

VERIFICATION STATEMENT

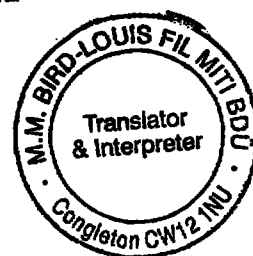
I, **Ms M.M. Bird-Louis** of 24-26 Surrey Drive, Lower Heath, Congleton, Cheshire CW12 1NU, England (UK), hereby refer to my statement dated March 25, 1996 and certify that the translation referred to therein is a true, accurate and complete translation of the German original of **PCT International Application No. PCT/EP 95/01409** as originally filed.

M.M. Bird-Louis

Signature

March 31, 1998

Date/Seal



SG 96 11814-6

PCT APPLICATION + TRANS

M. M. BIRD-LOUIS
Interpreter FIL MITI BDÜ

SG2
= SG1 + Summary
(PCT/EP85/01.405)

CERTIFICATE OF ACCURATE TRANSLATION

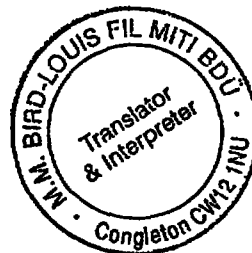
I, the undersigned Ms. M. M. Bird-Louis of 24-26 Surrey Drive, Lower Heath, Congleton, Cheshire, CW12 1NU certify that the translation attached is a true, accurate and complete translation of the German original.

Signature

March 25, 1996,

M. M. Bird-Louis

Ms. M. M. Bird-Louis



Fellow of the Institute of Linguists
Member of the Institute of Translation and Interpreting
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M. M. BIRD-LOUIS
Interpreter FIL MITI BDÜ

SG₂
= SG₁ + summary
(=PCT/EP 85/01.409)

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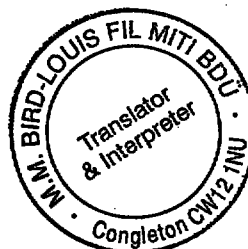
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Transl. of
what doc.?
SG 9611814-6

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200.678

09 April 1994/K

Reg. No. 200 678

J A C O B GmbH Elektrotechnische Fabrik
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Angular Cable Gland

Angular Cable Gland

Specification

The invention relates to an angular cable gland with and without strain release, for electronic equipment, i.e. a so-called an angular cable gland according to the generic term of Claims 1 or 5 (water-tight design).

The state of technology is based on 90° cable glands only consisting of two enclosure sections, either connected rigidly or articulated with each other. In the latter so-called hinged angles, an outwardly square-shaped enclosure is diagonally divided into the two externally triangular sections forming a hinge at the external corner of the enclosure, allowing the enclosure to be opened by 90°, with the two bores of the two sections therefore being aligned to form a straight cable gland. This is followed by the enclosure being folded for shutting, with the cable bent in a right angle as in rigid 90° cable glands. A **disadvantage** of these two cable glands is the rigid bending stress on the cable in the gland and its tedious pulling over an angle of 90° and/or the expensive manufacture of the hinge mechanism.

It is the **Aim** of the invention to reduce the stress on the cable and to facilitate pulling the cable through based on a medium manufacturing costs level.

The **solution** of this task is an angular cable gland according to Claims 1 and/or 2.

The **advantage** of this solution is the reduced curvature radius of the extended quarter circle-shaped cable curvature and easy separation of the two halves of the enclosure to which the cable is passed in two individual steps, with both sections being reunited, in a cable deflection of 90° affected by at least one intermediate section, preferably one centre section of the enclosure.

In a number of preferred embodiments of the angular cable gland according to the invention, the device has been designed according to Claim 3 in such a way as to allow the other half after to be fastened to the cable attaching its one section to the enclosure of the device and pulling the cables through both sections and connecting them with each other to be rotated in the direction from which the cable at the equipment enclosure originated.

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Other useful embodiments of the angular cable gland according to the invention, in particular by an engaging direction at the rotary connection of the two enclosure sections and/or by a quick-release connection of the same, result from Claims 4 to 10.

