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(54) **A CONDUCTOR TERMINAL WITH OPERATING HANDLE**

(57) The present invention relates to a terminal with operating handle.

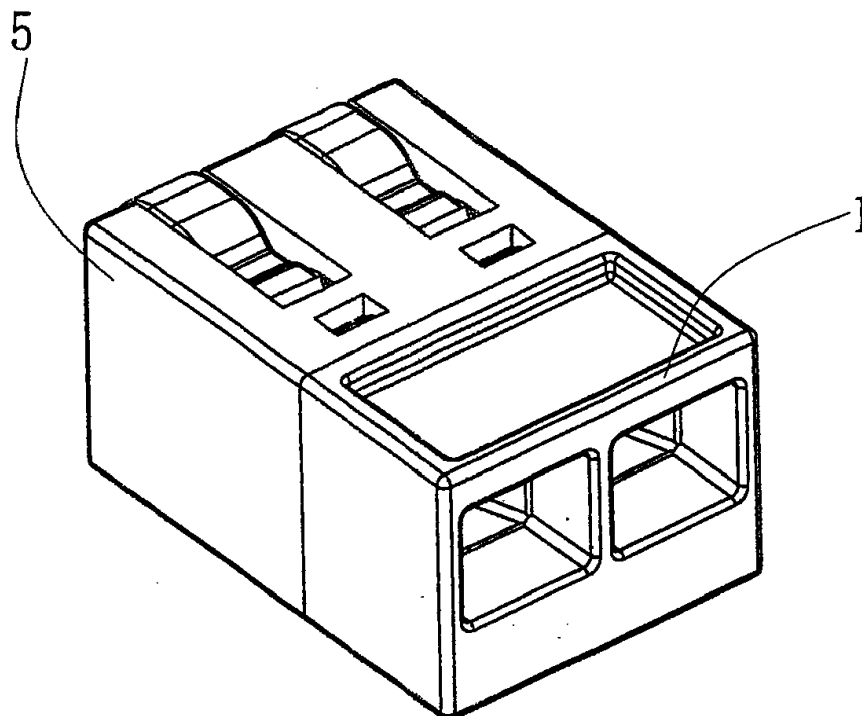


Figure 1

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Description

Technical Field

[0001] The present invention relates to a connector used in electrical industry, particularly the terminal that may open the connecting port by using its built-in operating handle to achieve fast connection and disconnection.

Technological Background

[0002] Conductor terminals are widely used in all kinds of electrical connections. In existing technology, most of the terminals are comprised of insulating material housing, electric conductor, line presser, and screws. And the line presser and screws are joined by thread. The wire is pressed onto the electric conductor with the screw and the line presser to achieve the connection between the wire and the electric conductor. This kind of wire connecting structure requires the use of screwdriver to tighten or loosen the screw to complete the connection or disconnection, which is labor consuming and inefficient. In actual application, screw slippage and damage to the screw notch may happen due to improper operating force, and therefore impair the repeated use of the product. Under vibrating environment, screwed connection may become loose and result in wire connection failure or connection signal interruption. Other terminals may be comprised of the electric conductor and cage spring. In comparison to screw-connected terminals, this kind of terminal features easier wire connection. However during the production process, the cage spring needs to be mounted with the conducting strip in advance, which result in assembling inefficiency and higher labor cost. During wire connection or wire withdrawal, screwdriver is required to open the connection port of the cage spring to insert and remove the wire.

Summary of the Invention

[0003] The purpose of the present invention is to come up with a kind of terminal with an operating handle to achieve fast wire connection and wire withdrawal and convenient maintenance without using any additional tool.

