

Contact device for a multiconductor cable

The invention relates to a contact device for a multiconductor cable, comprising a terminal support and a terminal cover to be placed on the upper surface of said terminal support, said terminal support and terminal cover being made of insulating material, said terminal support having recesses, each housing a terminal comprising a bifurcated insulation piercing contact, which extends from said terminal support upper surface towards said terminal cover, said terminal cover guiding insulated electrical conductors of said multicore cable across said bifurcated insulation piercing contacts.

Said contact device is known from the Dutch Patent Application 7 603 291. In this known device the insulated electrical conductors are passed through separate bores in the terminal cover, after which the ends are bent along the lower surface of said terminal cover and pushed between the tines of the insulation piercing contacts, located in the terminal support. The lower surface of the terminal cover comprises slots for accommodating the insulation piercing contacts, whereas transversely to each slot a deep groove is made for accommodating the bent end of the electrical conductor pressed between the tines of the insulation piercing contact.

Upon contacting a multicore cable to this contact device all conductors first have to be separated end then guided each through a respective bore in the terminal cover and then bent rectangulary at its end along the lower surface of the terminal cover, after which these bent portions are pushed between the tines of the corresponding insulation piercing contact upon sliding the cover over the insulation piercing contacts and lowering this cover upon the terminal support while pulling the ends of the conductors extending from their respective bores. Also first the bent ends of all separated conductors can be pushed between the tines and then all free conductors should be passed through corresponding holes in the terminal cover.

Using a multicore conductor to assemble such a contact device is time-consuming. All conductors have to be separated from each other prior to guiding each conductor through a hole in the cover. Therefore this contact device does not lend itself to automatic assembly processes. If one of the conductors has to be repaired or replaced, the terminal cover has to be removed, all conductors have to be removed too and then replaced, upon repositioning the terminal cover again. As a matter of course the remaining conductors may be damaged or torn apart in this repair process.

The above disadvantages are avoided in the contact device of the present invention which is characterized in that said terminal cover comprises recesses for accommodating each a

U-shaped portion of an insulated electrical conductor of said multicore cable, said recesses having their longitudinal direction in line with the guiding direction of said conductor and extending from the terminal cover upper surface towards the terminal cover lower surface opposing said terminal support upper surface, said terminal cover also comprising slots accommodating said bifurcated insulation piercing contacts each slot extending from the terminal cover lower surface upwardly and opening into a recess for said U-shaped conductor portion, the width direction of said slot extending transversely to the longitudinal direction of said recesses, such that after placing said terminal cover on top of said terminal support each bifurcated insulation piercing contact in the assembled contact device extends within said recess transversely to said recess longitudinal direction, each U-shaped conductor portion being pushed in a respective recess such that the bottom portion of said U-shaped conductor portion being pushed into the slot between the tines of the bifurcated insulation piercing contact in order to achieve electrical contact with the terminal, in which at both sides of said bifurcated insulation piercing contact sufficient space remains in said recess and said respective slot for allowing the tines to expand upon pushing said bottom portion between said tines.

The use of a supported, U-shaped bent conductor portion provides means for contacting the conductor with the insulation piercing contact without the need of first passing the conductor separately through a belonging hole in the terminal cover. This is achieved simply by pushing the conductor down in the recess of the cover and between the tines of the insulation piercing contact. The U-shape offers an excellent strain relief, which can be improved by additional pressing means. Repair or replacement of the conductors is very easy, since these conductors need not be passed separately through holes in the terminal cover.

Upon assembling the contact device of the present invention, first the terminal cover is lowered on the terminal support containing the inserted terminals. The insulation piercing contacts are first received by the slots in the terminal cover. The contacts thereafter emerge at the upper surface of the cover within a recess. Next the electrical conductors are placed on the upper surface of the terminal cover in the longitudinal direction across the recesses. Thereafter these conductors can be pushed successively and separately or simultaneously into the recess and between the tines of the insulation piercing contacts. This can be executed with separate tooling formed as a flat strip-shaped anvil, which can press the portion of a conductor stretching across the recess into this recess until in the slit between the two

tines. The insulation is cut by the sharp edges of the tines and the core is brought into contact with these sharp edges.

According to the present embodiment the pressing action on the terminals can be executed for all conductors simultaneously by means of a particular cable support, having a lower surface to be placed on the electrical conductor resting upon said terminal cover upper surface and having several conductor pushing anvils extending from said cable support lower surface towards said terminal cover upper surface, each anvil being of sufficient length such that upon lowering said cable support on said electrical conductors, each anvil pushing a conductor portion into each recess in said terminal cover and pushing the U-bottom portion of said electrical conductor into the slot between the tines of said bifurcated core piercing contact, each anvil being striplike and having a cross section the largest width extending in longitudinal direction of said recess and the smallest width being smaller than the width of said slot in said bifurcated piercing contact.

The contact device of the present invention is particularly suitable for automatically operating assembling means. In case a conductor has to be repaired or replaced only one conductor needs to be handled. With the exception of the cable support all remaining portions of the contact device can remain in position. The contact between each core and corresponding bifurcated insulation piercing contact is maintained, even when the cable support is removed. Bending each conductor several times for pushing it into the recess of the cover and between the tines of the insulation piercing contact results in a U-shaped bend in the conductor, which by its position in the terminal cover gives a strain relief. This strain relief can be improved by lowering the cable support, which is clamped on the upper surface of the terminal cover. The lower surface of the cable support and the upper surface of the terminal cover may comprise parallel grooves adjacent to each other for at least partly receiving the electrical conductors.

