

"Cable entry device"

The present invention is generally concerned with cable entry devices used to pass a cable of any kind through a wall of any kind to which it is sealed, for example for a cable to enter an enclosure of any kind such as a case, cabinet or other enclosure of such type in a sealed manner.

It is more particularly concerned with cable entry devices having a seat with an opening through which the cable is passed and an engagement portion extending annularly around the axis of the opening in the seat, the engagement portion having an outside wall that extends toward the front and connecting it to the seat and an inside wall, set back toward the rear relative to the outside wall, connected to the latter in a U-shape arrangement.

A cable entry device of the above kind is described in French patent application No. 2 402 323 filed as application No. 77 26710 on 2 September 1977.

In the above French patent application the entire device is made from an elastically deformable material.

Although an arrangement of the above kind is effective in terms of providing the required seal, the mechanical retention of the cable is relatively mediocre.

International patent application No. WO96/28862 proposes the use of jaws to assure this mechanical retention.

However, in the above international patent application the jaws are in a separate chamber which leads to a relatively complex overall construction.

Furthermore, the corresponding cable entry device being made as two shells which together form a globally parallelepiped-shape assembly, only two jaws can be provided and for the required mechanical retention to be satisfactory in spite of this the jaws

are in practice in the form of self-wedging catches which further complicates overall construction.

German patent application No. 35 33 418 also proposes the use of jaws, in practice more than two
5 jaws which are circumferentially arranged about the axis of the assembly and separated from each other by slots.

The jaws relate only to the inside wall of the engagement portion, however.

10 They are therefore relatively short.

They are also substantially rectilinear.

As a result, on the one hand, they are operative essentially through their stiffness, like the claws of a washer with its inside periphery divided
15 into claws, which reduces the range of acceptable cable diameters, and, on the other hand, they have to be used in conjunction with actuator means, in this instance fingers forming part of the seat, and this leads to a relatively complex construction in which, formed on a
20 component separate from the seat, the engagement portion is mobile axially relative to the seat, in practice screw-fashion.

Although the above German patent application also discloses a seal, the seal is in the form of a
25 ring to be clamped onto the cable concerned, which implies the use of particular cam arrangements.

In European patent No. 0 753 918, in which the engagement portion is reduced to a single cylindrical wall, the jaws are also in the form of relatively rigid
30 tongues, to be more precise in the form of plates, and each is articulated to the seat by a thinner area forming a hinge which in practice is tangential to a circumference concentric with the axis of the opening in the seat.

35 However, as previously, the jaws are relatively short and substantially rectilinear so that, also as previously, they are operative essentially through

their stiffness, to the detriment of the range of acceptable cable diameters.

Also, ribs must be provided inside the engagement portion to provide them with additional support when necessary and project radially, to the detriment of the available cross section of the engagement portion.

Finally, in European patent application No. 0 753 918 there is no sealing member.

10 A general aim of the present invention is an arrangement which overcomes the above drawbacks.

To be more precise, the present invention consists in a cable entry device of the kind including a seat which has an opening through which a cable can be passed and an engagement portion which extends annularly around the axis of the opening in the seat, this engagement portion having an outside wall which extends toward the front and which is joined to the seat and an inside wall set back rearwardly relative to the outside wall and joined thereto in a U-shaped configuration, characterized in that, conjointly, the engagement portion is circumferentially divided into elastically deformable jaws by slots that extend as far as the seat, in that, where they join onto the seat, the jaws are each embedded therein in a root area tangential to a circumference concentric with the axis of the opening in the seat, and in that the engagement portion which is made of a relatively rigid material is associated with a sealing member globally transverse to the axis of the opening in the seat, at least partly shutting off that opening and made of a relatively flexible material.

Because of their shape and size, and because of the manner in which they are connected to the seat from which they arise, the jaws of the cable entry device in accordance with the invention are essentially operative in bending when a cable is engaged between them.

They therefore cater for a wide range of cable diameters of which they provide effective mechanical retention.

5 More generally the arrangement in accordance with the invention, which lends itself to many different embodiments, has the advantage of reconciling good mechanical retention of the cable with a good seal around the cable.

