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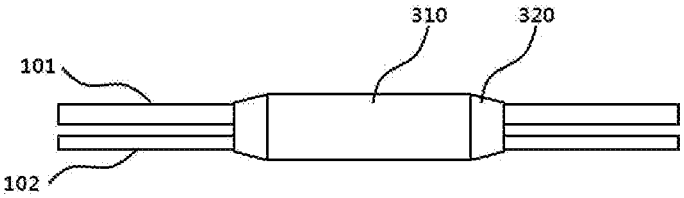
(54) Title of the invention: **Cable connection device and method**

(57) Abstract
The present invention pertains to a cable connection device and method, comprising a plurality of cables having at least two different thicknesses, a conductive portion for crimping and sealing covered cable core portions, and a sealing portion for sealing the core area of the cables.

Representative drawing - Fig. 1



Claims

Claim 1

A cable connection device comprising: a plurality of cables including a cable core portion that transmits power and includes 2 to 20 wires, and an insulation portion surrounding the cable core portion, wherein the cables have at least two different thicknesses; a conductive portion positioned in an overlapped area of exposed cable core portions for cable connection, surrounding the outside of the core portions and crimping them to connect the cable core portions; and a sealing portion comprising a sealing body that seals the exposed core portions and an extension body extending from the sealing body, wherein the sealing portion is formed to a size of 2 to 4 times the exposed core portions for cable connection, wherein the resistance of the conductive portion is lower than the resistance of the core portions, wherein the wires of the core portions are arranged in a staggered manner and then crimped, wherein when two cables of a first thickness and two cables of a second thickness are connected in a cross configuration, the horizontal length of the sealing body is 30 to 70 mm, the vertical length is 10 to 40 mm, and the height is 5 to 20 mm, and the horizontal length of the extension body is 5 to 15 mm, wherein in a Y-shaped connection where cables of the first thickness and cables of the second thickness are positioned on one side and another cable of the first thickness is positioned on the right side, the sealing body of the sealing portion comprises a wide plate-shaped body where two cables are positioned and a narrow plate-shaped body where one cable is positioned, the horizontal length of the sealing body is 50 to 70 mm, the vertical length is 10 to 30 mm, and the height is 5 to 17 mm, the vertical length of the narrow plate-shaped body is 5 to 20 mm, and the horizontal length of the extension body is 5 to 15 mm, and wherein in a T-shaped connection where two cables of the first thickness extend horizontally and a cable of the second thickness extends perpendicular thereto, the sealing portion comprises an upper area sealing body that seals the cables of the first thickness and a sealing body that seals the cable of the second thickness, the horizontal length of the upper area sealing body is 50 to 70 mm, the vertical length is 5 to 15 mm, and the height is 5 to 17 mm, and the horizontal length of the sealing body that seals the cable of the second thickness is 25 to 45 mm, the vertical length is 5 to 15 mm, and the height is 5 to 17 mm.

Claim 2

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Claim 3

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Claim 4

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Claim 5

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Claim 6

A cable connection method using a cable connection device comprising a plurality of cables including a cable core portion that transmits power and includes 2 to 20 wires, and an insulation portion surrounding the cable core portion, wherein the cables have at least two different thicknesses, a conductive portion positioned in an overlapped area of exposed cable core portions for cable connection, surrounding the outside of the core portions and crimping them to connect the cable core portions, and a sealing portion comprising a sealing body that seals the exposed core portions and an extension body extending from the sealing body, wherein the sealing portion is formed to a size of 2 to 4 times the exposed core portions for cable connection, wherein the resistance of the conductive portion is lower than the resistance of the core portions, and the wires of the core portions are arranged in a staggered manner and then crimped, the method comprising: cutting the insulation portion at one end of a photovoltaic cable to expose the wires of the core portion; arranging the cables in cross, Y-shaped, or T-shaped configurations and arranging the wires of the exposed core portions in a staggered manner; crimping the core portions with the wires arranged in a staggered manner with a conductive portion having lower resistance than the core portions; and sealing the core portions and the conductive portion through a sealing process, wherein when two cables of a first thickness and two cables of a second thickness are connected in a cross configuration, the horizontal length of the sealing body is 30 to 70 mm, the vertical length is 10 to 40 mm, and the height is 5 to 20 mm, and the horizontal length of the extension body is 5 to 15 mm, wherein in a Y-shaped connection where cables of the first thickness and cables of the second thickness are positioned on one side and another cable of the first thickness is positioned on the right side, the sealing body of the sealing portion comprises a wide plate-shaped body where two cables are positioned and a narrow plate-shaped body where one cable is positioned, the horizontal length of the sealing body is 50 to 70 mm, the vertical length is 10 to 30 mm, and the height is 5 to 17 mm, the vertical length of the narrow plate-shaped body is 5 to 20 mm, and the horizontal length of the extension body is 5 to 15 mm, and wherein in a T-shaped connection where two cables of the first thickness extend horizontally and a cable of the second thickness extends perpendicular thereto, the sealing portion comprises an upper area sealing body that seals the cables of the first thickness and a sealing body that seals the cable of the second thickness, the horizontal length of the upper area sealing body is 50 to 70 mm, the vertical length is 5 to 15 mm, and the height is 5 to 17 mm, and the horizontal length of the sealing body that seals the cable of the second thickness is 25 to 45 mm, the vertical length is 5 to 15 mm, and the height is 5 to 17 mm.