In contact devices for multiconductor cables there is a tendency to an ever increasing density of the connections, i.e., an ever increasing number of connectors and terminals per contact device. Increasing the density in the above mentioned known contact devices also increases the assembly and repair problems. The usual dimensioning of such contact devices, in which the distance between the center lines of the recesses is for instance equal to 2.54 mm (0.1 inch) and the number of recesses positioned behind each other in one row is three. This constitutes a limit for the number of terminals to be used in one contact device. The length also has to be within certain dimensions, particularly if all conductors have to be supplied from one side to the contact device as is

customary with flat cable. In the known devices it is customary to introduce the conductors from above or from different opposite sides to the upper surface of the terminal support.

This problem is solved likewise by the contact device described below which has one row of recesses positioned behind one another in the terminal support. Terminals in the terminal support have different distances between the center line of the terminal and the slit between the tines of the bifurcated insulation piercing contact. Terminals having an offset between the slit and their center line are mutually turned with respect to each other 180°.

In case of three recesses, one behind each other, in one row a central terminal can be used, the slot of which coincides with the center line of this terminal, whereas the outer terminals have slits offset with respect to its center line and are rotated 180° with respect to one another. With the above mentioned dimensioning in this case three conductors can be supplied from one side of the contact device to the upper surface of the terminal cover.

The DE-B-2 022 029 discloses per se a contact device for terminating one U-bent conductor in one dual insulation piercing contact, mounted in a recess of a housing for this one insulation piercing contact, by means of a pushing device which fits in said recess and comprises a channel for accommodating one upstanding part of the U-bent conductor portion. This device is made for contacting one conductor only and this one conductor should be guided first through the channel in the pushing device.

DE-B-2 747 395 also discloses per se a contact device for terminating one conductor in an insulation piercing contact, comprising a housing for this one contact and openings in opposite housing side walls for guiding the conductor and placing it on top of the insulation piercing contact. Thereafter this conductor has to be pushed down between the tines of the insulation piercing contact by means of a particular pushing device. Also here each conductor has to be guided through an opening as in above DE-B-2 022 029.

DE-A-2 726 226 discloses a contact device in which separate conductors are placed in channels on top of a combined cable and terminal support, after which core piercing contacts are pushed down onto these conductors into recesses in the cable-terminal support situated below each conductor. For replacing one conductor each insulation piercing contact first has to be removed.

THE DRAWINGS

The invention will now be further explained with reference to the drawings, in which:

FIG. 1 shows a side elevation of an example of a terminal of the present invention;

FIG. 2 shows the terminal according to FIG. 1

in side elevation rotated over 90° with respect to the side elevation of FIG. 1;

FIG. 3 shows an example of a modified terminal for the contact device of the present invention also rotated over 90° with respect to the side elevation of FIG. 1;

FIG. 4 shows a top view of the terminal of FIG. 2;

FIG. 5 shows a top view of the terminal of FIG. 3;

FIG. 6 shows an embodiment of a contact device of the present invention in exploded view;

FIG. 7 shows a top view of the terminal cover of the contact device of FIG. 2 with insulated electrical conductors laid upon the cover;

FIGS. 8, 9 and 10 show cross sections of the assembled contact device of FIG. 7 across the respective three terminals positioned behind each other in one row;

FIGS. 11, 12 and 13 show contact devices according to the present invention and a number of possibilities for applying electrical conductors;

FIG. 14 shows a contact device of the present invention in which a dust cover is used.

DESCRIPTION OF THE INVENTION

Each terminal consists of an upper portion 1, an intermediate portion 2 and a lower portion 3. The terminal may consist of a U-shaped bent electrically conducting sheet. The two parallel sides of this bent sheet are elongated above and below and connected with one another by means of the connection strip 4 in the intermediate portion 2. The elongated upper portions constitute the bifurcated insulation piercing contacts, each consisting of a pair of upstanding tines 5 and 6 respectively, separated from one another by a slit 7. The edges of the tines 5 and 6 defining the slit 7 are sharpened such that upon pressing an insulated conductor from above into the slit 7 the insulation will be cut and the sharp edges of the slit 7 will dig into the core of the electrical conductor. This results in an extremely reliable contact between the core and the terminal.

FIGS. 1, 4 and 5 show in the upper portion two parallel bifurcated insulation piercing contacts. For each terminal one or more bifurcated insulation piercing contacts can be used, however, in the present invention usually two bifurcated insulation piercing contacts are used. FIGS. 6, 12 and 13 show as an example one bifurcated insulation piercing contact per terminal. In FIG. 1 two insulation piercing contacts per terminal are used.

The connection strip 4 of the intermediate portion 2 is offset to the right over a predetermined distance with respect to the right-hand edge of the side surfaces, so that a shoulder or support base 8 is obtained. Upon positioning a terminal in the terminal support 10 this shoulder will come to rest on a cam in the recesses 11 of the terminal support 10. At

the opposite edge of the intermediate portion 2 a sharp protruding barb 9 is formed, which upon positioning in the recess 11 will dig in the material of the side of the opening, so that the terminal cannot be drawn or fall out of the recess.

The lower portion 3 of each terminal comprises two contact terminals 12, 13 approaching each other for connecting a further conductor. These contact terminals as a matter of course need not be embodied as shown and also may form part of the intermediate portion 2.

The difference between the terminals of FIGS. 2, 4 and FIGS. 3, 5 respectively is that the bifurcated core piercing contacts in the terminal of FIGS. 2 and 4 are displaced with respect to the center line of the intermediate portion 2. The slit 7 in FIG. 2 is situated to the left with respect to the center line over a distance determined by the pitch between recess 11 in longitudinal direction divided by the number of rows in the transverse direction of the connector. Upon positioning these terminals in the terminal support 10 one pair of each set is turned over 180°, so that the bifurcated insulation piercing contacts are displaced to the left or to the right with respect to the longitudinal direction of each row of recesses 11. By using a further terminal, the bifurcated insulation piercing contacts of which are not displaced with respect to the center line, as shown in FIGS. 3 and 5, a higher connection density can be obtained in the present invention.