10 The features and advantages of the invention will emerge further from the following description given by way of example with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a perspective view of a cable entry device in accordance with the invention;

15 Figure 2 is an exploded perspective view of the device;

Figure 3 is an elevation view of its front portion as seen in the direction of the arrow III in Figure 2;

20 Figure 4 shows the detail IV from Figure 3 to a larger scale;

Figure 5 is a view of the front portion in cross section taken along the line V-V in Figure 3 and to a different scale;

25 Figure 6 is an elevation view of the rear portion of the cable entry device concerned as seen in the direction of the arrow VI in Figure 2;

Figure 7 is a view of the rear portion in cross section taken along the line VII-VII in Figure 6 and to a larger scale;

30 Figure 8 is a perspective view derived from that of Figure 1 showing how the cable entry device of the invention is used;

35 Figure 9 is a view of the assembly in cross section taken along the line IX-IX in Figure 8 and to a larger scale;

Figures 10A, 10B, 10C are diagrammatic views in cross section showing how the jaws of the cable entry device of the invention work;

Figure 11 is a perspective view analogous to that of Figure 1 showing a variant of the cable entry device of the invention;

Figure 12 is a view of this variant in axial section taken along the line XII-XII in Figure 11;

Figure 13 is an exploded perspective view of this variant;

Figure 14 is a locally cut away plan view of the front part of this embodiment as seen in the direction of the arrow XIV in Figure 13;

Figure 15 is a perspective view of the rear portion of this variant, shown in isolation;

Figure 16 is an elevation view of the rear portion as seen in the direction of the arrow XVI in Figure 15;

Figure 17 is a top view of it as seen in the direction of the arrow XVII in Figure 16;

Figure 18 is a view in cross section of this variant, similar to that of Figure 9, but with an axial arrangement that is the opposite of that of Figure 9;

Figure 19 is a view in cross section analogous to that of Figure 12 showing a further development of this variant;

Figure 20 is an elevation view analogous to that of Figure 16 and relating to the aforementioned development;

Figure 21 is a view in cross section analogous to that of Figure 12 and relating to another variant of the cable entry device of the invention;

Figure 22 is a perspective view of an entity comprising a plurality of cable entry devices in accordance with the invention seen from the front;

Figure 23 is a partly exploded perspective view of the aforementioned entity seen from the rear;

Figure 24 is a view in cross section analogous to that of Figure 12 and relating to another variant of the cable entry device in accordance with the invention;

5 Figure 25 is an exploded view in cross section of the latter variant.

As shown diagrammatically in Figures 8, 9 and 18 the overall aim is to convey at least one cable 11 which is in practice an electrical cable in a sealed
10 manner through a wall of any kind, not shown in the figures.

A cable entry device 12 is used for this purpose, in a manner that is known in itself.

In a manner that is also known in itself the
15 cable entry device 12 includes a seat 13 which has an opening 14 for the cable to pass through and an engagement portion 15 extending annularly around the axis A of the opening 14 in the seat 13.

In practice, the opening 14 has a circular
20 contour and its diameter is significantly greater than that of the cable 11 to be inserted in it.

The axis A of the opening 14 is shown in chain-dotted line in Figures 1, 2 and 4 and its position is also shown in Figures 3 and 6.

25 In a manner that is known in itself the engagement portion 15 has an outside wall 16 extending toward the front and connecting it to the seat 13, extending in practice in the manner of a right cylinder from the edge of the opening 14 in the base 13, and an
30 inside wall 18 set back to the rear relative to the outside wall 16, connecting to it in a U-shape arrangement.

In accordance with the invention the engagement
portion 15 is divided circumferentially into
35 elastically deformable jaws 19, 19' in a manner described in more detail hereinafter and the engagement portion 15, which is made of a relatively rigid material, is associated with a sealing member 20

extending globally transversely to the axis A of the opening 14 in the seat 13 and at least partly shutting off the opening 14. The member 20 is made from a relatively flexible material.

5 In the present context the expression "relatively rigid material" simply means a material for the engagement portion 15 which is more rigid than the material from which the sealing member 20 is made.

10 In other words, the stiffness of the engagement portion 15 and the flexibility of the sealing member 20 are in the present context simply to be understood as defined relative to each other.

 In all the embodiments shown the sealing member 20 is to the rear of the engagement portion 15.

15 To be more precise, in the embodiments shown, the cable entry device 12 in accordance with the invention includes a rear portion 22 attached to and separate from the seat 13 and including an opening 23 coaxial with the opening 14 in the seat 13, and the
20 sealing member 20 is at least in part operative between the engagement portion 15 and the rear portion 22.