Specification

Technical Field

[0001] The present invention pertains to a cable connection device and method, and more particularly to a cable connection device and method for cables that transmit power, such as power generated by photovoltaic modules.

Background Art

[0002] Generally, cables used for photovoltaic power generation serve to transmit power generated from photovoltaic modules to storage devices or loads. Photovoltaic modules are located in external spaces where sunlight is well exposed. Therefore, photovoltaic cables are also located outdoors and are exposed to harsh external environments for long periods, that is, at least 10 years or more. Photovoltaic cables are manufactured under conditions that can withstand harsh external environments.

[0003] However, since photovoltaic cables are of various types and are installed in various spaces, when connecting them, cables are cut and joined, which causes problems such as corrosion in these connection sections.

Prior Art Documents

Patent Documents

[0004] (Patent Document 0001) (Patent Document 1) Korean Registered Patent No. 10-1160636
(Patent Document 0002) (Patent Document 2) Korean Registered Patent No. 10-1092148
(Patent Document 0003) (Patent Document 3) Korean Registered Patent No. 10-1160637
(Patent Document 0004) (Patent Document 4) Korean Registered Patent No. 10-1219846

Summary of the Invention

Problem to be Solved

[0005] The present invention has been devised to solve the above-mentioned problems, and provides a cable connection device and method that can seal cable connection portions so that they have no problems even in external environments, can suppress resistance increase at connection portions, and can connect cables of different thicknesses in various ways.

Solution to the Problem

[0006] The present invention provides a cable connection device comprising a plurality of cables having at least two different thicknesses, a conductive portion for crimping and sealing covered cable core portions, and a sealing portion for sealing the core area of the cables.

[0007] The cable includes a cable core portion that transmits power and an insulation portion surrounding the cable core portion, and the conductive portion is positioned in an overlapped area of exposed cable core portions for cable connection, surrounds the outside of the core portions and crimps them to connect the cable core portions.

[0008] The resistance of the conductive portion is lower than the resistance of the core portions, and the core portions are stacked and then surrounded by the conductive portion, or the wires of the core portions are arranged in a staggered manner and then surrounded.

[0009] The sealing portion comprises a sealing body that seals the exposed core portions and an extension body extending from the sealing body, wherein the sealing portion is effectively formed to a size of 2 to 4 times the exposed core portions for connection.

[0010] The cables are connected in X-shaped, Y-shaped, or T-shaped configurations.

[0011] The present invention also provides a cable connection method comprising the steps of cutting the insulation portion at one end of a cable to expose the core portion, crimping the overlapped area of the core portions with a conductive portion, and sealing the core portions and the conductive portion through a sealing process.

Effects of the Invention

[0012] In this manner, the present invention can seal cable connection portions so that they have no problems even in external environments, can suppress resistance increase at connection portions, and can connect cables of different thicknesses in various ways.

Brief Description of the Drawings

[0013] Fig. 1 is a plan view of the cable connection device of the present invention.
Fig. 2 is a vertical cross-sectional view of a cable connection device according to an embodiment.
Fig. 3 is a horizontal cross-sectional view of a cable connection device according to an embodiment.
Fig. 4 is a plan view of a cable connection device according to another embodiment of the present invention.
Fig. 5 is a plan view of a cable connection device according to yet another embodiment of the present invention.
Figs. 6 to 9 are drawings for explaining a cable connection method according to an embodiment of the present invention.
Figs. 10 to 11 are drawings for explaining a connection method of core portions according to an embodiment of the present invention.
Detailed Description of the Invention

[0014] Hereinafter, embodiments of the present invention will be described in more detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments disclosed below but will be implemented in various different forms, and these embodiments are provided only to make the disclosure of the present invention complete and to fully inform those skilled in the art of the scope of the invention. The same reference numerals in the drawings refer to the same elements.