The shape of the intermediate portion 2 is so adapted to the shape of the recesses 11, that the terminal fits closely in these recesses. In FIG. 6 these recesses are shown having rectangular cross sections. In this case the cross section of the intermediate portion 2 will be likewise rectangular. This can be seen in FIG. 6.

FIG. 6 shows the component portions of a contact device of the present invention in an exploded view. The device consists of the terminal support 10, the terminal cover 14 and the cable support 15. The component portions 10, 14 and 15 are drawn above one another, such that upon lowering each portion will take the necessary mutual position. Between the cable support 15 and the terminal cover 14 an electrical insulated conductor to be connected is shown having an insulating sheath 17 and a core 18.

The terminal support 10 consists of a plastic block having three rows of equi-spaced square or rectangular recesses 11 in this shown embodiment. The pitch between these recesses, which means the distance between the center lines of the recesses 11 which are placed behind each other and next to each other is as usual in this kind of contact devices 2.54 mm or 0.100 inch. This measure is mainly standardized and is used in the U.S.A. and in Europe. Between the recesses 11 lands 19 are formed,

having equal width, as long as the recesses 11 are of a rectangular cross section. The upper surfaces of these lands function as support for the terminals as shown in FIG. 1, where the shoulders 20 rest upon the upper side of the lands 19 between the recesses 11.

Terminals according to FIGS. 2 and 3 are positioned in the middle row of the shown recesses i.e. of the rows of recesses running parallel to grooves 21 in terminal cover 14. In the center opening a terminal according to FIG. 3 is introduced, whereas at both sides hereof terminals according to FIG. 2 are introduced, turned 180° with respect to each other. Upon introducing these terminals in the recesses 11 the barbs 9 dig in the material of the walls between the recesses, so that the terminals are kept firmly in position. The recesses in FIG. 6 are of square cross section, however, the invention is not restricted to this cross section. The cross section likewise can be circular or elliptical, in which case as a matter of course the intermediate portions 2 of the terminals have to be adapted to this modified cross section, such that the terminals cannot rotate in the recesses about their center lines.

In FIG. 6 the terminal cover 14 is shown partly in cross section above the terminal support 10.

The cover 14 is provided at the upper side with parallel grooves 21 having such cross section that the round outer surface of each conductor is supported over a part of the periphery. Three parallel grooves 21 are positioned within the distance between two recesses 11, seen transversely to the direction of the grooves.

A recess 22 emerges into each groove 21. A channel or slot 23 emerges in the lower end of the recess 22. Slot 23 emerges also in the lower surface of the terminal cover 14. In FIG. 6 upon lowering the terminal cover 14 on the terminal support 10 the slot 23 receives the bifurcated insulation piercing contact which forms part of the terminal positioned at the most right side in a recess of the terminal support 10. The recess 22 is of such depth that the upper parts of the two tines 5 and 6 together with slit 7 inbetween are received in the recess 22, sufficiently high in order to obtain a good contact between core 18 of conductor 16 after pushing down a conductor portion in the recess 22 and between the tines 5 and 6. In FIG. 6 the recess 22 is of angular shape at the bottom. However, this bottom can also be rounded.

Upon assembling the contact device of the present invention, first the terminals are positioned in a manner shown in the recesses 11 of the terminal support 10. In FIG. 6 three of the recesses are filled only, but it will be obvious that the invention is not restricted to this shown example. Next the terminal cover 14 is lowered on the upper surface of the terminal support 10 upon which all bifurcated insulation piercing

contacts will slip into the corresponding slots 23.

Next conductors 16 are laid in the grooves 21, which conductors 16 and in any case have to extend over the recesses 22, in which at both sides sufficient length remains in order to completely fill the recess 22 with the U-shaped bent portion of this conductor 16 upon pressing in the recess. See also FIGS. 11, 12 and 13. After applying all necessary conductors the cable support 15 is pressed on the upper surface of the terminal cover 14. The cable support 15 also is provided in parallel grooves 24, which together with grooves 21 in the terminal cover 14 will pinch in the electrical conductor 16. In each groove 24 of the cable support 15 a striplike anvil 25 is formed. This anvil is made of the same materials as the cable support 15. Upon lowering the cable support 15 on the terminal cover 14 each anvil 25 is conducted into a corresponding recess 22 and into the slit between the tines of the contact. The front of the anvil 25 forms a rounded hollow cylindrical support surface 26 for the insulating sheath 17 of conductor 16. In the middle each anvil comprises an opening 27, having such width that the two remaining pads at both sides of the opening 27 will take a position at both sides of the slit 7 in the bifurcated insulation piercing contact. If a conductor 16 is placed on the groove 21 of the terminal cover, which conductor 16 runs over the recess 22, this part of the conductor 16 on top of recess 22 will be pressed downwardly and between the tines 5 and 6 of the bifurcated insulation piercing contact upon lowering the cable support 15 on the terminal cover 14, so that the core 18 is introduced in the slit 7 after cutting insulation 17 by tines 5 and 6. This results in an excellent electrical contact between the core 18 and the terminal.

The above shows, that upon lowering the cable support 15 on cover 14 all conductors 16 in grooves 21 nearly simultaneously will be brought into contact with the corresponding bifurcated insulation piercing contact. For pressing a multitude of conductors in the recesses 22 a particular pressing means for the cable support 15 will be necessary. However, the conductors also can be pressed separately in each of the corresponding recesses 22 and between the tines 5 and 6 by a suitable tooling, the end surface of which is formed as the shown anvil 25.

Apart from the U-shaped portion of the conductor located in the recess 22 the cable support 15 together with the anvil 25, if used, gives an additional strain relief for conductors 16.