The following is a detailed description of the invention based on several embodiments presented as examples in the drawings based on several examples of embodiments presented in the drawing of the angular cable gland according to the invention. Where:

Fig 1a to c each are a centre longitudinal section and/or a view of a variation of the first embodiment

Fig. 2 is an alternative to the first embodiment in the same presentation

Fig. 3 is a second embodiment in the same presentation.

Where the shown angular cable glands agree, the same reference for this were used for identical or corresponding parts.

The embodiments more or less copied from the utility model 92 04 256 (Jacob) in the left-hand or top half include one enclosure each having left end and a single central intermediate and one bottom end section 10, 12 and/or 14 including straight bores, the axes of which are intersecting each other in pairs in a obtuse angle of less than 120° , resulting overall in a rectangular, slightly curved deflection of the cable which is not shown.

The central intermediate section 12 consists of two parts, i.e. one radial external part 12.1, which is an integral part of the left end section 10 and a coaxial, radial internal part 12.2, which is designed as an integral part of the bottom end section 14, therefore forming two sections 10-12.1 and/or 14-12.2 of the enclosure assembled in the direction of the central axes of the bore which can be separated again.

A combined rotary and quick-release coupling of the two parts 10.1 and/or 10.2 to be locked to each other, after central intermediate section and therefore the two enclosure halves 10-12.1 and/or 14-12.2 is formed by several biased tabs 16 of the part 12.2 of the same and an annular area 18 of its other part 12.1 - as described hereafter.

In addition to the engaging mechanism not shown at the rotary coupling to stop the enclosure section in a specific rotary position to each other in order to make the solid angle formed by the two halves level, radially enclosed, actually clamped O-ring 20 is

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provided for sealing the joint in the enclosure at the parting point of the intermediate section 10.

All options and alternatives of the first embodiment have the common feature that the parallel tabs 16 are projecting radially to the inside.

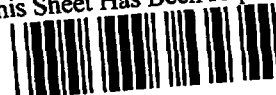
Fig. 1, the internal axial annular area 18 of the more or less cylindrical part 12.1 of the intermediate section - which is formed in Fig. 1a by semicircular sectional raised rings, in Fig. 1b by saw tooth-shaped sectional raised rings and in Fig. 1c by rectangular sectional raised rings and in any case by base section separating the rings - appropriate sectional recesses in the tabs 16.

An axial stop, when plugging the two enclosure halves together result simultaneously by abutting of free tab end and the mount of the O-ring 20 on the one and/or other half. In the alternative, four hooks 22 are moulded on the free tab ends according to Fig. 2, forming a continuous tapered sheath area 24, engaging behind an annular area 18' provided behind a radial plane, therefore extending radially. The four tabs 16 of the example, for instance, are divided radially towards the outside and relieved in a circular cylindrical surface 26 of the radial external part 12.1 of the intermediate section.

The second embodiment corresponds to the hooking principle of the alternative (see Fig. 2) of the first and is mainly differentiated by the fact that, for instance, the four tabs 16' are provided with hooks 22', in this case on the other part of the intermediate section 12.1 in reverse axial direction and radially projecting externally, with the annular surface 18'' being designed as a recess external shoulder on the part of the intermediate section 12.2, with four hooks 22' following radially, externally and flashing on this part 12.1, for instance.

The O-Ring has also changed its position and is now provided on the roof the tabs 16'.