[0004] To overcome the practical technological difficulties and achieve the purpose of the present invention, following technical proposals have been adopted:

The said terminal with operating handle has 2-hole, 3-hole, and 5-hole specifications available, which include one insulating material housing, one electric current carrier, one shrapnel, one insulating cover, and two or three or five operating handles (with 2-hole, 3-hole, and 5-hole available); the front of the insulating material housing is provided with incoming hole for inserting the wire; the bottom of the insulating

material housing is provided with a round current detection hole for the introduction of detection probe; the back of the insulating material housing is provided with the current carrier guide slot and shrapnel guide slot, and inside the shrapnel guide slot is the shrapnel limit. At the back of the insulating material housing is the square flange. Both sides of the flange have a undercut structure. Through the undercut on the flange, the insulating material housing and the insulating cover join the square undercut hole on the insulating cover and achieves the combined connection of the insulating material housing and the insulating cover. The insulating material housing has 2-hole, 3-hole, and 5-hole specifications available. The current carrier is fixed inside the insulating material housing. The wire incoming end of the current carrier is designed with a chamfer to guide the wire insertion; both sides of the installation end of the current carrier have been designed with an chamfer to guide the insertion of the current carrier into the guide slot of the insulating material housing; the bottom of the current carrier is designed with barbs to prevent slippage of wire during the connection. The top of the spring has been provided with a pressing line right-angle cut portion to prevent the wire slippage during connection; both sides on top of the spring have a bended arc surface; when rotating the handle, by pressing down on the bended arc on both sides of the spring with the resisting arm, the bended arc activates and brings the upper arm of the spring to sway, the pressing line right-angle cut portion on top of the spring separates from the bottom of the current carrier and opens the connecting port. The operating handle is installed inside the semi-circle guide slot of the insulating cover. Both sides of the operating handle have been provided with a round rotating shaft; the operating handle has both a power arm and a resisting arm. Under the external force, the power arm brings the handle to rotate around the axis of the rotating shaft, and the resisting arm rotate around the axis and press down on the spring; the operating handle has a rotation limit to limit the rotating angle of the handle. Both sides of the joint of the insulating cover and the insulating material housing have been provided with square holes, which are locked with the under cut on the insulating material housing. Inside the cavity of the insulating cover there is a semi-circle limiting surface to facilitate the installation of the operating handle rotating shaft and limit the rotation; a square column protruding from the bottom of the cavity of the insulating cover; the square column is used to press tightly against the spring and fix the spring inside the insulating material housing; the top part of the cavity of the insulating cover is provided with current carrier limit to limit the back-and-forth movement of the current carrier; the top part of the insulating cover is provided with a handle rotation limit to control the rotating angle of

the operating handle; the insulating cover has 2-hole, 3-hole, and 5-hole available.

[0005] A wire incoming hole has been provided on the front of the said insulating material housing and flanges at the back on four sides. Under cuts have been provided on the bottom and top flanges.

[0006] A current detection hole has been provided at the bottom of the insulating material housing to detect the line after wire connection.

[0007] A current carrier mounting guide slot has been provided inside the cavity of the said insulating material housing for fixing and controlling the current carrier.

[0008] A spring mounting guide slot has been provided in the cavity of the said insulating material housing for fixing and limiting the spring.

[0009] A guide chamfer has been provided on the top and bottom surface of the said current carrier for introducing the wire.

[0010] An anti-slip barb has been provided at the bottom of the said current carrier to prevent the wire from slipping.

[0011] A right-angle cut portion has been provided at the top of the said spring to increase the clamping force and friction of the wire.

[0012] A bended arc has been provided at the top of the said spring for taking the force of the handle and bringing the spring to elastic compression.

[0013] A round rotating axis has been provided to the said operating handle for locating the center of the rotating action of the handle.

[0014] Power arm and resisting arm have been provided to the said operating handle, and there is an 180° angle between the said power arm and the resisting arm.

[0015] A rotating limit has been provided to the said operating handle for controlling the rotating angle of the handle.

[0016] A square hole has been provided on the top and bottom of the said insulating cover for matching and locking with the under cut of the insulating material housing.

[0017] A semi-circle limiting surface has been provided inside the cavity of the said insulating cover for installing, matching, and controlling the rotation of the round rotating axis of the operating handle.