 In the embodiment more particularly shown in Figures 1 to 9 the seat 13 includes a plate 21 and the rear portion 22 forms a counter-plate substantially
25 parallel to the plate 21.

 The plate 21 and the rear portion 22 are of indeterminate size and one of them could be continuous with the wall through which the cable is to be passed.

 This is why their contours are shown in chain-dotted line in Figures 1, 2, 3, 6 and 8.
30

 For convenience, these contours are assumed to be square with rounded corners.

 They could equally well have any other configuration, however.

35 Additionally, in this embodiment, the sealing member 20 is also a separate part and is operative between the plate 21 of the seat 13 and the counter-plate formed by the rear portion 22.

As in all the embodiments shown, the engagement portion 15 preferably projects at least in part toward the front on the seat 13.

In the embodiment particularly shown in Figures 1 to 9 the engagement portion 15 as a whole projects toward the front on the seat 13, to be more precise on the plate 21 thereof.

As shown here, for example, the engagement portion 15 is molded in one piece with the seat 13.

The assembly is made from any of the following materials, for example: PA (polyamide) 6.6, PC (polycarbonate), rigid PVC (polyvinyl chloride), ABS (acrylonitrile butadiene styrene), PP (polypropylene) or a mixture of such materials, for example a mixture of PC and ABS.

Be this as it may, the base 13 and the engagement portion 15 together form the front portion of the cable entry device 12 in this embodiment.

In this embodiment the sealing member 20 is preferably made of an elastically deformable material.

As in all the embodiments shown, the engagement portion 15 includes at least one jaw 19 of a first type, referred to herein for convenience only as a long jaw 19, the end of which when unstressed envelops a relatively narrow passage P, and at least one jaw 19' of a second type, referred to herein for convenience only as a short jaw 19', the end of which when unstressed envelops a relatively wide passage P'.

As shown here, for example, the engagement portion 15 comprises alternating long jaws 19 and short jaws 19'.

Thus in the various embodiments shown there are three long jaws 19 alternating with three short jaws 19'.

All the jaws 19, 19' have a globally triangular contour converging toward the axis A of the opening 14 in the seat 13 and terminating in a circular arc at a

distance from the axis A to define the corresponding passage P, P'.

Like the opening 14 in the seat 13, with which they are concentric, the passages P, P' have circular
5 contours but their diameters are less than that of the opening 14, the diameter of the passage P being itself less than the diameter of the passage P'.

In the embodiment more particularly shown in Figures 1 to 9 the jaws 19, 19' are quasi-adjacent each
10 other along the whole of their lateral edges, which are substantially rectilinear.

In axial section the jaws 19, 19' have a globally U-shape profile.

To be more precise, in axial section they have
15 a rounded profile along the inside wall 18 of the engagement portion 15 and a substantially rectilinear profile along the outside wall 16 thereof. Where the inside wall 18 and the outside wall 16 join, the long jaws 19 have a flat 24 substantially perpendicular to
20 the axis A of the opening 14 in the seat 13.

In the various embodiments shown the corresponding passage P, P' is defined by the jaws 19, 19' by means of an end section 25 which, when unstressed, is substantially parallel to the axis A of
25 the opening 14 in the seat 13.

In accordance with the invention the engagement portion 15 is divided circumferentially into jaws 19, 19' by radially elongate slots 26 in a star-like configuration about the axis A of the opening 14 in the
30 seat 13, extending as far as the seat 13 and therefore affecting both the inside wall 18 of the engagement portion 15 and its outside wall 16, running the entire height thereof.

In accordance with the invention, where they
35 join onto the seat 13 the jaws 19, 19' are each embedded in it in a root area Z tangential to a circumference C centered on the axis A of the opening 14 in the seat 13.

In the embodiments shown the circumference C is the same for all of the jaws 19, 19'.

In the embodiment more particularly shown in Figures 1 to 9 the slots 26 extend as far as a flange 27 where the outside wall 16 of the engagement portion 15 joins onto the seat 13.

As shown here, for example, the edge of the flange 27 forms a hexagon.

As in all the embodiments shown, the jaws 19, 19' formed by the engagement wall 15 preferably have at least one detent 28 projecting transversely from their outside surface toward the axis A of the opening 14 of the seat 13.

In the embodiment more particularly shown in Figures 1 to 9 there is only one such detent 28 at the root of the end portion 25 of the jaws 19, 19' and it is substantially perpendicular to the axis A of the opening 14 in the seat 13.