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C L A I M S

- 1.) An angular cable gland for electrical equipment (angular cable gland) including an enclosure consisting of a minimum of two sections (10 and 14) having one continuous bore each, the adjacent axes of which at least intersect after assembly, characterised in that the two end sections (10 and 14) are connected with each other for entry and/or exit of the cable by means of at least one intermediate section (12), preferably a central section (12), following in an obtuse angle to the two adjacent sections (10 and 14).
- 2.) A cable gland according to Claim 1, characterised in that one of the intermediate sections (12) is divided and its two sections (12.1 and 12.2) are separably connected with each other.
- 3.) A cable gland according to Claim 2, characterised by a rotary coupling of both parts (12.1 and 12.2) of each intermediate section (12), with the rotary axis coinciding with the axis of a bore of this joined section (12).
- 4.) A cable gland according to Claim 2 or 3, characterised by a releasable locking mechanism (quick-release coupling) of the two parts (12.1 and 12.2) of the intermediate section (12) to each other.
- 5.) A waterproof cable gland according to Claim 4 including a seal (20) enclosing the axes of a bore, characterised in that the seal (20) is provided within the area of the locking mechanism.
- 6.) A cable gland according to one of Claims 3 to 5, characterised in that the rotary connection is provided with an engaging mechanism which is effective when the axes of the bore of the two adjacent sections (10 and 14) and the intermediate section (12) connecting the same is on the same level.
- 7.) A cable gland according to one of Claims 4 to 6 characterised in that the locking mechanism on one (12.2) of the two parts (12.1 and 12.2) of the intermediate section (12) includes preferably a radial internal sectional tabs (16) distributed over circumference of the bore and an annular surface (18) of a matching section on the other part (12.1) of this section (12).

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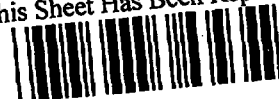


8.) A cable gland according to Claim 7, characterised in that the matching sections of each tab (16) and/or the annular surface (18) are periodically moulded, parallel to the axes in such a way that there is a flush connection of the tabs (16) firmly connected to the annular surface.

9.) A cable gland according to Claim 8, characterised in that the odd section of the annular surface (18) is formed by identical, successive actual semicircular or rectangular of saw tooth-shaped projections.

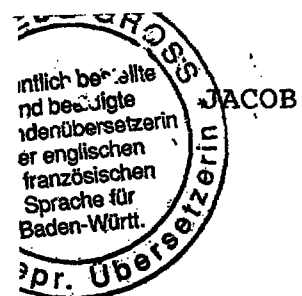
10.) A cable gland according to Claim 7 or 8, characterised in that the tabs (16) are provided radially with radial external hooks (22) and that the annular surface (18) is designed as a shoulder of the enclosure.

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S U M M A R Y

In order to avoid bending stress on an inserted cable in an angular cable gland consisting of two enclosure sections, the bore axes of which intersect, occurring due to a conventional right-angle of intersection, it is suggested to connect the two end sections (10 and 14) of the enclosure by means of an intermediate section (12) of the same in such way that each intermediate section is adjacent to the two end sections in an obtuse angle.



SG 96.11814-6

- IPER TRANS -

VERIFICATION
of translation

I, Elfriede GROSS, Goethestr. 21, D-74395 Mundelsheim, ALLEMAGNE, hereby declare that I am conversant with the German and the English language and that I am the officially appointed sworn document translator from German into English, of the German language document attached and certify that to the best of my knowledge and belief the following is a true/complete and correct translation into English of the attached German language text of the international application PCT/EP 95/01409 in its original version as amended on 30.03.96 and 21.06.96 respectively during the international preliminary examination of said international application.

Mundelsheim/Württ. (DE),
17. December 1997

Elfriede GROSS



E. Gross

REPLACEMENT SHEET

16 OCT 1996

- 1 -

A n g l e d threaded cable unionD e s c r i p t i o n

The invention relates to an angled cable passage with or without strain relief for electrotechnical devices, that means a so-called angled threaded cable union as described in claim 1.~~ex-5-(waterproof-embodiment).~~

cancelled by
amendment
21.06.96

The state of the art are 90° threaded cable unions with only two housing parts linked with each other either rigidly or articulatedly. The latter one, called hinged angle, is a rectangularly shaped housing divided diagonally into two triangular parts which at the outer corner of the housing form a hinge due to which the housing can be opened by 90° so that the two holes of the two parts are in alignment with the straight cable passage. Thereafter the housing is clap shut whereby the cable is bent rectangularly, like in the rigid 90° threaded cable unions.