Instead of the permanently present cable support 15 and anvils 25, the conductors also may be pressed simultaneously by means of a correspondingly shaped tooling in the recesses 22 and slit 7 of the bifurcated insulation piercing contacts. This particular tooling should

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be provided with anvils 25 in accordance with the number of recesses in which conductors have to be connected. After applying the conductors this particular tooling can be replaced by cable support 15, from which the anvils 25 can be omitted.

The terminal support 10 comprising the terminals, the terminal cover 14 lowered on the terminal support 10 and the cable support 15 with conductor 16 placed inbetween can be covered by a dust cover which also may provide additional pressing force between the three plastic parts 10, 14 and 15. This dust cover may be provided with a clamp.

FIG. 7 shows a top view of the terminal cover 14, after introducing the different conductors 16 between the tines of the bifurcated insulation piercing contacts. As distinct from the embodiment of FIG. 6, in the embodiment of FIG. 7 each terminal is provided with two bifurcated insulation piercing contacts. In the top view of FIG. 7 these are shown in interrupted lines. FIG. 7 also shows that three conductors 16 can be located between the usual distance of 2.54 mm between the recesses 11.

FIGS. 8, 9 and 10 respectively show cross sections of terminal cover 14 and terminal support 10 having terminals located in the recesses 11 of the terminal support 10, which terminals are provided with the bifurcated insulation piercing contacts. FIG. 8 shows a cross section over the central row in FIG. 7. FIG. 9 shows a cross section over the upper row and FIG. 10 a cross section over the lower row, seen in the surface of the drawing of FIG. 7.

FIGS. 8, 9 and 10 clearly show that the bifurcated insulation piercing contacts of the center row coincide with the center line of the terminal whereas the bifurcated insulation piercing contacts of the outer rows in FIGS. 9 and 10 are displaced with respect to the center line. This shows that three bifurcated insulation piercing contacts positioned in one row behind each other each can be brought into contact with a separate conductor 16. In this manner three conductors can be guided to the exterior of the contact at one side hereof. These three conductors use the space of one pitch between two recesses 11 in the terminal support 10.

FIGS. 8, 9 and 10 also show how the terminals rest with the shoulders 20 and 8 on the recesses 11 of the terminal support. The barbs 9 form an additional safety means for the terminals.

FIGS. 11, 12 and 13 show modified embodiments for applying the conductors 16. In the embodiment of FIG. 11 first the conductors 16 are applied and connected, after which these conductors are cut simultaneously at an edge of the contact device. See reference number 28. In this embodiment the conductors approach the contact device at the upper surface of the terminal cover 14.

As shown in FIG. 11 two bifurcated

insulation piercing contacts per terminal are used.

In the embodiment of FIG. 12 the conductors 16 approach from above. Here likewise all conductors are cut simultaneously at 28. In the embodiment of FIG. 13 the conductors also approach from above, but are cut in a surface of the grooves 21, where the bent portions of the conductors 16 leave the recesses' 22.

In case one single conductor has to be repaired or replaced separately, the cable support 15 need only be lifted, after which the conductor to be repaired can be removed by pulling out of recess 22 and out of the bifurcated insulation piercing contact. Thereafter, a new conductor can be applied and connected, after which the cable support 15 can be lowered on the terminal cover again.

The embodiments of FIGS. 11 and 12 are preferred above the embodiment of FIG. 13, because all conductors 16 in the embodiments of FIGS. 11 and 12 can be cut in one cutting operation, in which the cutting surfaces are in line with the side of the contact device. Also upon this cutting operation all conductors 16 are supported, at least in the embodiment of FIG. 11.

In the contact device of FIG. 14 a dust cover is used, consisting of two halves 29. These halves 29 are pressed together and grip around the terminal support 10, terminal cover 14 and cable support 15 and keep these parts clamped together. Conductors 28 are guided out through the shown pipe, also consisting of two halves 30. As a matter of course the number of conductors is not restricted to three as shown.

The embodiment to be practiced depends on the particular circumstances.

The contact device of the present invention can be used with cables of different design. In case of flat cables each conductor or wire needs firstly to be separated. The core 17 can be solid, but also may be a stranded type.

The configuration and dimension of the contact device of the present invention is adapted to a DIN 41612 connector system. However, there is enough design freedom within the scope of the present invention to produce connectors with different dimensional sizes and numbers of positions or recesses in one or more rows.

Also it is self-evident, that the invention is not restricted to a contact device having only three recesses placed behind each other in one row. The invention can be used throughout where space limitations exist caused by high density of connections, conductors and terminals. In the present invention these problems are solved by moving the separate conductors from a flat surface downwardly in the shape of a U, below the upper surface of the terminal cover 14 and pressing the conductors in the lower portion of the recess between the tines of the bifurcated insulation piercing contacts. Between these adjoining bifurcated

insulation piercing contacts sufficient insulation exists by turning these bifurcated insulation piercing contacts of the different terminals with respect to the center line of the terminals over 180°. This likewise facilitates the repair of separate conductors.

It is self-evident that the invention is not limited to the shown embodiments, and that modifications and additions are possible without leaving the scope of the present invention.