[0018] A limit has been provided at the top of the cavity of the said insulating cover for controlling the back-and-forth movement of the current carrier after installation.

[0019] A square column protruding from the bottom of the cavity of the insulating cover is used for pressing tightly against the spring after installation.

[0020] After assembling the said current carrier and the spring, the angle on the insertion surface of the wire shall be smaller than 50°.

[0021] The terminal of the present invention doesn't require any additional tool. It may achieve the connection of both a single hard wire and multiple soft wires. For connection of single hard wire, there is no need to pull the operating handle. Simply remove the insulating ma-

terial of the wire and insert into the inlet hole to complete the connection. To connect multiple soft wires, simply pull the handle till it is 90° to the horizontal direction of the incoming wire, the operating handle will automatically lock, and insert the multiple soft wire without the insulating material into the inlet hole, and pull the operating handle back to the position that is horizontal to the wire incoming direction to complete the connection. If it becomes necessary to release and disconnect the wire, pull the operating handle from horizontal direction till it is 90° to the horizontal incoming surface and pull out the wire to disconnect. Compared to traditional terminals, the present invention doesn't require any additional tools. Particularly the direct insertion of the single hard wire ensures outstanding connection efficiency, easy connection, and high effectiveness.

Description of the Drawings

[0022]

Figure 1: Perspective view of a terminal according to a preferred embodiment of the present invention

Figure 2: Sectional view of the terminal of Figure 1

Figure 3: Mounting and dismounting diagram of the terminal of Figure 1

Figure 4: Perspective view of components of the terminal of Figure 1

Figure 5: Perspective view of the electric current carrier of Fig. 3

Figure 6: Perspective view of the spring of Fig. 3

Figure 7: Perspective view of the operating handle of Fig. 3

Figure 8: Perspective view of the insulating cover of Fig. 3

Figure 9: Schematic drawing illustrating the operation of the terminal of Fig. 1

Description of the Preferred Embodiments

[0023] Following embodiments regarding the present invention have been given in accordance with the instructional drawings. Embodiment is a type of execution of the present invention. The scope of protection of the present invention shall not be restricted by the embodiments.

[0024] Embodiment: this embodiment illustrates a type of terminal with operating handle. It is comprised of insulating material housing (1), electric current carrier (2), spring (3), operating handle (4), and insulating cover (5). The front of the said insulating material housing (1) is provided with incoming hole (11), which may be 2, or 3 or 5 for inserting the wire; the bottom of the insulating material housing is provided with a round current detection hole (15) for detecting the current during wire connection; the back of the insulating material housing has been provided with matching flange (17) on all four sides for inserting into the cavity of the insulating cover; under

cut (12) has been provided on the outside of the upper and lower matching flanges to match and lock with the square hole (54) of the insulating cover. The said current carrier (2) is fixed inside the insulating material housing (1) for the electric connection of the wire; the concave face (23) of the current carrier matches with the face of the limiting boss (52) of the insulating cover (5); the bottom of the protruding portion (21) has elastic contact with the right-angle section (32) on top of the spring (3); guide chamfer (26) has been provided on the left and right side along the assembly direction of the current carrier (2); guiding chamfer (25) has been provided on the top and bottom for wire insertion; and barb (24) has been provided at the bottom to increase the withdrawing resistance of the wire to prevent the wire from becoming loose; the said spring (3) is installed inside the insulating material housing (1); the arc surface (33) fits with the arc surface (14) inside the cavity; the top right-angle section (32) encourages elastic contact with the bottom of the protruding structure (21) of the current carrier (2); a linking structure (35) has been provided between the two shrapnels of the spring (3); the surface of the linking structure (35) matches with the face of the spring limiting structure (16) of the insulating material housing (1); the inside of the arc surface (33) matches with the arc surface on the front end of the protruding square column (51) of the insulating cover; the said operating handle has a power arm (41) and resisting arm (43), which form an angle of 180 degrees. The power arm has been provided with limiting face (42); when the power arm (41) of the handle is pulled to a 90-degree angle with the incoming wire, the limiting surface (42) fits with the limiting surface (56) of the insulating cover (5), and the round rotating axis (44) fits with the limiting surface (53) of the semi-circle handle assembly inside the cavity of the insulating material housing (5); the power arm (41) is provided with a guide slot (45) at the bottom for matching with the protruding locating block (55) of the insulating cover (5) and preventing the operating handle from falling off after assembly; the said insulating cover (5) has a protruding square column (51), current carrier limiting boss (52), semi-circle handle assembly limiting surface (53), square hole for the under cut (54), protruding locating block (55), and power arm limiting surface (56).

