A transit, preferably for electric cables, comprising a plurality of cable transit elements (8, 12, 13, 16, 17) which are included in a cable transit frame (7a), and which are so adapted that they embrace a plurality of cables (9, 14) extending through the cable transit, or plugs (10, 15) which define temporary closing of cable openings. In order to arrive at a transit comprising fewer components for thereby giving a more stable construction, a simpler mounting, a simpler remounting and fewer sealing surfaces, it is according to the invention suggested that the cable transit elements comprise a combination of uninterrupted plates (8, 13, 17) having recesses (8a, 13a, 17a) for the through-going of cables, as well as individual elements (12, 16) adapted to the respective recesses (8a, 13a, 17a) in the plate or plates (8, 13, 17). The alteration between the uninterrupted plates and the individual elements is preferably made such that the cables "rest" on the plates, whereas the individual elements embrace the cable and/or plugs at the upper side thereof. Such a cable transit renders a favourable method for the pulling of cables (9, 14), especially when most of or all of the uninterrupted plates (8, 13, 17) are put in position at first and thereby define guidings for the pulling, which thereby is not bound by a special sequence.
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Transition, preferably for electric cables, and method for the assembly of such a transition

The present invention relates to a transit, preferably for electric cables, comprising a plurality of cable transit elements which are included in a cable transit frame, and which are so shaped that they embrace a plurality of cables extending through the cable transit, or plugs which define a temporary closure of cable openings.

The invention also relates to a method for assembling such cable transit.

There are previously known cable transits which comprise a plurality of cable transit elements, see for example Norwegian Patent Application 85.3167. According to this known technique there is during the assembly of the cable transit, firstly mounted a plurality of various cable transit elements at the bottom of the frame which embraces the cable transit. On this plurality of cable transit elements there are mounted lower halves of further cable transit elements which are to embrace the cables or plugs which thereafter are put into position in the transit. After the first row of cables has been put in position on the further elements, corresponding halves are put into position on top on the cables, whereafter side sections and another row of individual halves are put into position for the next row of cables and/or plugs.

In other words there are according this technique used a large number of individual elements for putting together such transits, which includes much preliminary work as regards the preparation of the individual elements for the fitting thereof to each other and to the plugs or cables which are to be put into the transit.

From SE publication 366614 there is described a cable transit comprising filling-in elements, but these have a
limited extension and is positioned uppermost and lowermost in the cable transit. Further, it is in this Patent publication discussed a vertical guiding means, but this is composed of a series of elements.

SE Patent publication 414439 refers to transversally extending supporting elements having a width corresponding to the width of a cable transit, the supporting elements being adapted to be pressed against end flanges of pipe-shaped electric cable embracing elements for the implementation of a gas tight transit.

From DE Patent publication 3219775 there is known a packing element having a plurality of rececces, there being between the rececces provided cuttings which uppermost merge into hinges in the form of short webs which easily can be cut through for the forming of individual elements.

The object of the present invention is to give instructions for a new cable transit which reduces the number of individual elements of which previously known cable transits are composed. The invention is also aiming for providing a cable transit which renders a more stable construction, which is simpler to mount, simpler to dismount, and which render fewer sealing surfaces for the finished composed transit.

According to the invention the above problem is solved in connection with a transit of the type mentioned in the preamble, by the fact that the cable transit elements comprise a combination of uninterrupted plates having rececces for cable transition, as well as individual elements adapted to the individual rececces in the plate.

Preferably, the uninterrupted plates might extend from the one side edge of the cable transit frame to the other side edge.
Thereby is achieved a transit including few individual elements, including the advantages as indicated above, and at the same time there is achieved a simple exchange of cables and/or plugs by means of few individual elements.

Thus in a preferred embodiment of the transit according to the invention there is achieved a combination of uninterrupted plates and individual elements alternating in the upward direction of the frame, there being arranged a first uninterrupted plate at the bottom of the frame, whereas above the plate there is provided a first set of individual elements which are adapted to the plate below and together therewith defining transitions for a first horizontal row of cables and/or plugs, and that above the first set of individual elements there is positioned another uninterrupted plate, and on top of the latter another set of individual elements which define transitions for another horizontal row of cables and/or plugs, etc.

By this combination of uninterrupted plates and individual elements it might be appropriate to apply the technique which is discussed in Norwegian Patent Application 85.3167, i.e. in that the uninterrupted plates as well as the individual elements comprise a narrow portion of resilient material which upon clamping of the plates and the elements in the frame will expand in the frame plane for sealing against cable and/or plugs and adjacent cable transit elements.

This technique is especially favourable for the achievement of a gas tight and water tight cable transit based on a minimum number of transit elements included in the transit.