[0015] It should be clarified that the division of components in this specification is merely based on the main functions that each component is responsible for. That is, two or more components to be described below may be combined into one component, or one component may be divided into two or more components according to more subdivided functions. Each component described below may additionally perform some or all of the functions that other components are responsible for, in addition to its main function, and some of the main functions that each component is responsible for may of course be exclusively performed by other components. Therefore, the existence of each component described in this specification should be interpreted functionally. For this reason, it is clearly stated that the configuration of the cable connection device and methods of the present invention may differ within the scope of achieving the objectives of the present invention.

[0016] Fig. 1 is a plan view of the cable connection device of the present invention, Fig. 2 is a vertical cross-sectional view of a cable connection device according to an embodiment, and Fig. 3 is a horizontal cross-sectional view of a cable connection device according to an embodiment.

[0017] As shown in Figs. 1 to 3, the cable connection device according to this embodiment includes a plurality of cables (100) having at least two different thicknesses, a conductive portion (200) for crimping and sealing covered cable core portions (110), and a sealing portion (300) for sealing the core area of the cables (100).

[0018] The cables (100) include first cables (101) of a first thickness and second cables (102) of a second thickness. Of course, it is not limited thereto and may include cables of various thicknesses such as third thickness and fourth thickness.

[0019] The cables (100) are composed of cable core portions (110) that transmit power and insulation portions (120) that surround the cable core portions (110). The insulation portion (120) may be a single layer or may be formed of multiple layers. As mentioned earlier, since photovoltaic cables are installed outdoors for long periods of 10 years or more, it is effective to use insulation portions (120) composed of multiple layers.

[0020] It is effective for the core portion (110) to include multiple wires. At this time, it is effective for the number of wires to be within 2 to 20. Through this, the rigidity of the core portion (110) can be improved, and even if one wire is disconnected due to external impact, there will be no problem in power transmission because there are other wires.

[0021] The conductive portion (200) is positioned in the overlapped area of exposed cable core portions (110) for cable connection, surrounds the outside of the core portions (110) and crimps them to connect the cable core portions (110), thereby connecting the cables (100). It is effective to use copper

rings as such conductive portion (200). However, it is not limited thereto, and it is preferable to use metallic rings. It is possible to use gold, silver, tungsten, aluminum, etc., which have excellent electrical conductivity, as the conductive portion (200).

[0022] By surrounding the core portion (110) with copper rings used as the conductive portion (200) and bringing the core portion (110) and the conductive portion (200) into close contact through crimping, the resistance of the core portion (110) connection area can be minimized. That is, when only the core portions (110) are crimped, contact is made by close contact between the core portions (110), but by providing the conductive portion (200), the core portion (110) comes into close contact with the conductive portion (200), thereby forming a current path between the core portion (110) and the conductive portion (200), which reduces resistance by about 10 to 47% or less compared to connection of only the existing core portions (110). Moreover, it is effective to use a material in which the resistance of the conductive portion (200) is lower than the resistance of the core portion (110). Through this, the resistance value in the core portion (110) connection area can be lowered.

[0023] At this time, for coupling the core portions (110) and the conductive portion (200), it is possible to stack the core portions (110) and then surround them with the conductive portion (200). It is not limited thereto, and it is also possible to arrange the core portions (110) in a staggered manner and then surround this arranged area with the conductive portion (200).

[0024] The sealing portion (300) can strengthen the environmental adaptability of the connection area by sealing the core portion (110) area. That is, the sealing portion (300) can prevent the cable (100) connection area from becoming vulnerable to external environments. At this time, it is effective for the sealing portion (300) to be formed to a size of 2 to 4 times the exposed core portion (110) for connection. That is, it is effective for the sealing portion (300) to be formed in the left and right spaces based on the exposed core portion (110) by the length of the exposed core portion (110). That is, it is preferable for the sealing portion (300) to be formed to 3 times the size of the exposed core portion (110).

[0025] The sealing portion (300) comprises a sealing body (310) that seals the exposed core portion (110) and an extension body (320) extending from the sealing body (310). At this time, the sealing body (310) is manufactured in the form of a column having curves on both sides as shown in Fig. 2. The extension body (320) extends from both sides of the sealing body (310) toward the cable direction and is manufactured to enable the cable (100) to respond to bending or flexing. It is effective for the manufacturing year of the cable to be displayed on the sealing body (310) of the sealing portion (300). Through this, the replacement time of the cable can be known.