In this embodiment the sealing member 20 is locally part of a plate 30 sandwiched between the plate 21 of the seat 13 and the rear portion 22.

As shown, the thickness E of the plate 30 is preferably a multiple n of thickness e of the plate 21 of the seat 13 (see Figure 2).

For example, n is at least equal to three.

For example, the sealing member 20 can at least initially be continuous, i.e. solid, having no bore in it and even no bore precursor.

It then completely shuts off the opening 14 in the seat 13.

It must therefore be forcibly perforated when the cable 11 is inserted, for example using a screwdriver or any other accessory.

The plate 30 of which the sealing member 20 is part is made of foam rubber, for example.

In this embodiment the counter-plate formed by the rear portion 22 is globally parallel to the plate 21 of the seat 13.

Like the engagement portion 15 it is made of a relatively rigid material.

It is made from the same material as the engagement portion 15, for example.

5 In all the embodiments shown the rear portion 22 includes a web 31 which at least partly shuts off its opening 23 and which is divided circumferentially into elastically deformable jaws 32.

10 In the embodiment more particularly shown in Figures 1 to 9 the web 31 of the rear portion 22 is thinner than the counter-plate that the rear portion 22 forms around it, that thickness being itself substantially equal to the thickness e of the plate 21 of the seat 13.

15 As shown here, for example, the web 31 of the rear portion 22 is level on the outside with the outside surface 33 of the counter-plate that the rear portion 22 forms around it (see Figure 6) and it is operative at the bottom of a recess 34 on its inside
20 surface 35.

Like the jaws 19, 19' of the engagement portion 15, the jaws 32 of the rear portion 22 have a triangular contour when seen in plan view, converging toward the axis A of the opening 14 in the seat 13 and
25 terminating in a circular arc at a distance from that axis A.

In the embodiments shown there are six jaws 32 and they are all the same size.

However, as previously, there can be long jaws
30 32 and short jaws 32.

In practice the jaws 32 formed by the web 31 of the rear portion 22 are separated from each other by radially elongate slots 36 in a star-like configuration around the axis A of the opening 14 in the seat 13.

35 In the embodiments shown the jaws 32 are of reducing thickness from their root to their free end.

As in the embodiment more particularly shown in Figures 1 to 8, the jaws 32 of the rear portion 22 are

face to face with the respective jaws 19, 19' of the engagement portion 15, for example.

However, they can instead be offset circumferentially relative to the latter.

5 In this embodiment the rear portion 22 is crimped to the plate 21 of the seat 13.

As shown here, for example, the plate 21 carries a plurality of projecting crimping lugs 37 which are circumferentially distributed around the axis
10 A of the opening 14 in the seat 13 and which, after passing through the sealing member 20, pass through bores 38 in the rear portion 22 in corresponding relationship thereto.

As in the embodiment shown, the crimping lugs
15 37 preferably have a transverse shoulder 39 against which the rear portion 22 abuts and which thereby form a spacer.

They are afterwards simply heated and crimped over the rear portion 22.

20 The cable 11 is inserted from the front, in the direction of the arrow F1 in Figures 7 and 8.

During its insertion, the jaws 19, 19' on the engagement portion 15 are pushed back radially in the direction away from the axis A of the opening 14 in the
25 seat 13.

Initially (Figure 10A) because of their elasticity the inside branches of the jaws 19, 19' corresponding to the inside wall 18 of the engagement portion 15 simply flex, rotating relative to the
30 outside wall 16 of the engagement portion 15, as indicated by arrows F2, F'2 in Figure 10A.

As the cable 11 is inserted further (Figure 10B) this elasticity adds to such rotation initial flexing outward of the outside branch of the jaws 19,
35 19' corresponding to the outside wall 16 of the engagement portion 15, as indicated by arrows F3, F'3 in Figure 10B, just as if, because it is rooted to the

seat 13, the outside branch of the jaws 19, 19' were operative in the manner of a built-in beam.

This flexing of the outside branch of the jaws 19, 19' is then accentuated (Figure 10B) until the final
5 configuration shown in Figure 10B is reached.

Accordingly the jaws 19, 19' are operative elastically over the whole of their length, as much by movement toward each other of their two branches as by flexing of their outside branch.

10 The cable is forced through the sealing member 20 and the jaws 32 of the rear portion 22 are themselves pushed backwards, in the direction of the arrows F4 in Figure 9.