Claims

1. A contact device for a multiconductor cable, comprising a terminal support (10) and a terminal cover (14) to be placed on the upper surface of said terminal support (10), said terminal support (10) and terminal cover (14) being made of insulating material, said terminal support (10) having recesses, each housing a terminal comprising a bifurcated insulation piercing contact (5, 6), which extends from said terminal support upper surface towards said terminal cover (14), said terminal cover (14) guiding insulated electrical conductors (16) of said multicore cable across said bifurcated insulation piercing contacts (5, 6), characterized in that said terminal cover (14) comprises recesses (22) for accommodating each a U-shaped portion of an insulated electrical conductor of said multicore cable, said recesses (22) having their longitudinal direction in line with the guiding direction of said conductor and extending from the terminal cover upper surface towards the terminal cover lower surface opposing said terminal support upper surface, said terminal cover (14) also comprising slots (23) accommodating said bifurcated insulation piercing contacts (5, 6) each slot extending from the terminal cover lower surface upwardly and opening into a recess (22) for said U-shaped conductor portion, the width direction of said slot (23) extending transversely to the longitudinal direction of said recesses (22), such that after placing said terminal cover (14) on top of said terminal support (10) each bifurcated insulation piercing contact in the assembled contact device extends within said recess (22) transversely to said recess longitudinal direction, each U-shaped conductor portion being pushed in a respective recess (22) such that the the bottom portion of said U-shaped conductor portion is pushed into the slot (7) between the tines (5, 6) of the bifurcated insulation piercing contact in order to achieve electrical contact with the terminal, in which at both sides of said bifurcated insulation piercing contact sufficient space remains in said recess (22) and said respective slot (23) for allowing the tines (5, 6) to expand upon pushing said bottom portion between said tines (5, 6).

2. A contact device as claimed in claim 1, characterized in that said terminal cover upper surface comprises parallel adjoining grooves

(21), each groove accommodating an electrical conductor of said multiconductor cable, at least one of said recesses (22) for accommodating said U-shaped conductor portion emerging in said one groove (21), the longitudinal direction of each said recesses (22) being in line with the longitudinal direction of said grooves (21).

3. A contact device as claimed in claims 1 and 2, characterized by a cable support (15) having a lower surface to be placed on the electrical conductor resting upon said terminal cover (14) upper surface and having several conductor pushing anvils (25) extending from said cable support lower surface towards said terminal cover upper surface, each anvil being of sufficient length such that upon lowering said cable support (15) on to said electrical conductors, each anvil (25) pushes a conductor portion into each recess (22) in said terminal cover (14) and pushes the U-bottom portion of said electrical conductor into the slot (7) between the tines (5, 6) of said bifurcated core piercing contact, each anvil (25) being striplike and having a cross section the largest width of which extending in the longitudinal direction of said recess (22) and the smallest width being smaller than the width of said slot (7) in said bifurcated insulation piercing contact.

4. A contact device as claimed in claim 3, characterized in that said cable support lower surface comprises parallel adjoining grooves (24), each groove accommodating an electrical conductor of said multiconductor cable, said anvils (25) emerging from the bottom of said grooves (24), said cable support (15) further comprising a clamp for holding the cable support (15) in assembled position.

5. A contact device as claimed in at least one of the foregoing claims, characterized in that said terminal support (10) comprises several terminal housing recesses (11) juxtaposed in the conductor longitudinal direction forming one row, each recess (11) of said row having located therein a terminal, the terminal of one row having different distances between the center line of the terminal intermediate portion and the slit (7) between the tines (5, 6) of the bifurcated insulation piercing contact, in which the terminals of one pair having equal said distances are mutually turned 180°.

6. A contact device as claimed in claim 3, characterized in that the front surface (26) of said anvil (25) resting on the insulated electrical conductor is shaped in accordance with the outer surface of the insulated electrical conductor and comprises a recess (27) which in operative position of the anvil (25) is positioned in the slit (7) between the tines (5, 6) of the bifurcated insulation piercing contact.

7. A contact device as claimed in one of the preceding claims, in which each terminal comprises an upper portion (1) having at least one bifurcated insulation piercing contact, which after inserting the terminal in the recess (11) in the terminal support (10) is located

insulation piercing contacts sufficient insulation exists by turning these bifurcated insulation piercing contacts of the different terminals with respect to the center line of the terminals over 180°. This likewise facilitates the repair of separate conductors.

It is self-evident that the invention is not limited to the shown embodiments, and that modifications and additions are possible without leaving the scope of the present invention.

Claims

1. A contact device for a multiconductor cable, comprising a terminal support (10) and a terminal cover (14) to be placed on the upper surface of said terminal support (10), said terminal support (10) and terminal cover (14) being made of insulating material, said terminal support (10) having recesses, each housing a terminal comprising a bifurcated insulation piercing contact (5, 6), which extends from said terminal support upper surface towards said terminal cover (14), said terminal cover (14) guiding insulated electrical conductors (16) of said multicore cable across said bifurcated insulation piercing contacts (5, 6), characterized in that said terminal cover (14) comprises recesses (22) for accommodating each a U-shaped portion of an insulated electrical conductor of said multicore cable, said recesses (22) having their longitudinal direction in line with the guiding direction of said conductor and extending from the terminal cover upper surface towards the terminal cover lower surface opposing said terminal support upper surface, said terminal cover (14) also comprising slots (23) accommodating said bifurcated insulation piercing contacts (5, 6) each slot extending from the terminal cover lower surface upwardly and opening into a recess (22) for said U-shaped conductor portion, the width direction of said slot (23) extending transversely to the longitudinal direction of said recesses (22), such that after placing said terminal cover (14) on top of said terminal support (10) each bifurcated insulation piercing contact in the assembled contact device extends within said recess (22) transversely to said recess longitudinal direction, each U-shaped conductor portion being pushed in a respective recess (22) such that the bottom portion of said U-shaped conductor portion is pushed into the slot (7) between the tines (5, 6) of the bifurcated insulation piercing contact in order to achieve electrical contact with the terminal, in which at both sides of said bifurcated insulation piercing contact sufficient space remains in said recess (22) and said respective slot (23) for allowing the tines (5, 6) to expand upon pushing said bottom portion between said tines (5, 6).

2. A contact device as claimed in claim 1, characterized in that said terminal cover upper surface comprises parallel adjoining grooves

(21), each groove accommodating an electrical conductor of said multiconductor cable, at least one of said recesses (22) for accommodating said U-shaped conductor portion emerging in said one groove (21), the longitudinal direction of each said recesses (22) being in line with the longitudinal direction of said grooves (21).

