Title: A METHOD AND ARRANGEMENT FOR RECONNECTING CONDUCTOR CONNECTIONS IN TELECOMMUNICATIONS EQUIPMENT

Abstract: The present invention relates to an arrangement and to a method for reconnecting conductors (1, 21) connected to a telecommunications equipment (4, 27). According to the invention, a breaking function (15, 24) ensures that a cross-connect (17, 28) is connected between the conductor and the telecommunications equipment when a reconnection is desired. The reconnection is effected by remote control in the cross-connect (17, 28). The reconnection of the conductor connection is effected between two routine visits at a plant where manual reconnection of the conductor is possible. When manual reconnection of the conductor (1, 21) has been effected, the breaking function (15, 24) ensures that the cross-connect (17, 28) is disengaged and the cross-connect resource appropriated in reconnecting the conductor connection is released. The invention obviates the need to make separate visits to a telecommunications node in order to reconnect conductor connections manually. The invention also enables the use of relatively small cross-connects for reconnecting conductor connections by remote control, since the cross-connects (17, 28) only needs to handle those reconnections that are required between two routine visits to the node.
A METHOD AND ARRANGEMENT FOR RECONNECTING CONDUCTOR
CONNECTIONS IN TELECOMMUNICATIONS EQUIPMENT

Field of invention
The present invention relates to a method and to an arrangement for
rearranging connections of conductors to a telecommunications equipment. The
invention enables the conductors to be reconnected with the aid of cross-connects
that include a relatively small number of crosspoints.

Description of the background art
The number of conductors connected to telecommunications equipment,
such as to a local exchange for instance, is normally very large. One conductor
may be comprised of twinned copper cables that connect a subscriber terminal to
a line interface board in the local exchange. A main distribution frame (MDF) is
often used to terminate the conductors. An MDF is a cross-connection frame
where incoming conductors terminate and can be cross-connected manually to
central office telecommunications equipment An MDF may be placed together with
the local exchange or, for instance, in a remote subscriber stage.

One problem is that it becomes desirable sooner or later to rearrange the
connections of certain conductors to the local exchange. For instance, a
subscriber may have purchased a broadband service and needs to be connected
to an ISDN line interface board instead of to a conventional PSTN line interface
board (where PSTN stands for Public Switched Telephone Network). Although this
rearrangement can be effected manually in the MDF, it necessitates a visit to the
access node, i.e. the apparatus in which the MDF is placed. In order to avoid
visiting the access node each time a rearrangement shall be made, there is used
a metallic cross-connect MXC that is placed between the MDF and the local
exchange. The MXC includes a large number of connection points, so-called cross
points, arranged in connection matrices, and enabling remotely controlled
reconnections of connected conductors. A very large number of cross points are
required to achieve a coupling that is totally free from congestion, and
consequently the MXCs are expensive.
It is quite probable that the number of reconnections that need to be made will increase with time, since more and more subscribers will purchase expensive broadband services periodically. It is therefore an important competitor factor for network operators to be able to execute the reconnections both quickly and easily. Since cross-connect equipment that includes a large number of cross points will be expensive, it is desirable that this equipment is utilised effectively and that it does not become unnecessarily large.

Cross-connects are not used solely in the access network. Digital cross-connects, DXC and optical cross-connects, OXC, are used in the transport network to enable conductors to be reconnected between transmission equipment.

Swedish Patent Specification 9101868-9 describes how an MXC can be implemented.

**Disclosure of the invention**

The present invention addresses the problem of how conductors connected to telecommunications equipment can be reconnected quickly, easily and inexpensively. As before mentioned, reconnecting conductor connections becomes necessary, for instance, in access networks when a subscriber changes type from a PSTN subscriber to an ISDN subscriber. At times it is also necessary to make reconnections between different transmission equipment in the transport network.

The object of the present invention is thus to provide a method and an arrangement with which conductor connections to telecommunications equipment can be reconnected quickly, simply and inexpensively.

The invention also solves the aforesaid problem of enabling a cross-connect to perform said reconnections by remote control. However, a breaking function ensures that the conductors are connected to the telecommunications equipment concerned, via said cross-connect, only when remote-controlled reconnection of the conductors is desired and when the cross-connect is required, otherwise the cross-connect is by-passed. This enables the number of unused cross points to be reduced and enables the use of a cross-connect that has fewer
cross points than the number required in earlier known conductor reconnection systems. In the case of the present invention, exploited crosspoints are released when they are no longer needed. The solution is inexpensive, because smaller and therefore cheaper cross-connects are used.