A method for assembling a transit, preferably a cable transit comprising a plurality of cable transit elements which are included in a cable transit frame, will thus in
accordance with the present invention comprise the following steps:
a) that in the bottom of the frame there is placed a first uninterrupted plate with rececces for the mounting of cables and/or plugs,
b) that thereafter there is pulled a first row of cables which are put into position in individual rececces in the plate and/or there are put into position one or more plugs in a respective rececc,
c) that above the first row of cables and/or plugs there is mounted a first set of individual elements adapted to the individual rececces and the contents thereof,
d) that above the first set of individual elements there is placed another uninterrupted plate which is adapted to the first set of individual elements, and which is provided with rececces for the mounting of cables and/or plugs,
e) that thereafter there is pulled another row of cables which are put into position in respective rececces in the second uninterrupted plate and/or there are put into position one or more plugs in respective rececces,
f) that above the second row of cables and/or plugs there is placed another set of individual elements which are adapted to the individual rececces and the contents thereof,
g) and that the process is possibly repeated until the frame is full, the frame at the top being terminated preferably by means of a whole plate which is adapted to the below arranged set of individual elements and the upper edge of the frame.

Alternatively, the method might be executed by first of all putting in position most of the uninterrupted plates or the total number thereof, and by so doing there is established guidings for the cables which at a latest stage are to be pulled through the cable transit.

It will then be possible to pull the cables in a substantially independent sequence, which renders great flexi-
bility and better adaption of the individual cables. It is accordingly possible to spread the pulling at several levels, and at the same time there is achieved an excellent guiding for the pulling of the individual cables independently of a given pulling sequence.

Further features and advantages of the present invention will appear from the following description which is to be read in connection with the appended drawings.

Fig. 1 comprising Fig. 1a - 1f, illustrate diagramatically various embodiments of known cable transit elements which are included in a cable transit frame housing a known cable transit.

Fig. 2 illustrates the elements of Fig. 1 mounted in a frame.

Fig. 3 illustrates diagramatically a cut out of a cable transit implemented in accordance with the teachings of the present invention.

In Fig. 1a - 1f there are illustrated various embodiments of known cable transit elements which are included in a cable transit frame, as well as a clamping means 1f.

The individual elements can be implemented in a manner as known per se, or as discussed in connection with Norwegian Patent Application 85.3167 concerning the provision of a gas tight and water tight transit. In Fig. 2 there are illustrated the various elements according to Fig. 1 mounted in a frame which is generally designated by 7.

The first thing which is done in connection with the cable transit according to Fig. 2, is that a first grid is put into the frame, i.e. at both sides thereof. Thereafter, the cable transit elements illustrated in Fig. 1a and 1b, are mounted into the frame, i.e. the elements A
and A1, as well as the elements B and B1. Thereafter, there are put into position further individual elements, i.e. the lower halves illustrated in Fig. 1c, i.e. the elements C and C1, possibly as one piece which is composed of the element C and the element C1, as this is discussed in the above mentioned Patent Application. After this, a first row of cables are pulled and put into position in the elements C - C1. Thereafter, the upper halves of the elements C - C1 are put into position above the cables, and then the side sections which are illustrated in Fig. 1d, namely the sections D and D1 and another row of lower halves C - C1, are put in position for the next cable row.

Thereafter, cable row number two is put into position in the available row of cable transit elements C - C1, and the upper halves of the cable elements are in position above the cables.

This procedure is repeated until the complete frame is full, whereafter possible openings are closed by means of the massive profiles or the plugs illustrated in Fig. 1e.

When all the cables have been pulled and the frame is completely closed, the grid walls on the one side is put under moderate pressure by means of screw connections in the outer flange of the frame.

As appearing from the above discussed cable transit and the assembly thereof, the cable transit comprises a series of individual elements which require much preliminary work as regards their preparation and mutual adaption. Besides, such a great number of individual elements will involve many sealing surfaces which must be sealed during the final mounting of the transit, a fact which includes a larger risk for leakage in case the finished assembled transit is to be gas tight and water tight.
In the new embodiment for a cable transit, as this appears from Fig. 3, there is provided an alteration between uninterrupted plates on which the cable is to "rest", and individual elements embracing either the plugs or the cables. Such a construction of cable transits including alternating plates and individual elements entail fewer components, a more stable construction, a simpler mounting, a simpler dismounting and fewer sealing surfaces and accordingly a more reliable transit as regards tightness in connection with gas and water.

In the cable transit according to Fig. 3 which illustrates a non-limiting embodiment of the transit according to the invention, the assembly thereof can be provided in several various manners.