[0025] During wire connection, when the hard wire is inserted from the wiring hole (11), the free end (34) of the shrapnel (3) produces elastic compression when pressed by the wire surface, the top part (32) of the spring always maintains elastic contact with the surface of the wire; the wire stops when inserted onto the end surface of the terminal cavity; the spring (3) makes use of the compressed elasticity to press the wire tightly against the sharp tip of the anti-slip barb (24) of the current carrier (2); to connect multiple soft wires, pull the operating handle (4) till it is perpendicular to the wiring direction; the bended arc surface at the top of the spring (3), when pressed by the resisting arm of the operating handle (4), produces elastic distortion; the top cut section of the

spring (3) separates from the bottom of the current carrier (2) and forms an open wire-inlet channel to help insert multiple soft wires into the cavity end of the insulating terminal and stops; pull the operating handle till it is horizontal to the wire-incoming direction; the pressed spring (3), with its own elasticity, suppresses the wire onto the surface of the current carrier (2); the top and bottom surface of the wire maintain elastic contact with the current carrier (2) and the spring (3) respectively.

[0026] When the wire imports electric current, the electric current is introduced into the current carrier (2) through the contact surface. The electric current inside the current carrier (2) is then again taken to another wire inside the wiring port through the contact surface of the wire inside the other wiring port. To disconnect and remove the wire, simply pull the operating handle till it is perpendicular to the wire-inlet direction and pull out the wire.

[0027] The present invention has solved the problems of requiring additional tools and inefficiency to connect and withdraw the wires faced by traditional terminals. The wire connecting and withdrawing efficiency of the present invention is 8-10 times that of the screw type terminals. A current detection hole has been reserved on the insulating material housing for line detection without needing to withdraw the wire, which ensures higher safety and convenience. The rotary operating handle also guarantees easy operation and high efficiency

Claims

1. A terminal with operating handle, said terminal comprising an insulating material housing, an electric current carrier, a spring, at least two operating handles, and an insulating cover, wherein the insulating housing comprises at least two connection holes and a current detection hole, wherein the electric current carrier and the spring are placed inside the insulating housing, wherein the operating handle is placed inside the insulating cover, and the insulating housing is plugged into and locked with the insulating cover through a square flange and a backoff.
2. The terminal with operating handle as claimed in claim 1, wherein the connection hole, a current carrier mounting groove, a spring mounting groove, the square flange, the backoff, and the current detection hole are provided on the insulating material housing.
3. The terminal with operating handle as claimed in claim 1, wherein the terminal can be of 2-connection hole, 3-connection hole, or 5-connection hole.
4. The terminal with operating handle as claimed in claim 1, wherein the angle between the current carrier and the line-pressing surface of the spring is less than 50°.

5. The terminal with operating handle as claimed in claim 1, wherein the connecting structure of the current carrier and the spring achieves direct insertion of single hard wire and the insertion of multiple soft wires after opening the connection port by pulling the operating handle. 5
6. For the said terminal with operating handle as claimed in claim 1, wherein the pulling the operating handle may release the connected wire to facilitate easy disconnection during maintenance. 10