The invention utilises the observation that a node, in which connections of conductors to different inputs of the telecommunications equipment have been made, needs to be visited at regular intervals, e.g., for routine maintenance. Reconnections of the conductor connections can be effected manually in the node, during such routine visits. However, it is desirable to avoid visiting a node with the express purpose of reconnecting conductor connections in the node manually during the times between said routine visits. Consequently, a cross-connect is used to perform remotely controlled reconnections of those conductor connections that need to be reconnected in the time between two consecutive routine visits to the node. Because the cross-connecting equipment only needs to handle the reconnections that are made between two visits to the node, it is not necessary for all conductor connections to always go via the cross-connect, but the cross-connecting equipment can be connected solely for a conductor for which remotely controlled reconnection is necessary. The conductor connection can be reconnected manually on the next routine visit and a cross-connecting resource can be made available. Thus, according to the invention, the conductors are normally connected to the telecommunications equipment directly. By direct connection in this case is meant that the conductor connections do not pass through the cross-connect to the telecommunications equipment, in other words the cross-connect is by-passed. When a reconnection of a conductor to the telecommunications equipment is desired a breaking function is activated so as to break the cross-connect bypass and the cross-connect is adjusted so that it becomes connected in between the conductor and the input of the telecommunications equipment. The cross-connect carries out the desired connection change. On the next routine visit to the node, the conductor is reconnected manually and the breaking function is reset so as to again bypass the cross-connect and a cross-connection resource is released in the cross-connect.
One advantage afforded by the invention is that a smaller cross-connect that has fewer cross points can be used to carry out desired conductor reconnections than what is required in previously known solutions. This is possible since the cross-connect only needs to handle those changes in conductor connections that take place between two routine visits to the node. Crosspoints are expensive, and consequently a cross-connect that has fewer cross points will be cheaper. A small cross-connect is also simpler to produce and maintain.

A further advantage afforded by the invention is that special visits to the node to perform conductor reconnections manually are unnecessary. Manual reconnections of conductor connections can be carried out at routine visits made to the node for other purposes.

Yet another advantage afforded by the invention is that conductor connections can be reconnected quickly, since switching can be effected by remote control in accordance with the invention and does not require a visit to the node in order to switch said connections manually.

The invention will now be described in more detail with reference to preferred embodiments thereof and also with reference to the accompanying drawings.

**Brief description of the drawings**

Fig. 1 is a block diagram illustrating an arrangement for reconnecting conductors in the access network by remote control in accordance with known technology.

Fig. 2 is a block diagram illustrating an inventive arrangement for reconnecting conductors in the access network.

Fig. 3 is a logic schematic illustration of a cross-connect and a breaking function in an inventive arrangement.

Fig. 4 is a block diagram, which illustrates an alternative embodiment of an inventive arrangement for reconnecting conductors in the access network.

Fig. 5 is a block diagram, which illustrates an inventive arrangement for reconnecting conductors in the transport network.
Fig. 6 is a flowchart, which illustrates an inventive method for reconnecting conductors connected to a telecommunications equipment.

Description of preferred embodiments

Fig. 1 illustrates an arrangement for switching conductor connections in the access network by remote control in accordance with known technology. A number of copper twin-cables 1 are connected at one end to subscriber equipments 2 and at the other end to an MDF 3 (Main Distribution Frame) belonging to a local exchange 4. Each copper twin-cable 1 is connected via the MDF to an MXC (Metallic Cross Connect) 5, which is a cross-connect that includes a large number of cross points 6 and an operating device 5a for setting the crosspoints. The ports 8 to which the copper twin-cables are connected are connected to inputs 9 in the MXC by jumper cables 7 in the MDF. The MXC also includes outputs 10 to which inputs 11 in the local exchange 4 are connected. Several different types of equipment for different types of communications services are associated with the inputs 11 in the local exchange. Fig. 1 shows symbolically that an input 11a is associated with equipment 12a adapted for PSTN, that an input 11b is associated with equipment 12b adapted for ISDN, and that an input 11c is associated with equipment 12c adapted for ADSL.

