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(54) **SEALABLE CONNECTOR ARRANGEMENT**

(57) The present invention relates to a sealable connector arrangement (1), comprising a seal (20) with at least one fixing element (30) and a connector housing (10) with a reception space (13) for receiving the seal

(20). The reception space (13) comprises an opening (11) to receive the fixing element (30), when the seal (20) is mounted onto the connector housing (10) for securing the seal (20) inside the reception space (13).

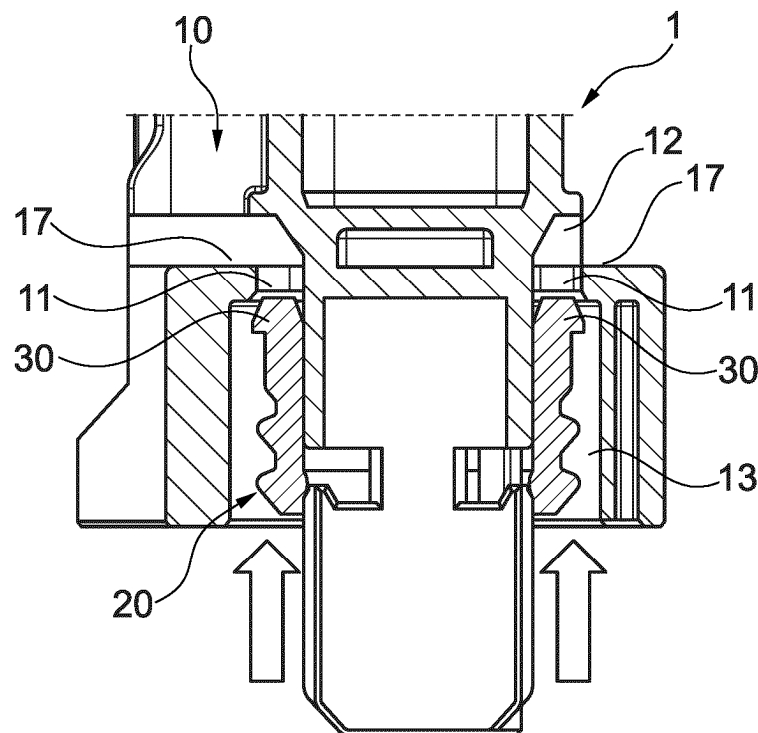


Fig. 5

EP 4 819 404 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a sealable connector arrangement designed to enhance the securement of seals within connector housings. Specifically, the disclosure pertains to a connector housing featuring a reception space with an opening for fixing elements for improved seal retention.

BACKGROUND OF THE INVENTION

[0002] In the field of connector arrangements, it is common to use seals to ensure a tight and secure connection between different components. Known systems typically involve seals that are mounted onto connector housings to prevent leakage and maintain the integrity of the connection. These seals often rely on various fixing elements to secure them in place within the connector housing. Traditional approaches include the use of snap-fit elements, which engage with corresponding openings in the housing to hold the seal securely. However, these systems can be prone to issues such as improper engagement, difficulty in assembly, and potential damage to the fixing elements during installation.

[0003] According to known systems, the fixing elements are often designed to fit tightly within the openings of the connector housing, which can lead to bending or deformation of the fixing elements during insertion. This can compromise the effectiveness of the seal and result in a less reliable connection. Additionally, the design of the connector housing and the seal can make the assembly process cumbersome and time-consuming, requiring precise alignment and forceful insertion to achieve a secure fit. These challenges are exacerbated when dealing with seals that have complex geometries or multiple fixing elements, further complicating the installation process.

[0004] Despite the substantial advances in the field of sealable connector arrangements, there remains a need for improved systems that offer easier assembly, reliable engagement of fixing elements, and enhanced sealing performance. It is therefore a technical problem underlying the present invention to provide a sealable connector arrangement that at least partially overcomes the disadvantages of known systems.