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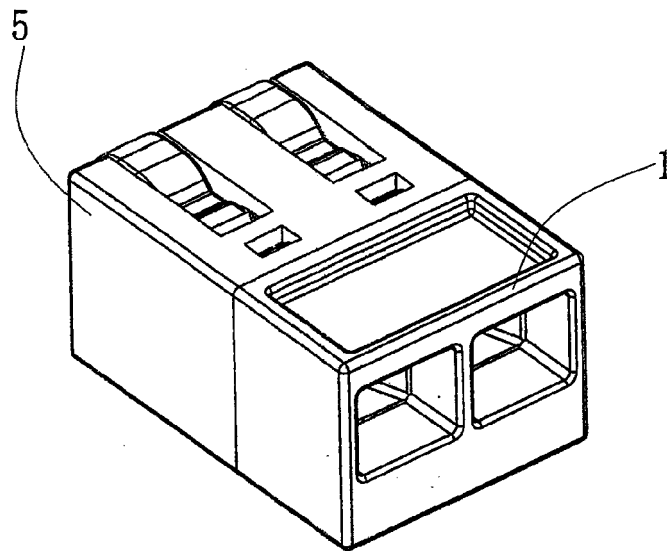


Figure 1

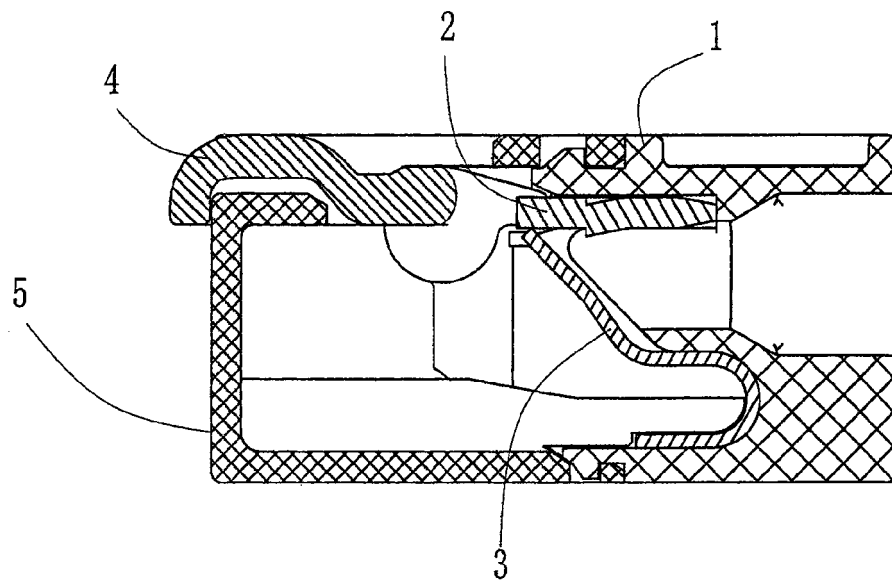


Figure 2

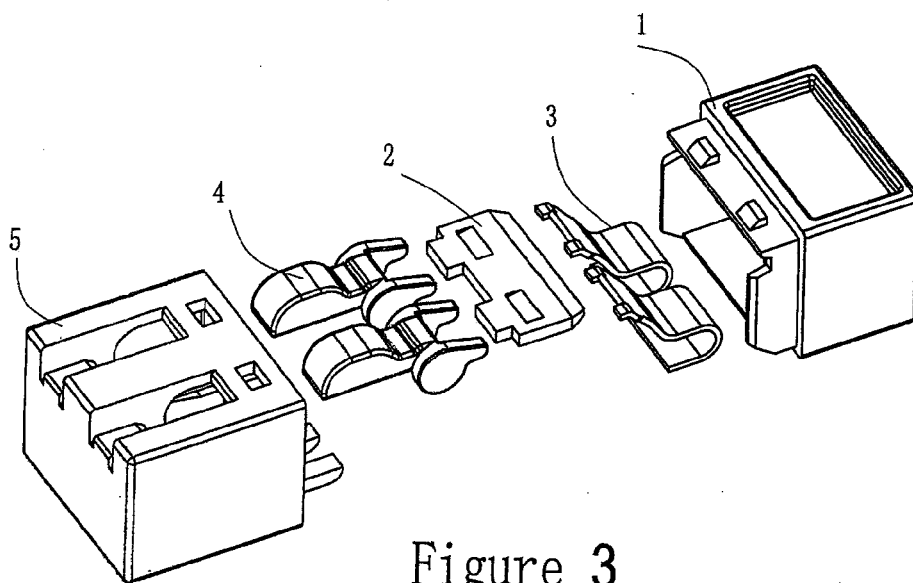


Figure 3

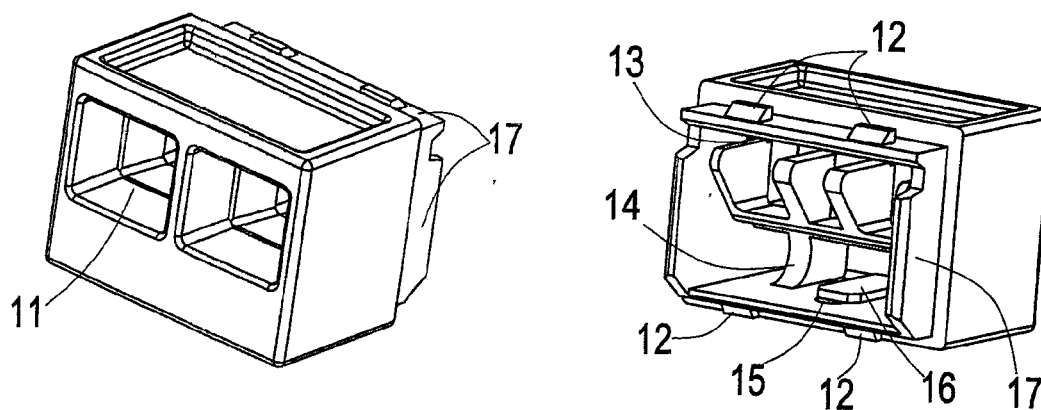


Figure 4

