

A CABLE PENETRATION DEVICE

The present invention relates to a cable penetration device of the kind defined in the preamble of the accompanying Claim 1.

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A cable penetration device, also called a cable transit device, that enables a plurality of cables to be fitted sealingly in an opening in the wall of a housing or some like structure is known, for instance, from US-5,235,138, US-4,267,401 or DE-U1-298 03 091, wherewith said device includes a rubber plug which has several through-penetrating channels that are plugged with removable stoppers and that are accessible from the circumferential edge of the plug via slits. A clamping plate is disposed on each side of the rubber plug and has openings corresponding to the channels. Tensioning bolts extend through the clamping plates and the rubber plug and function to cause the clamping plates to compress the rubber plug axially, therewith causing its channel walls to seal against cables that pass through the channels, and so that the plug circumference can be expanded into sealing contact with the wall opening of the cable transit device. The clamping plates must, of necessity, be rigid and takes-up a large part of the area of the wall opening. In addition, it is difficult to fit the cables correctly in practice, since the cables cannot be anchored sealingly in the device until the device is anchored sealingly in the transit opening.

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A similar multi-cable transit device is known from SE-B-460 392, this device being included in the subject matter of the preamble of Claim 1.

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A cable transit device that comprises a tubular sleeve at one end has an external thread for securing said device in a threaded opening through a wall or a housing, for instance a clutch housing, junction box or the like is known, for instance, from GB-A-22 80 317.

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The tubular sleeve has at its other end a thread that co-acts with the thread of a nut. A rubber sleeve (gland) is disposed in the tubular sleeve between a circular shoulder on the nut and a circular shoulder in the tubular sleeve. The rubber sleeve is compressed axially by screwing in the nut, thereby contracting the inner channel wall of the sleeve into sealing engagement around a cable that extends through the cable transit. The cable transit device is conventionally fitted to the housing and the cable is passed through said device and the ring-nut then tightened.

One problem with such cable transit devices is that they do not allow a pre-connected cable to be fitted easily, by pre-connected cable being meant a cable to which there has previously been connected to one end of a cable an electrical connector or contact that is larger than the bore of the rubber sleeve.

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A further drawback is that the cable transit device only allows one single cable to be passed through.

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An object of the present invention is to further develop a cable transit device of the aforesaid kind that will enable several cables, that may be pre-connected to an electrical device, to be passed through the device and secured sealingly at the same time on the one hand, and that can be pre-fitted in a wall opening and enable the cables to be sealingly fastened in a simple fashion on the other hand.

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This object is achieved with the cable transit device defined in the accompanying Claim 1.

Further embodiments of the device will be apparent from the accompanying dependent Claims.

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The sleeve is conveniently supported at each main surface by a support washer that includes an opening which is preferably slightly smaller than the sleeve orifice in the absence of load on said sleeve, so that the axial positional setting or retention of at least some of the modules between the support washers will be improved. Each module has a channel which is suitably filled initially, but which can be exposed. The modules are preferably divided, for instance in a plane axially to the channel, so as to enable the channel to be exposed by mutually separating the modules. The channel is normally plugged with a removable plug. The channel wall may be comprised of parallel layers of material that can be peeled away and therewith give the channel a selectively larger free diameter. The modules may, for instance, have a rectangular outer cross-sectional contour, for instance a square contour, and the sleeve opening may have a contour corresponding to the combined contour of a number of modules placed therein.

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The sleeve and the washers will conveniently have mutually co-acting devices for maintaining the sleeve opening and the washer openings in correct alignment. These

devices prevent relative rotation between the sleeve and respective washers. For instance, the washers may be provided with holes that receive projections on the axial ends of the sleeve to this end.

5 In one embodiment of the invention, the cable transit device may include four modules of square cross-section that together essentially fill the corresponding square opening through the rubber sleeve.

10 Respective modules may be divided in two parts in a plane axially to their throughpassing channels. The channel wall may consist of a tubular elastomeric element built-up of concentric layers which have a relatively low bonding strength in relation to each other, so as to enable the layers to be peeled one from the other and therewith adapt the size of the channel to the size of the cable concerned. The tubular rubber element that defines the channel through the module may be supported by a surrounding module part, which may
15 also be elastically resilient, springy, so that the radially directed compression force from the rubber sleeve can be passed to its tubular sleeve and to the cable circumference via the module body.

20 An inventive cable transit device will now be described with reference to an exemplifying embodiment thereof and also with reference to the accompanying drawing.

Fig. 1 is an expanded perspective view illustrating schematically an inventive cable transit device.

25 Fig. 2 illustrates schematically the device in an assembled state.

Fig. 3 is a schematic illustration of one variant of a module.