3. A contact device as claimed in claims 1 and 2, characterized by a cable support (15) having a lower surface to be placed on the electrical conductor resting upon said terminal cover (14) upper surface and having several conductor pushing anvils (25) extending from said cable support lower surface towards said terminal cover upper surface, each anvil being of sufficient length such that upon lowering said cable support (15) on to said electrical conductors, each anvil (25) pushes a conductor portion into each recess (22) in said terminal cover (14) and pushes the U-bottom portion of said electrical conductor into the slot (7) between the tines (5, 6) of said bifurcated core piercing contact, each anvil (25) being striplike and having a cross section the largest width of which extending in the longitudinal direction of said recess (22) and the smallest width being smaller than the width of said slot (7) in said bifurcated insulation piercing contact.

4. A contact device as claimed in claim 3, characterized in that said cable support lower surface comprises parallel adjoining grooves (24), each groove accommodating an electrical conductor of said multiconductor cable, said anvils (25) emerging from the bottom of said grooves (24), said cable support (15) further comprising a clamp for holding the cable support (15) in assembled position.

5. A contact device as claimed in at least one of the foregoing claims, characterized in that said terminal support (10) comprises several terminal housing recesses (11) juxtaposed in the conductor longitudinal direction forming one row, each recess (11) of said row having located therein a terminal, the terminal of one row having different distances between the center line of the terminal intermediate portion and the slit (7) between the tines (5, 6) of the bifurcated insulation piercing contact, in which the terminals of one pair having equal said distances are mutually turned 180°.

6. A contact device as claimed in claim 3, characterized in that the front surface (26) of said anvil (25) resting on the insulated electrical conductor is shaped in accordance with the outer surface of the insulated electrical conductor and comprises a recess (27) which in operative position of the anvil (25) is positioned in the slit (7) between the tines (5, 6) of the bifurcated insulation piercing contact.

7. A contact device as claimed in one of the preceding claims, in which each terminal comprises an upper portion (1) having at least one bifurcated insulation piercing contact, which after inserting the terminal in the recess (11) in the terminal support (10) is located



outside said recess (11), an intermediate portion (2) received within the recess (11) and having a cross section adapted to the cross section of this recess (11) in order to keep this terminal in position and a lower portion (3), forming the connecting means for an electrical conductor, characterized in that each terminal consists of a rectangularly formed sheet of electrically conducting material, having opposite sides (4) and at least one connecting strip in the intermediate portion (2) between these sides (4), which sides (4) are elongated at both ends with respect to the intermediate portion (2), on the one end comprising at least one bifurcated insulation piercing contact and on the other end comprising two narrowing side strips (12, 13) approaching one another and forming a conductor connection terminal, whereas the connecting strip of the intermediate portion (2) is so offset with respect to the edges of the adjoining sides (4), that a support base is formed at the end of the conductor connecting terminal forming a shoulder, which support base upon introducing the terminal in a recess of the terminal support will come to rest on a cam in this recess the opposite edges of the side surface comprising protruding barbs (9) for keeping the terminal in the recess.

Revendications

1. Dispositif de contact pour câble multiconducteur comprenant un support de bornes (10) et un couvercle de bornes (14) destiné à être placé sur la surface supérieure du support de bornes (10), le support de bornes (10) et le couvercle de bornes (14) étant formés de matière isolante, le support de bornes (10) présentant des évidements qui logent chacun une borne comprenant un contact fourchu de percement d'isolant (5, 6) qui part de la surface supérieure du support de bornes en se dirigeant vers le couvercle de bornes (14), le couvercle de bornes (14) guidant des conducteurs électriques isolés (16) du câble multiconducteur en travers des contacts fourchus de percement d'isolant (5, 6) caractérisé en ce que le couvercle de bornes (14) présente des évidements (22) destinés à loger chacun une partie en U d'un conducteur électrique isolé du câble multiconducteur, ces évidements (22) ayant leur direction longitudinale alignée sur la direction de guidage du conducteur et partant de la surface supérieure du couvercle de bornes en direction de la surface intérieure du couvercle de bornes qui est opposée à la surface supérieure du couvercle de bornes, le couvercle de bornes (14) comportant aussi des fentes (23) qui logent les contacts fourchus de percement d'isolant (5, 6), chaque fente se dirigeant de la surface inférieure du couvercle de bornes vers le haut et s'ouvrant dans un évidement (22) de la partie en U du conducteur, la direction de la largeur de la fente (23) étant transversale à la direction longitudinale des évidements (22), de

sorte qu'une fois qu'on a placé de couvercle de bornes (14) par dessus le support de bornes (10), chaque contact fourchu de percement d'isolant, dans le dispositif de contact assemblé, s'étend à l'intérieur de l'évidement (22), transversalement à la direction longitudinale de l'évidement, chaque partie de conducteur en U étant poussée dans un évidement respectif (22) de sorte que la partie inférieure de la partie en U du conducteur est poussée dans la fente (7) entre les dents (5, 6) du contact fourchu de percement d'isolant, de manière à établir le contact électrique avec la borne, un espace suffisant subsistant dans l'évidement (22) et dans ladite fente respective (23) pour permettre aux dents (5, 6) de se détendre lorsqu'on pousse la partie inférieure entre les dents (5, 6).

2. Dispositif de contact selon la revendication 1, caractérisé par le fait que la surface supérieure du couvercle de bornes comprend des gorges parallèles adjacentes (21), chaque gorge logeant un conducteur électrique du câble multiconducteur, au moins un des évidements (22) destinés à loger la partie de conducteur en U émergeant dans la gorge correspondante (21), la direction longitudinale de chacun des évidements (22) étant alignée sur la direction longitudinale des gorges (21).