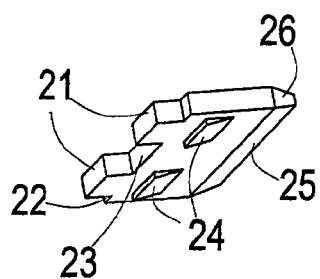


Figure 5

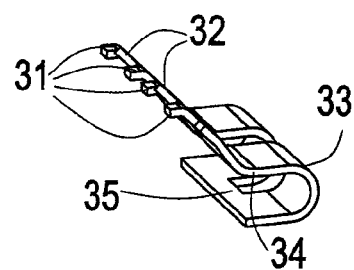


Figure 6

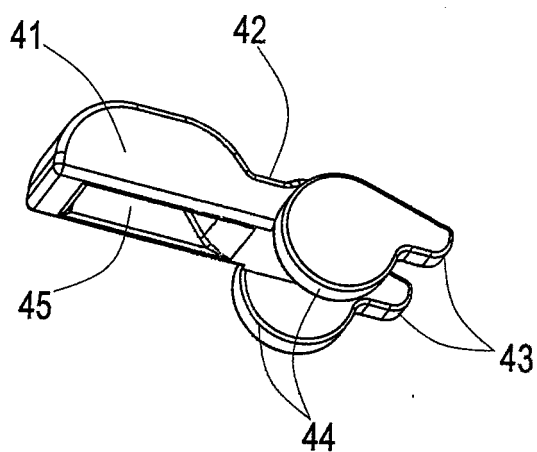


Figure 7

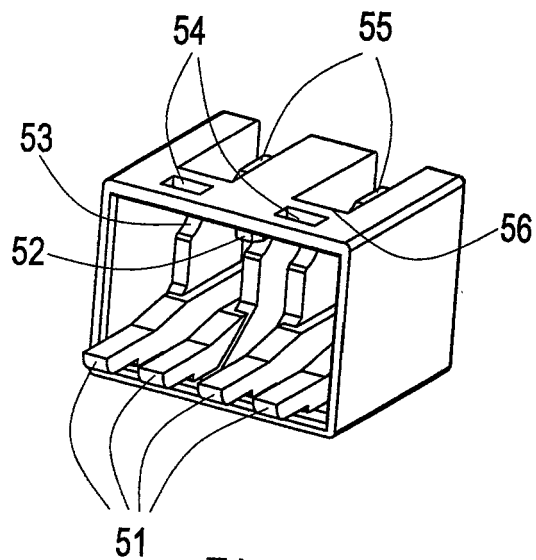


Figure 8

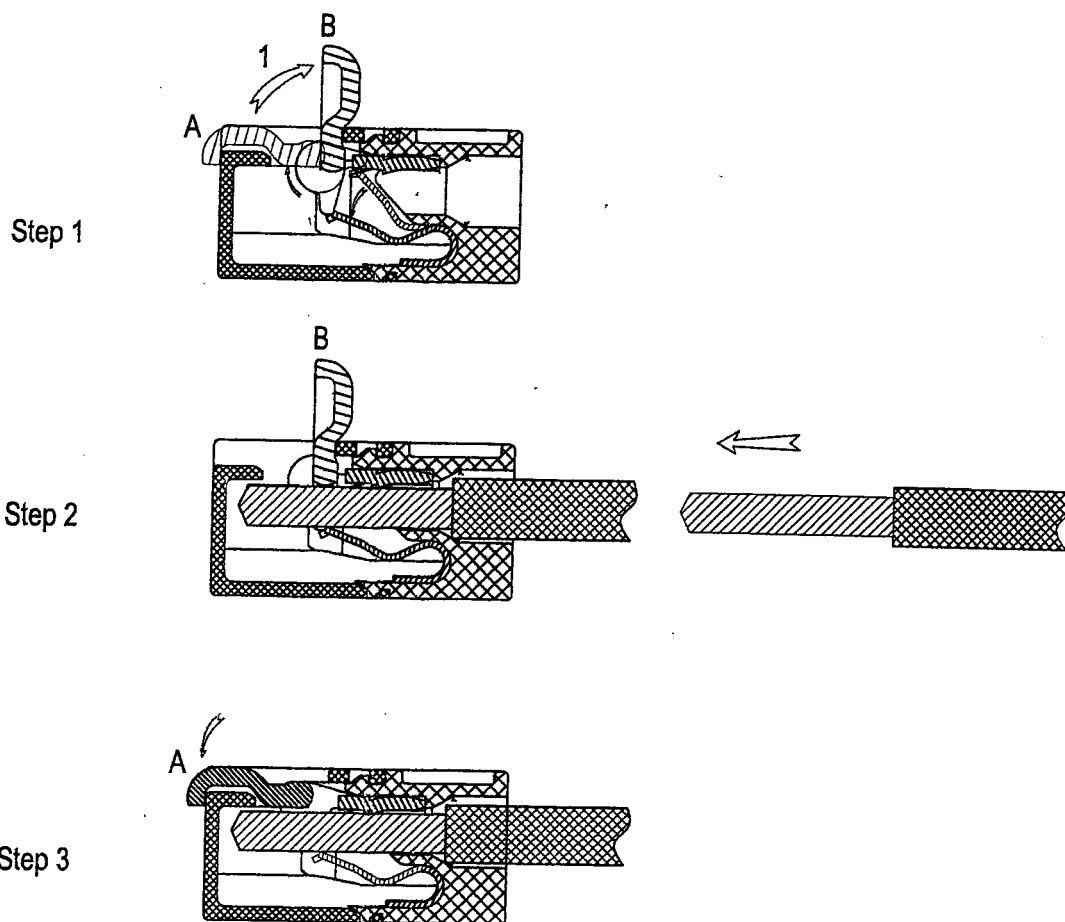


Figure 9



EUROPEAN SEARCH REPORT

Application Number
EP 16 18 2048

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 November 2016	Examiner Pugliese, Sandro
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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