The disadvantages of the above two types of threaded cable unions are the high bending stress of the passing cable and the difficulty to pull it through 90°, as well as the expensive manufacture of the clap mechanism.

It is the object of this invention to reduce the stress on the cable and to facilitate the cable passage, with medium manufacture expenditure.

The solution of this task is an angled threaded cable union as described in claims 1 and 2.

The advantage of this solution, with a cable bend of 90°, is the reduction of the bend/^{radius} obtained by an elongated quarter circle bend passing through at least one intermediate section, preferably a central section, of the housing, respectively the simple separation possibility of the two housing halves through which the cable can be pulled in two single steps whereafter these two halves can be reunited. as above

In a number of preferred versions of the angled threaded cable union according to the invention, said cable union is conceived according to claim 3 in such a way that after fastening its one half at the device housing and after pulling the cable through both halves and thereafter connecting them, the other

16 OCT 1996

- 2 -

half which has to be clamped to the cable can be turned in the direction from which the cable arrives at the housing of the device.

Other favourable embodiments of the angled threaded cable union according to the invention are described in claims 4 to 10, in particular, a cable union provided with a catch at the rotatable connection of the two housing halves and/or with a snap-in connection of said housing halves.

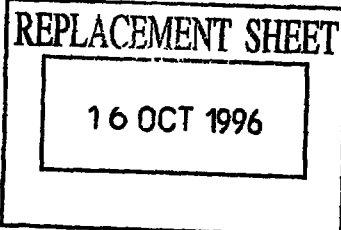
Both DE-A 36 14 198 as well as GB-A-2 253 458 disclose an angled threaded cable union according to claim 1 with not more than two housing parts, i.e. with exactly two end parts for the inlet and outlet of the cable. But these threaded cable unions are lacking at least one intermediate part of the housing, in particular a central part thereof, which makes it possible that the cable after it is pulled through, instead of being bent on one spot by 90 °, is bent gently on at least two spots by more than 90° . In the two known angled threaded cable unions the two mitre cut end parts are meeting in a way that they can be arranged temporarily colinear for pulling the cable straight through, however, thereafter are at right angles to each other, unless another angle between 90° and 180° is chosen which, however, as a whole, would not produce a right angled cable path.

In the following, the invention will be explained in detail by way of example in preferred embodiments with reference to the attached drawings in which

Fig. 1a to 1c each show a longitudinal cross sectional view of one half of the first embodiment

Fig. 2 shows an alternative of the first embodiment in the same view as above

Fig. 3 shows a second embodiment in the same view as above.



- 3 -

As far as the angled threaded cable unions are complying with each other, the same reference numbers are used for equal or corresponding parts.

Each of the embodiments, the left or upper half of which is built largely like the utility model 92 04 256 (Jacob), is provided with one housing with a left end section, a central intermediate section, and a lower end section 10, 12, and 14 which all have straight bores the axes of which intersect pairwise obtuse-angled at 120° so that as a whole a rectangular gentle bend of the not shown cable is obtained.

The central intermediate section 12 consists of two parts, i.e. a radial outer part 12.1 which forms one piece with the left end section 10, and a coaxial radial inner part 12.2 which forms one piece with the lower end section 14 so that there are two housing halves 10 - 12.1 and 14 - 12.2 which can be plugged together towards the central bore axis and separated.

A combined turning and snap-in connection of the two interlocking parts 10.1 and 10.2 of the central intermediate section and thus of the two housing halves 10 - 12.1 and 14 - 12.2 is formed by means of several axis parallel springy tongues 16 distributed regularly over the circumference of the bore of the intermediate section 10 in one part 12.2 of the foregoing and by means of a ring surface 18 of its other part 12.1. - how this is obtained will be described below.

Beside a not shown snap-in device at the rotatable connection for locking the housing halves at a definite turning position to each other in a way that the solid angle formed by said two halves is flat, a radially held axially clamped O-ring 20 is provided to seal the housing joint at the separation of the intermediate section 10.

All versions and alternatives to the first embodiment have in common that the parallel tongues 16 are located radially inside.