A first manner is to the fact that in the bottom of the frame 7a, there is mounted a first uninterrupted plate 8 having receces 8a for the mounting of cables and/or plugs 10. Because there is used an uninterrupted plate 8, it is avoided to use all the individual elements which are discussed above in connection with prior art technique according to Fig. 2.

After a first row of cables 9 have been pulled through and brought into position in respective receces 8a, or there have been put into position one or more plugs 10 in the individual receces, there are above the first row of cables and/or plugs mounted a first set of individual elements 12 which are adapted to the individual receces 8a in the bottom plate 8 and to the contents 9 and/or 10 in said receces.

Above the first set of individual elements 12 there is thereafter mounted a second uninterrupted plate 13 which
is adapted to the first set of individual elements 12, and which is provided with receces 13a for the mounting of a second row of cables and/or plugs, here illustrated by means reference number 14 and 15, respectively.

Above the second row of cables and/or plugs 14, 15 there are placed another set of individual elements 16 which are adapted to the individual recesses 13a in the whole uninterrupted plate 13 arranged therebelow.

Above this second set of individual elements 16 there is thereafter mounted a third uninterrupted plate 17 which possibly can be provided with receces 17a, or which at the top can be terminated with a plane surface which fits to the upper edge of the frame.

Possibly, the above mentioned technique can be repeated with several alternations between individual elements and uninterrupted plates, the finished transit at the top being terminated preferably with a whole plate adapted to a subarranged set of individual elements and the upper edge of the frame.

Another manner of putting togheter a cable transit resides in firstly putting in position most of or all of the uninterrupted plates 8, 13, 17, said plates at the endedges resting on each other and comprising a plurality of receces 8a, 13a, 17a which define guidings for a later pulling of cables 9, 14.

Such an assembly of the cable transit includes that the pulling of cables can be spread to several levels without being limited to any special sequence.

After having pulled the cables in position and after possible plugs have been put in position in unoccupied receces, the individual elements 12, 16 are finally put in position.
In a later exchange of cables and/or plugs it is then only necessary to remove one or more individual elements 12, 16 for one or more cables or plugs which are to be exchanged, and this will in connection with the present cable transit include a relatively simple and time saving operation.

It is be to understood that the individual elements and the plates can comprise a small portion of resilient material which upon clamping of the plates and the elements in the frame expand in the frame plane for sealing against cable and/or plugs and adjacent cable transit elements.

This technique is especially favourable for achieving a gas tight and water tight cable transit based on a minimum number of transit elements included therein.

Further, it is to be understood that the individual elements and the plates can comprise halves, which possibly are put together individually in the frame, which can be of interest if a completely gas tight or water tight transit is not required.

Finally, it is to be understood that the expression individual elements covers elements which preferably are adapted to one cable transit or a plug transit, but which also can be adapted to several cable transits or plug transits. As regards the plates these will preferably extend from the one side of the frame to the other. Besides, the alteration between plates and individual elements can possibly be executed in arbitrary direction relative to the edges of the frame.

In the present cable transit, and especially in the cases where the uninterrupted plates are put in position for the pulling of cables, it will more easily be achieved a favourable cable guiding at an early stage of the pulling operation. By providing a predetermined positioning of
the individual cables in the transit, it is thus achieved an immediate correct cable geometry.

Without the guiding provided for by the present cable transit, the cables will in the beginning take a slanted position relative to the cable transit, which in connection with a later lining up and final mounting of the cables can give to tense cables with unwanted stresses.
1. Transit, preferably for electric cables, comprising a plurality of cable transits which are included in a cable transit frame, and which are so shaped that they embrace a plurality of cables extending throughout the cable transit, or plugs which define a temporary closure of cable openings, characterized in that the cable transit elements comprise a combination of uninterrupted plates (8, 13, 17) having recesses (8a, 13a, 17a) for cable transition, as well as individual elements (12, 16) adapted to the individual recesses in the plates (8, 13, 17).

2. Transit as stated in claim 1, characterized in that the uninterrupted plates (8, 13, 17) extend from the one side edge of the cable transit frame (7a) to the other side edge.

3. Transit as stated in claim 1 or 2, characterized in that the combination of uninterrupted plates (8, 13, 17) and the individual elements (12, 16) alternates in the upward direction of the frame, there being arranged a first uninterrupted plate (8) at the bottom of the frame, whereas above the first plate (8) there is arranged a first set of individual elements (12) which are adapted to the plate (8) below and together therewith defining transits (8a) for a first horizontal row of cables (9) and/or plugs (10), and that above the first set of individual elements (12) there is arranged a second uninterrupted plate (13) having on its top arranged a second set of individual elements (16) which define transits for a second horizontal row of cables (14) and/or plugs (15), etc.