The purpose of the MXC 5 is to enable the copper twin-cables 1 to be reconnected to the inputs 11 by remote control. For instance, assume that a subscriber A having a subscriber equipment 2a is originally a PSTN subscriber. A copper twin-cable 1a is connected at one end to the subscriber equipment 2a and at the other end to the input 11a of the local exchange 4, via the MDF 3 and the MXC 5. Also assume that the subscriber A changes the type of subscription, by purchasing an ISDN service. The subscriber equipment 2a must then be connected to equipment in the local exchange 4 that is adapted for ISDN. Reconnection of the cable 1a to the input 11b can be effected by remote control in the MXC 5, by resetting a number of crosspoints 6 with the aid of the operating device 5a. In order to enable similar reconnections to be made for all of the copper twin-cables 1, all connections to the inputs 11 in the local exchange 4 will always pass through the MXC 5 in the case of the earlier known solution illustrated in Fig.
1. The MXC 5 must, of necessity, include a large number of crosspoints 6 if totally congestion-free reconnection is to be guaranteed, which makes it very expensive. If no reconnections were necessary, the MXC 5 could be removed and the cables 1 could be connected to the local exchange either directly or via the MDF. However, the reality is that reconnections are necessary. A present-day estimate is that about 10% of the subscriber lines connected to a local exchange will need to be reconnected on an annual basis. Naturally, it is possible to reconnect the cable connections manually, even without the MXC 5, by simply moving the cables between the inputs 11. When the connections are made via the MDF, manual reconnections can also be effected by moving the jumper cables 7 in the MDF. However, it is not practical to carry out all reconnections manually in order to save the cost of an expensive MXC. This would require a visit to the plant where the MDF or the local exchange is placed on each switching occasion, which would presumably cost still more than the MXC.

Fig. 2 illustrates an arrangement for reconnection of conductors in the access network in accordance with the invention. As with the Fig. 1 arrangement, the copper twin-cables 1 shall be connected between the subscriber equipment 2 and the local exchange inputs 11, which are associated with the equipment 12 adapted for different types of communications services. The copper twin-cables 1 are connected to the inputs 11 of the local exchange 4 via the MDF 3, as in the case in Fig. 1, and also via a breaking function 15 in accordance with the invention, this function including at least one breaker 16 for each copper twin-cable 1, and an operating device 19 for controlling the breakers 16 (only one operating device is shown in the Figure). An MXC 17 that includes crosspoints 18 is connected in parallel with the breaking function 15 in a manner in which it is bypassed in respect of one of the conductors 1 when one of the breakers 16 is closed. The MXC 17 can be remotely controlled by means of an operating device 17a. The concept of the invention is to allow the MXC 17 to carry out remotely controlled reconnections in the time between two routine visits to the plant at which the MDF or the local exchange is situated. It is necessary to visit the plants at regular intervals, in order to carry out routine maintenance, for instance. The reconnections can then be made manually. Assume that the subscriber A was
originally a PSTN subscriber that has now purchased an ISDN service, as in the earlier example. The copper twin-cable 1a that connects the subscriber equipment 2a must then be reconnected from the input 11a of the local exchange 4 to the input 11b associated with the equipment 12b adapted for ISDN. This reconnection can be remotely controlled, with the aid of the inventive arrangement. The breaking function is primarily set in a first mode in which the connection of conductor 1a to the local exchange 4 by-passes the MXC 17, which means in the present case that the breaker 16a is closed. Remotely controlled reconnection of the conductor 1a is effected by setting the breaking function 15 in a second mode so that by-passing of the MXC 17 by the conductor 1a is broken, meaning in the present case that the breaker 16a is opened. The MXC 17 is activated between the copper twin-cable 1a and the local exchange 4, by setting the cross points 18 with the aid of the operating device 17a. The cross points are set so that the copper twin-cable 1a becomes connected to the input 11b via the MDF 3 and the MXC 17. At the next routine visit to the MDF, the copper twin-cable can be reconnected manually in the MDF by rearranging the jumper cables 7, as indicated in broken lines in Fig. 2. The MXC 17 is not then required for the reconnection concerned, meaning that it can be deactivated by setting the breaking function to the first mode, i.e. to the mode in which the connection of the conductor 1a to the local exchange 4 by-passes the MXC 17, which here means that a breaker 16B is closed, whereafter the crosspoints 18 are set so that the connection of the copper twin-cable 1a will go directly to the local exchange 4 without passing the MXC 17. The cross-connection resources that were appropriated by the remotely controlled reconnection in the MXC can thus be released when the reconnection is made manually when visiting the MDF.