[0026] In this embodiment, when connecting two first cables (101) and two second cables (102) in a cross configuration, it is effective for the horizontal, vertical, and height values of the sealing body (310) of the sealing portion (300) to be 30 to 70 mm, 10 to 40 mm, and 5 to 20 mm, respectively. It is preferable for the horizontal length of the extension body (320) to be 5 to 15 mm. Of course, it is not limited thereto, and the length may vary according to the connection form of the cables (100). The reason for manufacturing within the above range is that it is effective for the size to be maintained within a certain range according to the exposed area of the core portion (110).

[0027] However, the cable connection device of this embodiment can have various structures according to the cable connection method.

[0028] Fig. 4 is a plan view of a cable connection device according to another embodiment of the present invention.

[0029] As shown in Fig. 4, the photovoltaic cable of this embodiment connects two first cables (101) of a first thickness and one second cable (102) of a second thickness. Of course, at this time, it is effective for the conductive portion (200) to be in close contact with the connection core area of the cables (100). At this time, the three cables (100) are arranged in a Y-shape. That is, one first cable (101) and one second cable (102) are positioned on the left side, and another first cable (101) is positioned on the right side. At this time, the body of the sealing portion (300) comprises a wide plate-shaped body where two cables are positioned and a narrow plate-shaped body where one cable (100) is positioned. At this time, it is effective for the horizontal length of the entire body of the sealing portion (300) to be 50 to 70 mm, and it is effective for the vertical length to be 10 to 30 mm. It is preferable for the height to be 5 to 17 mm. At this time, it is effective for the vertical length of the narrow plate-shaped body to be 5 to 20 mm. It is effective for the horizontal length of the extension body to be 5 to 15 mm.

[0030] Fig. 5 is a plan view of a cable connection device according to yet another embodiment of the present invention.

[0031] As shown in Fig. 5, the cable of this embodiment connects two first cables (101) of a first thickness and one second cable (102) of a second thickness. Of course, at this time, it is effective for the conductive portion (200) to be in close contact with the connection core area of the cables (100). At this time, the three cables (100) are arranged in a T-shape. That is, two first cables (101) extend horizontally, and one second cable (102) extends perpendicular to the first cables (101).

[0032] At this time, the sealing portion (300) is also manufactured in a T-shape. It is effective for the sealing portion body of the upper area that seals the first cables (101) to have a horizontal length of 50 to 70 mm and a vertical length of 5 to 15 mm. It is effective for the height to be 5 to 17 mm. Also, it is effective for the sealing portion body that seals the second cable (102) positioned perpendicular to the first cables (101) to have a horizontal length of 25 to 45 mm. It is effective for the lengths of other areas to be similar to the sealing portion body of the aforementioned upper area.

[0033] Below, the cable connection method of the above-described structure will be explained.

[0034] Figs. 6 to 9 are drawings for explaining a cable connection method according to an embodiment of the present invention. Figs. 10 to 11 are drawings for explaining a connection method of core portions according to an embodiment of the present invention.

[0035] As shown in Fig. 6, the insulation portion (120) at one end of the cable is cut to expose the core portion (110). At this time, it is effective to cover so that the core portion (110) is exposed by about 1 to 3 cm.

[0036] Next, as shown in Fig. 7, the core portions (110) of the cables (100) are overlapped. At this time, it is effective to overlap the core portions (110) vertically as in Fig. 10 or to overlap the core portions (110) so that they cross each other as in Fig. 11. Preferably, it is effective to overlap so that the wires within the core portions (110) cross each other as in Fig. 11.

[0037] Next, as shown in Fig. 8, the conductive portion (200) is placed in the overlapped area of the core portions (110), and the conductive portion (200) is crimped. At this time, it is possible for some of the wires within the core portion (110) to be fused to the conductive portion (200) by the crimping force.

[0038] Next, as shown in Fig. 9, the core portions (110) and the conductive portion (200) are sealed through a sealing process. At this time, it is effective to perform silicon sealing or sealing with synthetic resin. Through this, even if the cable is exposed to the external environment by the sealing portion (300), deterioration phenomena such as corrosion may not occur in the cable connection portion.

[0039] Also, by providing the conductive portion (200) as described above, it is possible to prevent the resistance from increasing at the connection portion of the cable (100).

[0040] The technical concept of the present invention described above has been specifically described in preferred embodiments, but it should be noted that the above embodiments are for explanation and not for limitation. Also, those skilled in the art of the present invention will understand that various embodiments are possible within the scope of the technical concept of the present invention.