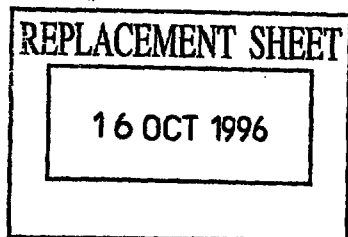
With respect to said versions, according to fig. 1 the generally speaking cylindrical part 12.1 of the intermediate section with its inner axially extending ring surface 18, which in fig. 1a is formed by semicircularly profiled raised rings, in fig. 1b by saw-tooth profiled raised rings, and in fig. 1c by rectangularly profiled raised rings as well as the pertaining separating basic surface portions, includes the correspondingly profiled recesses of the tongues 16.

An axial stop when the two housing halves are plugged together is obtained simultaneously by the meeting of the free tongue ends and the holder of the O-ring 20 at the one respectively the other half.

The alternative version acc. to fig. 2 shows for example four hooks 22 at the free tongue ends which form an interrupted conical surface 24 and reach behind the radial extending ring surface 18' which here lies on a radial plane. The four tongues 16 of said example are radially stress-released adjacent to a cylindrical surface 26 of the radial outer part 12.1 of the intermediate section.

The second embodiment shows the same hooking principle as the alternative (see fig. 2) of the first one, but it differs mainly in the fact that for example the four tongues 16' with hooks 22' are located in the other part 12.1 of the intermediate section in opposite axial direction and radially outside, whereby the ring surface 18" is formed as deepened outer shoulder of part 12.2 of the intermediate section and the four hooks 22' of this example are radially outside flush adjacent to this part 12.2.

The O-ring, too, has another place and is now located at the roots of the tongues 16'.



C l a i m s



- 1) An angled cable passage for electrotechnical devices (angled threaded cable union) with a housing which has at least two sections (10 and 14) each with a through bore the axes of which intersect at least after installation, c h a r a c t e r i z e d i n that the two end sections (10 and 14) for inlet and outlet of the cable are linked with each other by at least one intermediate section (12), preferably a central section (12) which abuts on the two neighbouring sections (10 and 14) in an obtuse angle and thus considerably elongates the cable bend in order to flatten its curve.
- 2) A threaded cable union according to claim 1 characterized in that one of the intermediate sections (12) is divided and its two parts (12.1 and 12.2) are separably connected with each other.
- 3) A threaded cable union according to claim 2 characterized by a rotatable connection of the two parts (12.1 and 12.2) of said intermediate section (12) whereby the rotation axis coincides with the bore axis of the united section (12).
- 4) A threaded cable union according to claims 2 or 3 characterized by a releasable locking (catch lock) of the two parts (12.1 and 12.2) of the intermediate section (12).
- 5) A water-tight cable union according to claim 4 with a sealing ring (20) which circles a bore axis characterized in that the sealing ring (20) is located in the locking area.

added by
amendment
21.06.96



- 6) A threaded cable union according to one of claims 3 to 5 characterized in that the rotatable connection has a catch which becomes effective when the bore axes of the two neighbouring sections (10 and 14) and the intermediate section (12) connecting them are coplanar.
- 7) A threaded cable union according to one of claims 4 to 6 characterized in that the locking at one (12.2) of the two parts (12.1 and 12.2) of the intermediate section (12) preferably radially inside, has profiled tongues (16) distributed over the circumference of the bore, and that the other part (12.1) of said section (12) has a ring surface (18) of complementary profile.
- 8) A threaded cable union according to claim 7 characterized in that the coinciding profiles of each tongue (16) respectively the ring surface (18) are periodically axis parallel formed in a way that the tongues (16) in frictional connection with the ring surface generate a form-closed connection with said ring surface.
- 9) A threaded cable union according to claim 8 characterized in that the irregular profile of the ring surface (18) is formed by axially successive equal semicircular or rectangular or saw-tooth projections.
- 10) A threaded cable union according to claims 7 or 8 characterized in that the tongues (16) are provided with preferably radially outside located hooks (22) and the ring surface (18) is formed as a shoulder of the housing.

