) of the elastic element (E) adheres to the plate (C1) of the electrical contact (C) and so that the narrower end (E11) and/or the end of the plate (C1) of the electrical contact are housed in the window or hole (E21) of the second side (E2) of the elastic element (E), **characterised in that** it comprises a cylindrical pin (A) designed to rotate, having, on its lateral surface, a groove or channel (A1) and provided at the top with a slot (A2) designed to receive the tip of a screwdriver, and where said groove or lateral channel (A1) of the cylindrical pin (A) has a roughly spiral portion shaped section, connecting a portion near the axis of the cylindrical pin (A) to the lateral surface of the cylindrical pin (A) on a plane perpendicular to the axis of the cylindrical pin (A).

2. Plug/socket connector for flexible and rigid cables, as in claim 1, **characterised in that** said cylindrical pin (A) is housed in the socket or plug so that its channel or groove (A1) rests on the corner and/or on the connection side (E3) of the elastic element (E) and where, due to rotation of the cylindrical pin (A), the portion of channel or groove (A1) in contact with the elastic element (E) gradually decreases in depth, pushing said corner of the elastic element (E).
3. Connector, as in claim 1, **characterised in that** said cylindrical pin (A) is housed in the socket or pin so that its rotation causes compression of the elastic element (E), thus opening its window (E21).
4. Connector, as in claims 1, 2, **characterised in that** said cylindrical pin (A) and/or its housing in the socket or plug feature stop or stroke end elements designed to limit rotation of the cylindrical pin (A).

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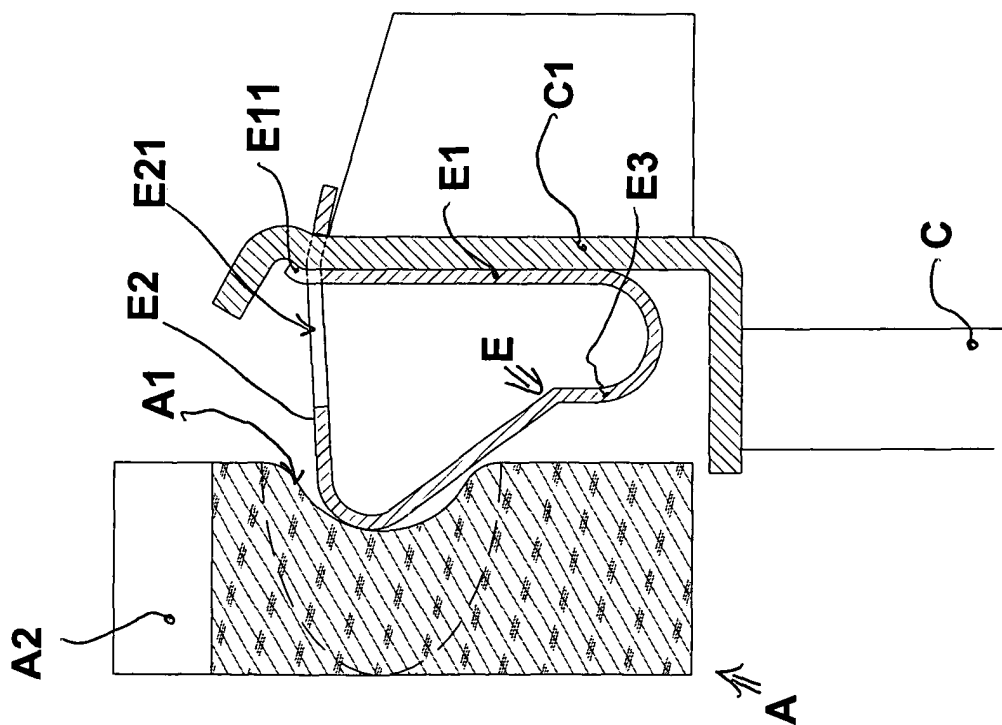