4. Transit as stated in any of claims 1 - 3, characterized in that the uninterrupted plates (8, 13, 17) as well as the individual elements (12, 16) comprise a narrow portion of resilient material, which upon clamping of the
plates and the elements in the frame expend in the frame plane for sealing against cable and/or plugs and adjacent cable transit elements.

5. Transit as stated in any of the claims 1 - 4, characterized in that the plates and the individual elements comprise pairs of assembled part elements which at the one end is provided with a narrow portion of resilient material.

6. Method for the assembly of a transit, preferably a cable transit comprising a plurality of cable transit elements included in a cable transit frame, characterized in that the method comprises the following steps:
a) that in the bottom of frame (7a) there is arranged a first uninterrupted plate (8) having recesses (8a) for the mounting of cables (9) and/or plugs (10),
b) that a first row of cables (9) is thereafter pulled and put into position in respective recess (8a) in the plate (8) and/or there is put in position one or more plugs (10) in each recess (8a),
c) that above the first row of cables (9) and/or plugs (10) there is mounted a first set of individual elements (12) adapted to the respective recesses and the contents thereof,
d) that above the first set of individual elements (12) there is mounted a second uninterrupted plate (13) which is adapted to a first set of individual elements (12), and which is provided with recesses (13a) for the mounting of cables and/or plugs,
e) that thereafter there is pulled a second row of cables (14) which is put into position in respective recess (13a) in the plate (13) and/or there are put in position one or more plugs (15) in each recess (13a),
f) that above the second row of cables (14) and/or plugs (15) there is mounted a second set of individual elements (16) adapted to the individual recesses (13a) and the contents thereof,
g) and that the process is possibly repeated until the
frame is full, the frame at the top preferably being terminated by means of a hole plate adapted to a sub-arranged set of individual elements and the upper edge of the frame.

7. Method for the assembly of a transit, preferably a cable transit comprising a plurality of cable transit elements included in a cable transit frame, characterized in that the method comprises the following steps:
   a) that in the frame there are mounted a plurality of uninterrupted plates (8, 13, 17, respectively) having recesses (8a, 13a, 17a, respectively) for the mounting of cables (9, 14, respectively) and/or plugs (10, 15, respectively) in each recess,
   b) that cables (9, 14, respectively) are pulled or plugs (10, 15, respectively) are mounted in an arbitrary sequence at various height or side positions in the transit, and
   c) that above the pulled cables (9, 14, respectively) and/or the mounted plugs (10, 15, respectively) there are mounted individual elements (12, 16, respectively) adapted to the respective recesses (13a, 17a, respectively).

8. Method as stated in claims 6 or 7, characterized in that there are used plates and individual elements comprising a narrow portion of resilient material which upon clamping of the plates and the elements in the frame expand in the frame plane for sealing against cables and/or plugs and adjacent cable transit elements.

9. Method as claimed in 8, characterized in that there are used plates and individual elements comprising pairs of assembled part elements which at each one end is provided with a narrow portion of a resilient material.
**INTERNATIONAL SEARCH REPORT**

International Application No: PCT/NO87/00024

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**I. CLASSIFICATION OF SUBJECT MATTER**

According to International Patent Classification (IPC) or to both National Classification and IPC:

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**II. FIELDS SEARCHED**

Minimum Documentation Searched:

Classification System:

- IPC
- Nat Cl

Classification Symbols:

- IPC: F 16 L 5/00, /02; H 01 B 17/26, /30; H 02 G 3/22, 15/013
- Nat Cl: 21C: 10/01, /05

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched:

SE, NO, DK, FL classes as above

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**III. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>DE, A1, 3 219 775 (RUDOLF DÖPFL GmbH- UND SCHEHERISTECHNIK) 1 June 1983</td>
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**IV. CERTIFICATION**

Date of the Actual Completion of the International Search: 1987-07-09

Date of Mailing of this International Search Report: 1987-07-17

International Searching Authority: Swedish Patent Office

Signature of Authorized Officer: Magnus Westöö

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* Special categories of cited documents:
  - "X" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier document but published on or after the international filing date
  - "L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another document or other special reason (as stated)
  - "O" document referring to an oral disclosure, use exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family
## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

### 11. Fields Searched (cont.)

| US Cl | 174:48, 49, 151-153 |

## OBservations Where Certain Claims Were Found UnSearchable

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers ..., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out specifically.

3. Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

## Observations Where Unity of Invention Is Lacking

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

**Remark on Protest**

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (supplemental sheet (2)) (January 1985)