The mechanical retention of the cable 11 is
15 assured by friction, essentially by the jaws 19, 19' of the engagement portion 15, but also by the sealing member 20 and by the jaws 32 of the rear portion 22.

Because they are different lengths the jaws 19, 19' of the engagement portion 15, or rather their
20 detents 28, are advantageously operative at two different levels, namely (see Figure 9) at a level N relatively close to the plate 21 of the seat 13, in the case of the long jaws 19 and a level N' relatively far from the plate 21, in the case of the short jaws 19'.

25 This strengthens the required mechanical retention.

The seal is provided by the sealing member 20, which grips the cable 11 continuously all around the exterior of the cable 11.

30 Clearly the rear portion 22 advantageously holds the sealing member 20 in place, by confining it, and prevents it bursting when perforated.

It additionally and advantageously contributes to guiding the cable 11 by holding it perpendicular to
35 the plate 21 of the seat 13 and strengthens its mechanical retention.

Because of the overall capacity for elastic deformation, the cable entry device 12 of the invention

advantageously suits an entire range of cables 11 with different diameters.

In the embodiments shown in Figures 11 to 25 the cable entry device 12 of the invention includes a
5 cap 40 which covers its engagement portion 15.

The cap 40 has a lateral wall 41 surrounding the outside wall 16 of the engagement portion 15 and a front wall 42 in front of the engagement portion 15.

The side wall 41 at least is made of a
10 relatively rigid material and the front wall 42 includes a closure 44 which can be pushed in and which covers a part of its surface. The closure is made from a relatively flexible material.

The side wall 41 is made from the same material
15 as the engagement portion 15 and the rear portion 22, for example, and the closure 44 which can be pressed in is made of an elastomer.

In the embodiment shown the front wall 42 has at its periphery and continuous with the side wall 41 a
20 washer 45 which is in one piece with the side wall 41.

In this case the closure 44 that can be pressed in covers only a portion of the surface of the front wall 42, here its central portion.

In the embodiments shown the side wall 41 of
25 the cap 40 has an annular rib 46 projecting from its outside surface halfway up its height and adapted to serve as a guard through which the assembly bears on a wall 47 to be equipped with the cable entry device, as shown in chain-dotted line in Figure 10, bearing either
30 against the outside surface of the wall 47 or against its inside surface.

In the embodiments shown in Figures 11 to 25 the seat 13 is reduced to a cylinder 48 and the rear portion 22 includes a cylinder 50 with a shoulder 51
35 bracing the seat 13 formed by the cylinder 48.

In these embodiments the cap 40 and the rear portion 22 are fastened together.

As shown here, for example, the cylinder 50 of the rear portion 22 has around but set back from its shoulder 51 a shoulder 52 against which bears the edge of the side wall 41 of the cap 40 and the cap 40 is
5 attached to the rear portion 22 at this level, by welding or otherwise, for example by ultrasound welding.

Be this as it may, in the embodiments shown in Figures 11 to 25 the cap 40 and the rear portion 22
10 together delimit an enclosure 53 in which the engagement portion 15 and the seat 13 to which it is attached are trapped.

As shown here, for example, the outside surface of the cylinder 48 of the seat 13 bears against the
15 inside surface of the side wall 41 of the cap 40.

Similarly, the top area of the engagement portion 15 can if required bear on the washer 45 of the front wall 42 of the cap 40.

In the embodiments shown in Figures 11 to 25 the slots 26 between the jaws 19, 19' are substantially
20 wider at the level of the seat 13 to facilitate the movement of the jaws 19, 19'.

As shown here, for example, they have a width L1 at the level of the seat 13 greater than one third
25 the width L2 of the jaws 19, 19' at this same level.

In these embodiments the lateral edges of the inside branch of the jaws 19, 19' are globally rounded.

In the embodiments shown in Figures 11 to 25 the sealing member is molded onto at least a portion of
30 the rear portion 22.

As shown here, for example it is molded onto the web 31 of the rear portion 22.

In the embodiment more particularly shown in Figures 9 to 16 the sealing member 20 is on both sides
35 of the web 31 of the rear portion 22, totally enclosing the jaws 32 of the web 31.

In other words, it extends over the front face of the web 31, i.e. the face thereof facing toward the

engagement portion 15, and over the rear face of the web 31, i.e. the face thereof facing away from the engagement portion 15.