Fig. 1

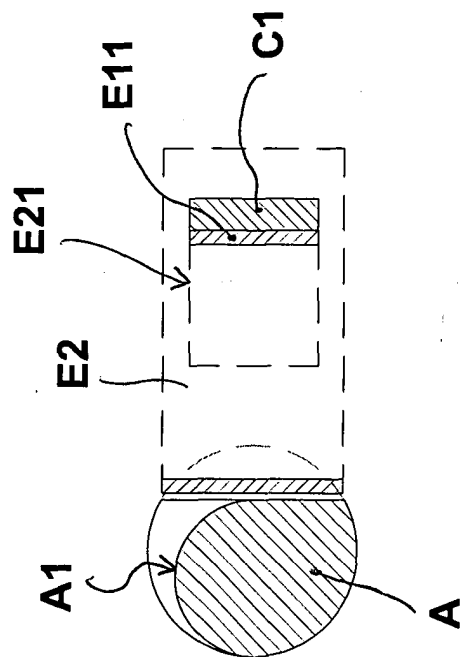


Fig. 2

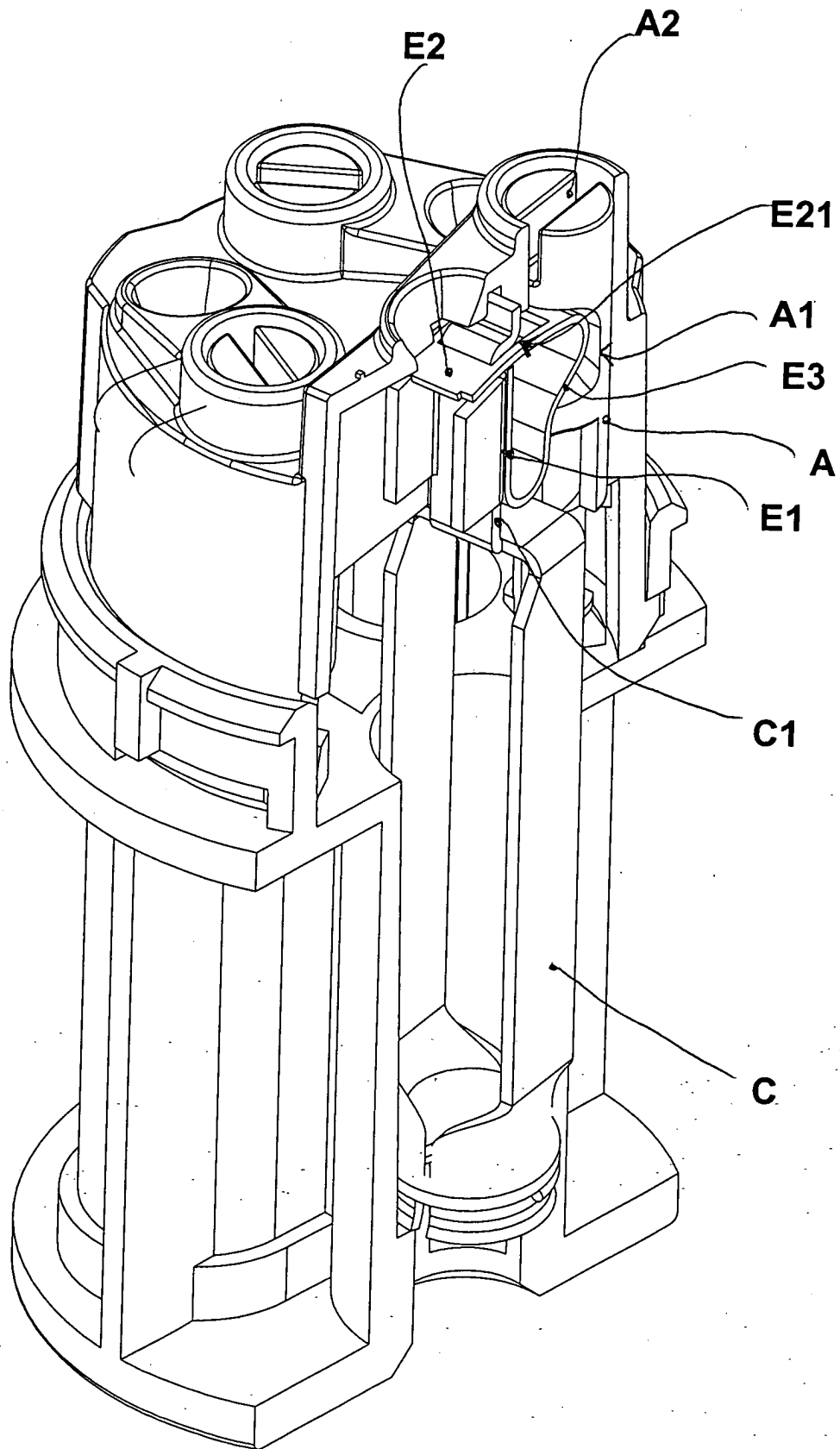


Fig. 3