3. Dispositif de contact selon les revendications 1 et 2, caractérisé par un support de câble (15) présentant une surface inférieure destinée à se placer sur le conducteur électrique reposant sur la surface supérieure du couvercle de bornes (14) et présentant plusieurs enclumes de poussée de conducteur (25) partant de la surface inférieure du support de câble et se dirigeant vers la surface supérieure du couvercle de bornes, chaque enclume ayant une longueur suffisante pour que, lorsqu'on abaisse le support de câble (15) sur les conducteurs électriques, chaque enclume (25) pousse une partie de conducteur dans chaque évidement (22) du couvercle de bornes (14) et pousse la partie inférieure en U du conducteur électrique dans la fente (7) entre les dents (5, 6) du contact fourchu de percement d'isolant, chaque enclume (25) étant en forme de bande et présentant une section dont la plus grande largeur est située dans la direction longitudinale de l'évidement (22) et dont la plus petite largeur est inférieure à la largeur de la fente (7) du contact de percement d'isolant.

4. Dispositif de contact selon la revendication 3, caractérisé par le fait que la surface inférieure du support de câble présente des gorges parallèles adjacentes (24), chaque gorge logeant un conducteur électrique du câble multiconducteur, les enclumes (25) émergeant du fond des gorges (24), le support de câble (15) comprenant en outre une pince pour retenir le support de câble (15) en position assemblée.

5. Dispositif de contact selon au moins une des revendications précédentes, caractérisé par le fait que le support de bornes (10) présente plusieurs évidements de logement de bornes



(11) juxtaposés dans la direction longitudinale du conducteur, formant une rangée, chaque évidement (11) de cette rangée présentant une borne qui y est placée, la borne d'une rangée ayant des distances différentes entre la ligne médiane de la partie intermédiaire de borne et la fente (7) entre les dents (5, 6) du contact fourchu de percement d'isolant, les bornes d'une paire qui ont des distances égales étant déviées de 180° l'une par rapport à l'autre.

6. Dispositif de contact selon la revendication 3, caractérisé par le fait que la surface antérieure (26) de l'enclume (25) reposant sur le conducteur électrique isolé présente une forme correspondant à la surface extérieure du conducteur électrique isolé et présente un évidement (27) qui, dans la position active de l'enclume (25), est placé dans la fente (7) entre les dents (5, 6) du contact fourchu de percement d'isolant.

7. Dispositif de contact selon l'une des revendications précédentes, dans lequel chaque borne comprend une partie supérieure (1) présentant au moins un contact fourchu de percement d'isolant qui, après insertion de la borne dans l'évidement (11) du support de bornes (10) est située à l'extérieur de l'évidement (11), une partie intermédiaire (2) logée dans l'évidement (11) et ayant une section adaptée à la section de cet évidement (11) afin de maintenir cette borne en position, et une partie inférieure (3) formant le moyen de connexion d'un conducteur électrique, caractérisé par le fait que chaque borne est formée d'une plaque de matière conductrice de l'électricité de forme rectangulaire présentant des côtés opposés (4) et au moins une bande de liaison dans la partie intermédiaire (2) entre ces côtés (4), ces côtés (4) étant allongés aux deux extrémités relativement à la partie intermédiaire, comportant sur l'une des extrémités au moins un contact fourchu de percement d'isolement et sur l'extrémité opposée deux bandes latérales rétrécissantes (12, 13) s'approchant l'une de l'autre et formant une borne de connexion de conducteur, tandis que la bande de liaison de la partie intermédiaire (2) est décalée relativement aux bords des côtés adjacents (4) de telle sorte qu'une base de support est formée à l'extrémité de la borne de connexion de conducteur, formant un épaulement, cette base de support venant reposer, lorsqu'on introduit la borne dans un évidement du support de bornes, sur une came prévue dans cet évidement, les bords opposés de la surface latérale présentant des griffes en saillie (9) pour maintenir la borne dans l'évidement.

Patentansprüche

1. Eine Kontaktvorrichtung für ein mehradriges Kabel mit einem Polträger (10) und einer Polabdeckung (14) zur Anordnung auf der Oberseite des Polträgers (10), welcher Polträger

(10) und welche Polabdeckung (14) aus Isoliermaterial hergestellt sind, wobei der Polträger (10) Ausnehmungen aufweist, jede zur Aufnahme eines Pols aus einem gegabelten Isolationlochungskontakt (5, 6), der sich von der Oberseite des Polträgers zu der Polabdeckung (14) erstreckt, welche Polabdeckung (14) isolierte elektrische Leiter (16) des mehradrigen Kabels quer über die gegabelten Isolationlochungskontakte (5, 6) führt, dadurch gekennzeichnet, daß die Polabdeckung (14) Ausnehmungen (22) zur Aufnahme je eines U-förmigen Teils eines isolierten elektrischen Leiters des mehradrigen Kabels aufweist, welche Ausnehmungen (22) sich mit ihrer Längsrichtung in Ausfluchtung mit der Führungsrichtung des Leiters befinden und sich von der Polabdeckungsobenseite zur Polabdeckungsunterseite erstreckt, die der Oberseite des Polträgers gegenüberliegt, welche Polabdeckung (14) ferner Schlitze (23) zur Aufnahme der gegabelten Isolationlochungskontakte (5, 6) aufweist, wobei sich jeder Schlitz von der Polabdeckungsunterseite nach oben erstreckt und in eine Ausnehmung (22) für den U-förmigen Leiterteil mündet, wobei die Breitenrichtung des Schlitzes (23) sich quer zur Längsrichtung der Ausnehmungen (22) erstreckt, so daß nach dem Auflegen der Polabdeckung (14) auf die Oberseite des Polträgers (10) jeder gegabelte Isolationlochungskontakt in der zusammengebauten Kontaktvorrichtung sich innerhalb der Ausnehmung (22) quer zu der Ausnehmungslängsrichtung erstreckt, jeder U-förmige Leiterteil in eine jeweilige Ausnehmung (22) geschoben wird, so daß der untere Teil des U-förmigen Leiterteils in den Schlitz (7) zwischen den Zinken (5, 6) des gegabelten Isolationlochungskontakts geschoben wird, um elektrischen Kontakt mit dem Pol zu erzielen, in welchem auf beiden Seiten des gegabelten Isolationlochungskontakts ausreichend Raum in der Ausnehmung (22) und in dem jeweiligen Schlitz (23) bleibt, um zu ermöglichen, daß die Zinken (5, 6) sich ausdehnen, wenn der erwähnte untere Teil zwischen die Zinken (5, 6) geschoben wird.