Moreover, in the embodiments shown in Figures 5 11 to 23 the sealing member 20 includes an opening 54 coaxially with the opening 14 in the seat 13.

Finally, in these embodiments, the web 31 of the rear portion 22 is globally frustoconical with its concave side facing toward the engagement portion 15.

10 As in the embodiments shown, the sealing member 20 preferably forms a tube 55 beyond the free end of the jaws 32 of the web 31 of the rear portion 22 and the tube extends axially away from the engagement portion 15. The opening 54 of the sealing member 20 is 15 at the end of the tube.

As in the embodiments shown, the tube 55 formed in this way by the sealing member 20 is preferably frustoconical with a smaller cone angle than the web 31 of the rear portion 22.

20 In other words, the half-angle at the apex of the frustoconical tube 55 of the sealing member 20 is less than the half-angle at the apex of the frustoconical web 31 of the rear portion 22.

The sealing member 20 is made of an elastomer, 25 for example.

The remaining features are as before.

The device is also used as before (see Figure 15), by forcibly passing the cable 1' through the press-in closure 44 in the cap 40.

30 To facilitate this insertion a disc can be pre-cut in the central area of the press-in closure 44.

As previously and as shown in chain-dotted line in Figure 18 the cable entry device 12 of the invention advantageously caters for cables 11 with different 35 diameters.

Clearly, in all cases the side wall 41 of the cap 40 advantageously prevents excessive movement apart of the jaws 19, 19' of the engagement portion 15.

It therefore contributes to more effective mechanical retention of the cable 11.

Also, and most importantly, it advantageously opposes penetration of water into the engagement
5 portion 15 and thereby prevents water accumulating on the upstream said of the sealing member 20, to the benefit of the required watertight closure.

The elastomer from which the press-in closure 44 is made is translucent or even transparent so that the
10 interior volume of the cable entry device 12 of the invention can be seen.

Clearly the jaws 32 in the web 31 of the rear portion 22 advantageously constitute an armature for the sealing member 20, to the benefit of its mechanical
15 strength.

Operative at the surface of the rear portion 22, the sealing member 20 also and advantageously facilitates sliding of the cable 11 along the latter and provides the required seal around the cable 11.

20 A tool, not shown, in the form of a canula can advantageously be provided to facilitate removal of the cable, if required.

As shown in figure 19, if required a plug 56 can be provided to plug and seal the cable entry device 12
25 after a first use by shutting off the press-in closure 44 of the cap 40 of the cable entry device 12, which will then have been pressed in.

As shown here, for example, the plug 56 includes a plate 57 which bears on the washer 45 on the front
30 wall 42 of the cap 40 and a globally frustoconical boss 58 projecting from the inside surface of the plate 57 which enters the press-in closure 44, progressively pushing it back in the radial direction.

As shown in Figure 17, the plug 56 can if
35 required be molded in one piece with the rear portion 22.

In the embodiment shown in Figure 21 the sealing member 20 extends over only the front face of the rear

portion 22.

In another embodiment that is not shown the sealing member 20 extends over only the rear face of the rear portion 22.

5 In both cases other features are as before.

In the foregoing description the cable entry device 12 of the invention is operative on its own and there is only one cable 11.

10 In the embodiment shown in Figures 22 and 23 it is associated with at least one other cable entry device 12 of the same kind and another cable 11, not shown, sharing a common plate 21, 21' with the other cable entry device 12.

15 As shown here, for example, it is associated with a plurality of other cable entry devices 12 for the same number of cables 11.

In these figures the cable entry devices 12 are identical and are of the type described with reference to Figures 11 to 21.

20 Their common plate 21' is substituted for the rib 46 on their cap 40.

In other words, their cap 40 is in one piece with the plate 21' they share with at least one other.

25 As shown in Figure 23, all that is then required is to stack successively into each cap 40, first the combination of an engagement portion 15 with the seat 13 to which it is attached, then the combination of the rear portion 22 and the sealing member 20 covering its web 31, and then weld the rear portion 22 to the cap 30 40, as described above.

As shown here, for example, the various cable entry devices 12 associated in this manner are disposed in rows, possibly staggered rows.

35 With their common plate 21' they constitute an entity 59 which, if required, can advantageously be fixed, for example welded, clipped or screwed, to any wall having a corresponding opening, possibly with a seal around the opening in the wall.