Since, in accordance with the invention, the MXC 17 is used only to handle those reconnections that take place between two routine visits to a plant where the reconnections can be effected manually, the MXC 17 can be made smaller with fewer crosspoints than the MXC 5 used in accordance with earlier known techniques. Fig. 3 illustrates a more detailed, logic schematic view of the MXC 17. The MXC 17 is a three-stage cross-connect, although cross-connects that include more or fewer stages are also available. As will be seen from Fig. 3,
the crosspoints 18 are disposed in connection matrices 40. Internal links 41 interconnect the crosspoints 18. The MXC 17 also includes external links in the form of inputs 42 and outputs 43. The figure shows only the outer links in each connection matrix 40 in full lines. The inner links may include a large number of links, shown in the form of dots in the figure. It can also be seen from Fig. 3 that the MXC 17 includes 2*n inputs 42 and as many outputs 43. As can also be seen from the figure, the connection matrices 40 include n*m, m*n or m*n cross points. In order to achieve completely congestion-free reconnections in the MXC, it is necessary that m=2n-1.

In the case of the earlier known arrangement shown in Fig. 1, the MXC 5 is normally made completely congestion-free or almost completely congestion-free, meaning that the arrangement will include a very large number of crosspoints and internal links. The invention makes it possible to obtain a fully sufficient capacity in the MXC 17 for the desired reconnections to be made with m very much smaller than 2n-1. In many cases, m can be made much smaller than n in an inventive arrangement. Thus, the invention enables a significant reduction to be made in the number of crosspoints and internal links in the cross-connect used to switch the conductor connections by remote control.

It is indicated in the connection matrix 40a that the crosspoints 18 that are associated with the input 42a include a breaker 18a. When the breaker 16a is open and the cross-connect shall be taken into use, one of the breakers 18a is closed so that cross-connection of the conductor 1a will take place through the MXC. Subsequent to manually reconnecting the conductor 1a when the cross-connect is no longer required, all breakers 18a are opened so that internal links 41 and crosspoints 18 that were earlier used to effect the cross-connect are released and can be used for cross-connecting some other conductor 1.

Fig. 4 illustrates an alternative embodiment of an arrangement for reconnecting conductors in the access network in accordance with the invention. The arrangement is similar to the arrangement shown in Fig. 2, but with the exception that it lacks the MDF 3. Although it is not necessary to connect the copper twin-cables 1 to the local exchange 4 via an MDF, it is nevertheless often done. This is not only because manual reconnections can be effected easily in the
MDF, but also for other reasons such as because the MDF will often include some other functionality, e.g. a lightening arrester. The arrangement in Fig. 4 is used in precisely the same way as the arrangement shown in Fig. 2, with the exception that manual reconnections that release cross-connect resources in the MXC 17 cannot, of course, be effected in the MDF 3. In the case of the Fig. 4 arrangement, the conductors are reconnected manually by rearranging the connections of copper twin-cables 1 to the breaking function 15 or directly in the local exchange, by rearranging the connections to the inputs 11. When manual reconnection is effected by re-arranging the connections to the inputs 11, one and the same breaker 16a is opened when the conductor 1a shall be cross-connected and then closed upon completion of the manual reconnection, c.f. the above example where the manual reconnection is effected in the MDF 3 and where a breaker 16b is closed after making the manual reconnection.

Inventive arrangements for use in the access network have been described above. It will be understood, however, that the invention can also be applied in the transport network to effect reconnection of conductor connections between transmission equipment. Fig. 5 illustrates an inventive arrangement for reconnecting conductor connections in the transport network. A number of first transmission equipment 20 are connected to inputs 26 in second transport equipment 27 via conductors 21, a DDF (digital distribution frame) 22 and a breaking function 24 that includes breakers 25 and operating devices 30. A DXC 28 that includes crosspoints 29 and operating devices 28a is connected in parallel with the breaking function 24, so that it will be connected between one of the conductors 21 and the second transmission equipment 27 when one of the breakers 25 is opened. Changes in the connections of the conductors 21 to the inputs 26 of the second transmission equipment 27 are carried out in the same way as that described with reference to Fig. 2 in respect of reconnecting conductor connections in the access network. The differences are that the MDF 3 in the transport network is corresponded by the DDF 22, and that the MXC 17 is corresponded by the DXC 28. A cross-connect resource in the DXC 28 is taken into use after one of the breakers 25 has been opened and can then be released after manual reconnection in the DDF 22, for instance.
The invention enables a simpler DXC to be used in the transport network than was possible with earlier known technology for corresponding purposes. The savings in cost that can be made with a smaller DXC, however, are judged to be lower than the savings that can be gained with the invention by using a smaller MXC in the access network. In reality, a DXC functions slightly differently to an MXC, because cross-connection takes place in time, although logically the function is the same and the invention thus results in a reduction in the number of crosspoints required even in a DXC.