Description of Reference Numerals

[0041] 100: Cable
110: Core portion
120: Insulation portion
200: Conductive portion
300: Sealing portion

Drawings

Fig. 1

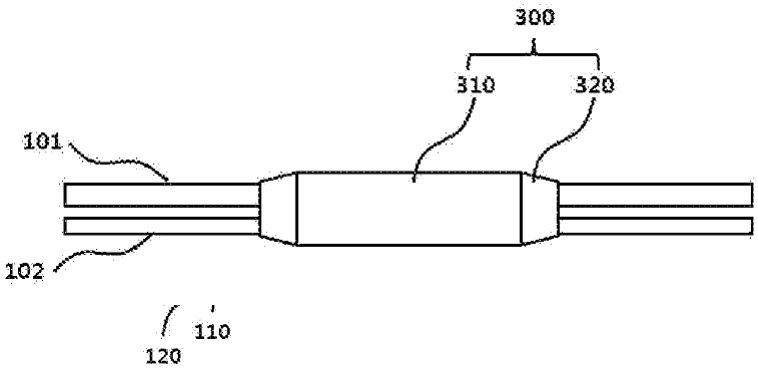
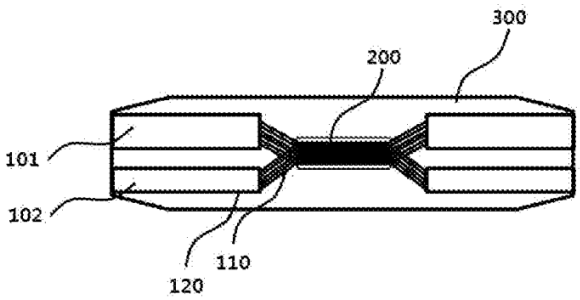


Fig. 2



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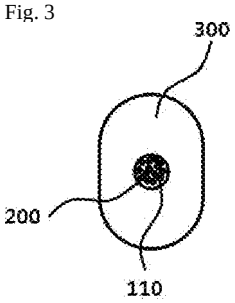

Fig. 4

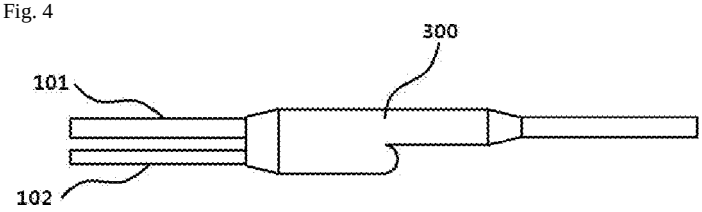

Fig. 5

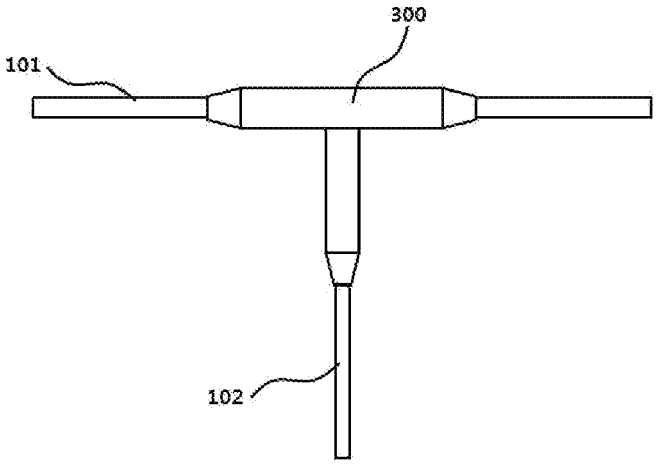

Fig. 6

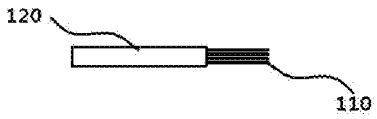

Fig. 7

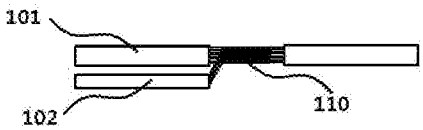

Fig. 8

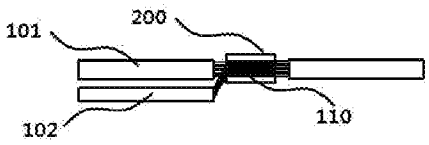

Fig. 9

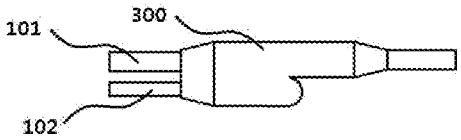

Fig. 10

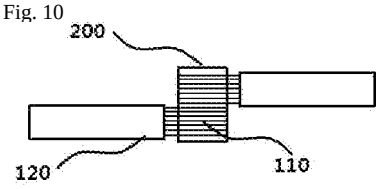

Fig. 11