Alternatively, the cable entry device 12 of an entity 59 of the above kind can be of the type described with reference to Figures 1 to 9.

In the embodiment shown in Figures 21 and 22 the
5 cable entry device 12 of the invention is used on its own, in the manner of a stuffing gland.

The cable entry device 12 is, for example, globally of the type described with reference to Figures 11 to 21.

10 However, its cap 40 is screwed to the rear portion 22.

As shown here, for example, the rear portion 22 has a sleeve 60 beyond and coaxial with its cylinder 50 and which has a screwthreaded inside surface.

15 The outside surface of the side wall 41 of the cap 40 is correspondingly screwthreaded beyond its rib 46.

In this embodiment the sealing member 20 completely shuts off the opening 14 in the seat 13, the
20 end of the tube 55 formed by the sealing member 20 being closed by a closure 62.

The present invention is clearly not limited to the embodiments described and shown but encompasses any variant execution and/or combination of their various
25 component parts, especially with regard to the number and/or the distribution and/or the configuration of the jaws of the engagement portion.

CLAIMS

1. Cable entry device of the kind including a seat (13) which has an opening (14) through which a cable
5 can be passed and an engagement portion (15) which extends annularly around the axis (A) of the opening (14) in the seat (13), this engagement portion (15) having an outside wall (16) which extends toward the front and which is joined to the seat (13) and an
10 inside wall (18) set back rearwardly relative to the outside wall (16) and joined thereto in a U-shaped configuration, characterized in that, conjointly, the engagement portion (15) is circumferentially divided into elastically deformable jaws (19, 19') by slots (26)
15 that extend as far as the seat (13), in that, where they join onto the seat (13), the jaws (19, 19') are each embedded therein in a root area (Z) tangential to a circumference (C) concentric with the axis of the opening (14) in the seat (13), and in that the
20 engagement portion (15) which is made of a relatively rigid material is associated with a sealing member (20) globally transverse to the axis (A) of the opening in the seat (13), at least partly shutting off that opening (14) and made of a relatively flexible
25 material.

2. Cable entry device according to claim 1, characterized in that the inside wall (18) of the engagement portion (15) includes at least one jaw (19) of a first type, referred to as a long jaw (19), the
30 end of which when unstressed flanks a relatively narrow passage (P), and at least one jaw (19') of a second type, called a short jaw (19'), the end of which when unstressed flanks a relatively wide passage (P').

3. Cable entry device according to claim 2, characterized in that the inside wall (18) of the engagement portion (15) has alternating long jaws (19) and short jaws (19').



4. Cable entry device according to any one of claims 1 to 3, characterized in that the jaws (19, 19') formed by the inside wall (18) of the engagement portion (15) have at least one transverse detent (28) projecting from their outside surface toward the axis (A) of the opening (14) in the seat (13).
5. Cable entry device according to any one of claims 1 to 4, characterized in that the jaws (19, 19') formed by the inside wall (18) of the engagement portion (15) have a triangular contour in plan view.
6. Cable entry device according to any one of claims 1 to 5, characterized in that at the level of the seat (13) the slots (26) between the jaws (19, 19') have a width (L1) greater than one third the width (L2) of the jaws (19, 19') at that level.
7. Cable entry device according to any one of claims 1 to 6, characterized in that the sealing member (20) is made of an elastically deformable material.
8. Cable entry device according to any one of claims 1 to 7, characterized in that the sealing member (20) is continuous.
9. Cable entry device according to any one of claims 1 to 8, characterized in that the sealing member (20) is to the rear of the engagement portion (15).
10. Cable entry device according to claim 9, characterized in that it includes a distinct rear portion (22) attached to the seat (13) which includes an opening (23) coaxial with the opening (14) in the seat (13).
11. Cable entry device according to claim 10, characterized in that the rear portion (22) includes a web (31) which shuts off at least partly its opening (23) and which is circumferentially divided into elastically deformable jaws (32).
12. Cable entry device according to claim 10 or claim 11, characterized in that the sealing member (20) is at least in part operative between the engagement portion (15) and the rear portion (22).



13. Cable entry device according to any one of claims 10 to 12, characterized in that the seat (13) includes a plate (21), the rear portion (22) forms a counter-plate substantially parallel to that plate (21) and the sealing member (20) is operative between the plate (21) and the counter-plate formed by the rear portion (22).