30 The device shown in Fig. 1 includes a rigid tightening sleeve 1 which has at one end an external thread 11 for engagement with a corresponding thread in an opening in, for instance, a wall of a coupling housing or junction box (not shown). The sleeve also includes an outer spanner grip 12. Provided on the inside of the sleeve is a circular shoulder 13, and an internal thread 14 at its end distal from the thread 11. A nut 5 includes a support ring 51 which is received in the sleeve 1 with a slight radial clearance, and has an

end 52 which forms a further support shoulder 52. The nut also includes an external thread 53 which interacts with the internal thread 14 of said sleeve; and a spanner grip 54. A rubber compression sleeve 3 has an outer diameter that corresponds to the inner diameter of the sleeve 1 between the shoulders 13, 52. The rubber sleeve 3 has a rectangular, axially throughpassing opening 31 and axially extending projections 32 on each end surface. Lying on each side of the rubber sleeve 3 is a washer 2 whose outer diameter corresponds to the inner diameter of the sleeve 1 between the shoulders 13, 52. Respective washers 2 include a square opening 21 that is slightly smaller than the opening 31, and also include holes 22 that have a size and position that enables them to receive the projections 32 and thereby impart a correct position of rotation of said washers 2 in relation to the sleeve 3, so that their openings 21, 30 will be aligned congruently.

Four modules 4 are mounted in the sleeve opening 31. Each module 4 has a central, axially extending channel 41, which can be fitted with a removable stopper (not shown). The channel 41 may be defined by a tubular element 42 that consists of mutually concentric layers that have limited adhesion to one another, so that said layers can be peeled-off such as to establish a chosen channel diameter. The tubular element 42 may consist of elastic material. The module 4 may comprise an outer module body 43 that receives the element 42. The module body 43 may be elastomeric.

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As the nut 5 is screwed into the sleeve 1, the sleeve 3 is compressed axially and therewith transfers the radially acting compression forces to the circumference of a cable extending through respective channels 41, via the modules and the elements 42. The spanner grip 54 may be arranged to co-act with the sleeve 11 in a manner to limit or restrict compression of the rubber sleeve 3.

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When using the device illustrated in Fig. 2, the device is first fitted in an opening in a coupling housing (not shown), with the exception of the modules 4. Cables are then drawn through the device. Modules 4 of appropriate channel size are then mounted on the cables and caused to fill out the opening 31 in the rubber sleeve 3. The nut 5 is then tightened and the shoulders 13, 52 therewith transfer force to the washers 2 and further to the ends of the rubber sleeve 3, such as to contract the sleeve opening 31 and compress the modules 4 and therewith achieve sealed transit of the cables passing therethrough and anchoring said cables against pulling forces.

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The illustrated modules have a square cross-section and a partition plane that extends parallel to two module sides.

5 A module may include two or more, preferably parallel, channels 41 that lie suitably in the module partition surface, as illustrated in Fig. 3.

The inner wall of the sleeve 1 and the outer wall of the sleeve 3 are suitably adapted to fit together at the centre, and may be cylindrical in shape.

10 After the cable bunch has been sealingly fixated in the cable transit device, the electrical contacts pre-fitted to the cables can be connected easily and reliably to respective corresponding electric contacts in the coupling housing.

CLAIMS

1. A cable transit device including a tubular, elastic sleeve (3), a plurality of elastic module elements (4) each containing at least one cable-accommodating, through-penetrating channel (41) and being divided to permit lateral access to said channel, wherein the modules (4) together fill out the opening (31) of the elastic sleeve, said opening having a shape that corresponds to the resultant outer contour of the mutually tightly combined modules, characterised by a rigid sleeve (1) which includes at one end portion means for securing the rigid sleeve to a wall opening, wherein the sleeve (1) has an inner circular shoulder against which the elastic sleeve (3) is brought into abutment, wherein the rigid sleeve (1) has a thread (11) and a nut (5) that includes a support shoulder (52) which co-acts with the elastic sleeve and that has a thread (53) which interacts with the thread (11) of the rigid sleeve (1); in that the nut has a cable-accommodating central opening; and in that the rigid sleeve (1) has an inner wall corresponding to the outer wall of the elastic sleeve, thereby enabling the cable transit device to be sealed by tightening the nut.
2. A device according to Claim 1, characterised in that the device includes a support washer (2) mounted on each end surface of the elastic sleeve (3) and having an opening (21) that corresponds to the opening (31) of the elastic sleeve (3), wherein the support washers are adapted to transfer force from the shoulder (13) of the rigid sleeve (1) to the elastic sleeve (3) and from the nut shoulder (52) to the sleeve (3) respectively.
3. A device according to Claim 2, characterised in that the support washer (2) has at least one hole that receives a corresponding projection (32) on the end of the elastic sleeve (3), such as to keep the opening of said washer in congruent alignment with the opening of the elastic sleeve (3).
4. A device according to any one of Claims 1-3, characterised in that the modules (4) are divided in a plane axial to the channel; in that the channel is established with the aid of a tubular element (42) that is comprised of mutually concentric layers that can be separated from each other to enable the diameter of the channel to be adapted to the diameter of a cable to be received therein; and in that the tubular element (42) is received in a channel body (43) that defines the cross-sectional shape of the module element and that transfers forces from the rubber sleeve (3) to said element (42).



5. A device according to any one of Claims 1-4, **characterised** in that the modules include several generally parallel channels that lie in the module partition plane.

5 6. A device according to any one of Claims 1-5, **characterised** in that the channels are provided initially with removable sealing elements.

7. A device according to any one of Claims 1-6, **characterised** in that the modules have rectangular cross-sections and a partition plane that is generally parallel with and located centrally between two mutually opposing, parallel outer module surfaces.