It will be understood that the invention can also be applied to other types of cross-connects than the aforementioned MXCs and DXCs. Optical cross-connects (OXC) and optical distribution frames (ODF) are used to reconnect optical fibre cables. According to the present invention, an OXC and an ODF can be used in the same way as that illustrated in Fig. 5 in respect of the DXC 28 and the DDF 22 in order to make reconnections between transmission equipment in the transport network. A large number of cross-connect designs are available. For instance, these cross-connects can include one or more stages, the crosspoints can be disposed in two or three dimensions, they can be so-called folded selectors, just to mention a few optional designs. The invention, however, is not limited to the type of cross-connect with which it may be applied. According to the invention, several cross-connects may be interconnected in a network and used to effect the remotely controlled reconnections of conductor connections. The breaking function will then handle bypassing of the network by cross-connects.

The invention has been described above with reference to embodiments that with and without a distribution frame in the form of an MDF or a DDF. As mentioned before, the invention does not necessarily require the use of a distribution frame, although the use of such a frame is often convenient in practice since the manual reconnections can be effected easily in the distribution frame, and the distribution frame may also include other functions, such as a lightening arrester means, for instance.

Fig. 6 is a flowchart that illustrates an inventive method for reconnecting conductor connections. The necessary reconnection of the connection of the conductor 1, 21 to the telecommunications equipment 4, 27 is identified in a first
step 31. One of the breakers 16, 25 is then opened with the aid of the operating device 19, 30, so as to break bypassing of the cross-connect 17, 28, step 32. The cross-connect 17, 28 is coupled in between the telecommunications equipment 4, 27 and the conductor 1, 21 whose connection is to be reconnected; step 33. This is achieved by adjusting the cross points 18, 29 with the aid of the operating device 17a, 28 so as to obtain the desired cross-connection. Coupling of the cross-connect between the conductor 1, 21 and the telecommunications equipment 4, 27 is maintained until it is time to make the next routine visit to the plant where manual reconnection of the cross-connected conductor is possible, step 34.

The manual reconnection is carried out on the occasion of the visit, step 35, and one of the breakers 16, 25 is closed, step 36, so that the cross-connect 17, 28 will be by-passed between the conductor and the telecommunications equipment and so that the cross-connecting resources in the cross-connect used for the earlier cross-connection can be released.

There is provided in accordance with the invention an arrangement and a method for reconnecting conductors connected to telecommunications equipment that have many advantages over earlier known solutions. When practising the invention, it is not necessary to make special visits to a telecommunications node in order to effect reconnection of conductor connections manually, since the connections can first be reconnected by remote control with the aid of a cross-connect and then carried out manually on the occasion of a routine visit to the node. The invention also enables relatively small cross-connects to be used for the remotely controlled reconnections of the conductors, since the cross-connect only needs to handle those conductor reconnections that are required between two routine visits to the node. A cross-connect, and then particularly an MXC, is expensive and the more crosspoints that it includes the more expensive it becomes. A cross-connect that contains fewer crosspoints is not only less expensive but easier to manage and maintain.
CLAIMS

1. An arrangement for switching conductor connections to telecommunications equipment, wherein the arrangement is able to reconnect at least one conductor (1a, 21) from one connection to at least a first input (11a, 26) of a telecommunications equipment (4, 27) to a connection to at least a second input (11b, 26) of the telecommunications equipment, and wherein said arrangement includes at least one cross-connect (17, 28) through which said conductor can be reconnected by remote control, characterised in that the connection to the inputs of the telecommunications equipment passes via a breaking function (15, 24) that includes at least one breaker (16a, 25) and at least one operating device (19, 30), wherein when in a first mode said breaking function (15, 24) ensures that the conductor connection to said telecommunications equipment (4, 27) by-passes the cross-connect (17, 28), and wherein when in a second mode said breaking function (15, 24) ensures that the cross-connect by-pass is broken.

2. An arrangement according to Claim 1, characterised in that the arrangement supports manual reconnection such that the conductor will be connected to the second input (11b, 26) even when the breaking function (15, 24) is in its first mode.