14. Cable entry device according to claim 13, characterized in that the web (31) of the rear portion (22) is thinner than the counter-plate that the rear portion (22) forms around it.

15. Cable entry device according to claim 13 or claim 14, characterized in that the sealing member (20) is part of a plate (30) sandwiched between the plate (21) of the seat (13) and the rear portion (22).

16. Cable entry device according to claim 15, characterized in that the thickness (E) of the plate (30) of which the sealing member (20) is part is a multiple (n) of that (e) of the plate (21) of the seat (13).

17. Cable entry device according to claim 15 or claim 16, characterized in that the plate (30) of which the sealing member (20) is part is made of foam rubber.

18. Cable entry device according to any one of claims 1 to 17, characterized in that the sealing member (20) shuts off all of the opening (14) in the seat (13).

19. Cable entry device according to any one of claims 1 to 18, characterized in that it includes a flange (27) where the outside wall (16) of the engagement portion (15) joins onto the seat (13).

20. Cable entry device according to any one of claims 10 to 12, characterized in that the sealing member (20) is molded onto at least part of the rear portion (22).

21. Cable entry device according to claim 11 in conjunction with claim 20, characterized in that the



sealing member (20) is molded onto the web (31) of the rear portion (22).

22. Cable entry device according to claim 21, characterized in that the sealing member (20) is on
5 respective opposite sides of the web (31) of the rear portion (22), totally surrounding the jaws (32) of the web (31).

23. Cable entry device according to claim 21, characterized in that the sealing member (20) extends
10 over only the front face of the rear portion (22).

24. Cable entry device according to claim 21, characterized in that the sealing member (20) extends over only the rear face of the rear portion (22).

25. Cable entry device according to any one of
15 claims 20 to 24, characterized in that the seat (13) is reduced to a cylinder (48) and the rear portion (22) itself includes a cylinder (50) which braces the seat (13) constituted by the cylinder (48).

26. Cable entry device according to any one of
20 claims 20 to 25, characterized in that the sealing member (20) has an opening (54) in it coaxial with the opening (14) in the seat (13).

27. Cable entry device according to any one of
25 claims 20 to 26, characterized in that the web (31) of the rear portion (22) is globally frustoconical with its concave side facing toward the engagement portion (15) and, beyond the free end of the jaws (32) of the web (31), the sealing member (20) forms a tube (55) extending axially away from the engagement portion
30 (15).

28. Cable entry device according to claim 27, characterized in that the tube (55) formed by the sealing member (20) is frustoconical with a cone angle smaller than that of the web (31) of the rear portion
35 (22).

29. Cable entry device according to any one of claims 20 to 28, characterized in that the sealing member (20) is made of an elastomer.



30. Cable entry device according to any one of claims 1 to 29, characterized in that the engagement portion (15) is in one piece with the seat (13).

31. Cable entry device according to any one of
5 claims 1 to 30, characterized in that it is associated with at least one other cable entry device (12) of the same type having a plate (21, 21') in common with that other cable entry device (12).

32. Cable entry device according to any one of
10 claims 1 to 30, characterized in that it is operative on its own in the manner of a stuffing gland.

33. Cable entry device according to any one of
15 claims 1 to 32, characterized in that the engagement portion (15) projects at least partly toward the front on the seat (13).

34. Cable entry device according to any one of claims 1 to 33, characterized in that it includes a cap (40) which covers its engagement portion (15).

35. Cable entry device according to claim 34,
20 characterized in that its cap (40) has a side wall (41) around the outside wall (16) of the engagement portion (15) and a front wall (42) in front of that engagement portion (15) and at least its side wall (41) is made from a relatively rigid material, its front wall (42)
25 including a closure (44) that can be pressed in and which extends over at least a part of its surface and is made from a relatively flexible material.

36. Cable entry device according to claim 10 in conjunction with claim 34, characterized in that the
30 cap (40) is attached to the rear portion (22) and the cap (40) and the rear portion (22) together delimit an enclosure (53) in which the engagement portion (15) and the seat (31) are trapped.

37. Cable entry device according to claim 36,
35 characterized in that the cap (40) is welded or otherwise attached to the rear portion (22).

38. Cable entry device according to claim 32 in conjunction with claim 36, characterized in that the cap (40) is screwed onto the rear portion (22).

39. Cable entry device according to claim 31 in
5 conjunction with claim 34, characterized in that its cap (40) is in one piece with the plate (21') which it shares with at least one other device.