2. Eine Kontaktvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Polabdeckungsobenseite parallele benachbarte Nuten (21) aufweist, jede Nute zur Aufnahme eines elektrischen Leiters des mehrarmigen Kabels, wobei mindestens eine der Ausnehmungen (22) zur Aufnahme des U-förmigen Leiterteils in die erwähnte eine Nut (21) eintaucht und sich die Längsrichtung jeder der Ausnehmungen (22) in Ausfluchtung mit der Längsrichtung der Nuten (21) befindet.

3. Eine Kontaktvorrichtung nach den Ansprüchen 1 und 2, gekennzeichnet, durch einen Kabelhalter (15) mit einer Unterseite zur Auflage auf den elektrischen Leiter der auf der Oberseite der Polabdeckung (14) ruht, und mit mehreren Leiterschleibeamboßen (25), die sich



von der erwähnten Kabelhalterunterseite zur Polabdeckungsoberseite erstreckt, wobei jeder Amboß von ausreichender Länge ist, so daß beim Absenken des Kabelhalters (15) auf die elektrischen Leiter jeder Amboß (25) einen Leiterteil in jede Ausnehmung (22) in der Polabdeckung (14) schiebt und den U-förmigen Bodenteil des elektrischen Leiters in den Schlitz (7) zwischen die Zinken (5, 6) des gegabelten Kernlochungskontakts schiebt, wobei jeder Amboß (25) streifenförmig ist und einem Querschnitt hat, dessen größte Breite sich in der Längsrichtung der Ausnehmung (22) erstreckt und dessen geringste Breite kleiner ist als die Breite des Schlitzes (7) in dem gegabelten Isolationlochungskontakt.

4. Eine Kontaktvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Kabelhalterunterseite parallele benachbarte Nuten (24) aufweist, von denen jede einen elektrischen Leiter des mehradrigen Kabels aufnimmt, wobei die erwähnten Amboße (25) aus dem Boden der Nuten (24) heraustauchen, und der Kabelhalter (15) ferner eine Klemme besitzt, um den Kabelhalter (15) in der zusammengebauten Stellung zu halten.

5. Eine Kontaktvorrichtung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Polträger (10) mehrere Polaufnahmeausnehmungen (11) aufweist, die nebeneinander in der Leiterlängsrichtung angeordnet sind und eine Reihe bilden, wobei in jeder Ausnehmung (11) der erwähnten Reihe ein Pol angeordnet ist, der Pol von einer Reihe verschiedene Abstände zwischen der Mittellinie des Polmittelteils und der Schlitz (7) zwischen den Zinken (5, 6) des gegabelten Isolationlochungskontakts, in welchen die Pole von einem Paar mit gleichen der erwähnten Abstände gegenseitig um 180° verdreht sind.

6. Eine Kontaktvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Frontseite (26) des Amboß (25), die auf dem isolierten elektrischen Leiter aufruh, übereinstimmend mit

der äußeren Fläche des isolierten elektrischen Leiters geformt ist und eine Ausnehmung (27) aufweist, die in der Betriebsstellung des Amboß (25) im Schlitz (7) zwischen den Zinken (5, 6) des gegabelten Isolationlochungskontakts angeordnet ist.

7. Eine Kontaktvorrichtung nach einem oder mehreren der vorangehenden Ansprüche, bei welcher jeder Pol einen oberen Teil (1) mit mindestens einem gegabelten Isolationlochungskontakt aufweist, der nach dem Einsetzen des Pols in die Ausnehmung (11) im Polträger (10) sich außenseitig zu der Ausnehmung (11) befindet, einen mittleren Teil (2), der von der Ausnehmung (11) aufgenommen wird und einen Querschnitt hat, der dem Querschnitt dieser Ausnehmung (11) angepaßt ist, um diesen Pol in seiner Stellung zu halten, und einem unteren Teil (3), der die Verbindung für einen elektrischen Leiter bildet, dadurch gekennzeichnet, daß jeder Pol aus einem rechteckig geformten Blech aus elektrisch leitendem Material besteht, das entgegengesetzte Seiten (4) und mindestens einen Verbindungstreifen im mittleren Teil (2) zwischen diesen Seiten (4) aufweist, welche Seiten (4) an beiden Enden mit Bezug auf den Mittelteil (2) verlängert sind, an dem einen Ende mindestens einen gegabelten Isolierunglochungskontakt besitzt und am anderen Ende zwei sich verengende Seitenstreifen (12, 13) besitzt, die sich einander nähern und einen Leiterverbindungspol bilden, während der Verbindungstreifen des Mittelteils (2) so versetzt ist mit Bezug auf die Kanten der anschließenden Seiten (4), daß eine Erregerbasis am Ende des Leiterverbindungspols geformt ist, die eine Schulter bildet, welche Trägerbasis beim Einführen des Pols in eine Ausnehmung des Polträgers an einem Kurvenelement in dieser Ausnehmung zur Ruhe kommt, wobei die entgegengesetzten Kanten der Seitenfläche vorstehende Widerhaken (9) aufweisen, um den Pol in der Ausnehmung zu halten.