3. An arrangement according to Claim 2, characterised in that the conductor (1a, 21) is connected to the telecommunications equipment (4, 27) via a distribution frame (3, 22) which is placed between the conductor and the breaking function (15, 24) and in which distribution frame the manual reconnection can be carried out.

4. An arrangement according to Claim 3, characterised in that the conductor (1a) connects subscriber equipment (2a) to the telecommunications equipment (4), the cross-connect (17) is an MXC, the distribution frame (3) is an MDF, the first input (11a) is associated with a first equipment (12a) for handling a first type
of communication; and in that the second input (11b) is associated with a second equipment (12b) for handling a second type of communication.

5. An arrangement according to Claim 3, characterised in that the telecommunications equipment (27) consists of a first transmission equipment, the conductor (21) connects second transmission equipment (20) to the telecommunications equipment (27), the cross-connect (28) is a DXC, and in that the distribution frame (22) is a DDF.

6. An arrangement according to Claim 3, characterised in that the telecommunications equipment (27) consists of a first transmission equipment, the conductor (21) connects a second transmission equipment (20) to the telecommunications equipment (27), the cross-connect (28) is an OXC, and in that the distribution frame (22) is an ODF.

7. A method of reconnecting conductor connections to telecommunications equipment, which method enables at least one conductor (1a, 21) to be reconnected from a connection to at least a first input (11a, 26) of a telecommunications equipment (4, 27) to a second input (11b, 26) of said telecommunications equipment (4, 27), wherein said method includes the steps of identifying (31) the second input to which the conductor shall be reconnected, and setting by (32) remote control of a cross-connect (17, 28) for cross-connecting the conductor (1a, 21) to the second input (11a, 26), and wherein said method is characterised in that the conductor (1a, 21) is connected to the first input (11a, 26) via a breaking function (15, 24) in a first mode, wherein said breaking function includes at least one breaker (16, 25) and at least one operating device (19, 30); in that the connection of the conductor (1a, 21) to the telecommunications equipment (4, 27) by-passes the cross-connect (17, 28) when said breaking function (15, 24) is in its first mode; and in that the method also includes a step (33) in which the breaking function is placed in a second mode so that by-passing of the cross-connect (17, 28) is broken, whereafter the cross-connect is taken into use and cross-connects the conductor to the second input (11b, 26).
8. A method according to Claim 7, characterised in that subsequent to said remotely controlled reconnection, the conductor (1a, 21) is reconnected manually to the second input (11b, 26) on the occasion of a visit to a plant where the conductor connection can be re-arranged manually, and the breaking function (15, 24) is set to its first mode so that the cross-connection (17, 28) is by-passed by the connection of the conductor (1a, 21) to the second input (11b, 26).

9. A method according to Claim 8, characterised in that the conductor (1a, 21) is connected to the telecommunications equipment (4, 27) via a distribution frame (3, 22) which is placed between the conductor (1a, 21) and the breaking function (15, 24); and in that the manual reconnection is effectuated in the distribution frame (3, 22).

10. A method according to Claim 9, characterised in that the conductor (1a) connects subscriber equipment (2a) to the telecommunications equipment (4), the cross-connect (17) is an MXC, the distribution frame (3) is an MDF, the first input (11a) is associated with a first equipment (12a) for handling a first type of communication; and in that the second input (11b) is associated with a second equipment (12b) for handling a second type of communication.

11. A method according to Claim 9, characterised in that the telecommunications equipment (27) consists of a first transmission equipment, the conductor (21) connects second transmission equipment (20) to the telecommunications equipment, the cross-connect (28) is a DXC, and in that the distribution frame (22) is a DDF.

12. A method according to Claim 9, characterised in that the telecommunications equipment (27) consists of a first transmission equipment, the conductor (21) connects a second transmission equipment (20) to the telecommunications equipment, the cross-connect (28) is an OXC, and in that the distribution frame (22) is an ODF.
 Identify 31

 Open the breaker 32

 Adjust 33

 Wait 34

 Reconnect 35

 Close the breaker 36

fig.6
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 3/52, H04M 3/22
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>US 5764754 A (ORTEL ET AL), 9 June 1998 (09.06.98), column 1, line 63 - line 67, column 3, line 13 - line 33; column 3, line 60 - line 67, figures 1,3A,3B, column 4, line 47 - line 49</td>
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<td>A</td>
<td>WO 9506344 A1 (CONX CORPORATION), 12 March 1995 (12.03.95), page 4, line 11 - page 6, line 7</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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