SUMMARY OF THE DISCLOSURE

[0005] It is an object of this invention to provide a sealable connector arrangement that overcomes at least partially one or more of the disadvantages of known systems.

[0006] A first aspect of the invention provides a sealable connector arrangement, comprising: a seal with at least one fixing element; and a connector housing with a reception space for receiving the seal, which reception

space comprises an opening to receive the fixing element, when the seal is mounted onto the connector housing for securing the seal inside the reception space; wherein the connector housing comprises a sloping wall adjacent to the opening, adapted to facilitate a tilting movement of the fixing element upon insertion of the fixing element into the opening.

[0007] The subject matter involves a sealable connector arrangement designed to secure a seal within a connector housing. The arrangement includes a seal equipped with at least one fixing element, which may refer to a component designed to attach or secure the seal in place. The connector housing features a reception space intended to accommodate the seal, and this space includes an opening to receive the fixing element when the seal is mounted onto the connector housing. This configuration ensures that the seal is securely positioned inside the reception space.

[0008] The connector housing comprises a sloping wall adjacent to the opening. This sloping wall is adapted to facilitate a tilting or deflection movement of the fixing element upon its insertion into the opening. The term "sloping wall" may refer to an inclined surface designed to guide or influence the movement of the fixing element, allowing it to tilt and thereby secure itself more effectively within the housing.

[0009] The advantages of this arrangement include the elimination of additional parts typically required to hold, in particular radial, seals in place, such as seal retainers or secondary locking mechanisms. The sloping wall aids in the secure attachment of the seal during transport, ensuring that it remains in its intended position without the need for excessive force or complex assembly procedures. This design is particularly beneficial for larger seals, which may be prone to deformation if pressed in using traditional methods. Overall, the arrangement offers an efficient and reliable solution for securing seals within connector housings, enhancing both ease of assembly and transport stability.

[0010] In an implementation of the sealable connector arrangement, the fixing element comprises a hook, said hook having a generally L-shaped geometry for engaging the housing, and preferably the hook is designed to not engage in a fastening relationship with the housing when un-tilted.

[0011] This particular shape is crucial as it provides a means for the hook to engage the connector housing effectively. The L-shaped design facilitates the interaction between the hook and the housing, allowing for a secure engagement when the hook is tilted. The implementation further specifies that the hook is preferably designed not to engage in a fastening relationship with the housing when it is un-tilted. This feature is significant as it introduces a conditional engagement mechanism, where the hook only secures the seal within the reception space when it undergoes a tilting movement. The interaction between the hook and the sloping wall ensures that the fixing element can be inserted into the opening

effectively, allowing for a secure fit of the seal within the connector housing.

[0012] In a further implementation of the sealable connector arrangement, upon being set into a tilting movement by the sloping wall, the hook is brought into engagement with an edge of the opening.

[0013] The implementation specifies that upon tilting by the sloping wall, the fixing element, shaped as a hook, engages with an edge of the opening. This engagement provides a secure and stable connection between the seal and the connector housing. The hook engaging with the edge of the opening ensures the seal is locked into position, preventing any unintended dislodgement or movement.

[0014] In a further improvement of the sealable connector arrangement, the openings are larger than the hook.

[0015] The implementation specifies that the openings in the connector housing are larger than the hook of the fixing element. This feature ensures that the fixing element does not bend upon initial insertion of the hook into the opening. The larger openings facilitate a smoother and more reliable insertion process, preventing deformation or damage to the fixing element. This is in particular important as the seal is often made from a relatively flexible material, which may be bend or deformed unintentionally, upon insertion into the opening. Thus, it is desirable that the opening is relatively large, which however makes it impossible to use some of the prior art fixation methods (more details will be given below in relation with Fis. 1A and 1B). The present invention allows the use of such a large opening, as the fixing elements will be tilted into engagement, preferably after at least partial insertion into the opening.

[0016] In a further implementation of the sealable connector arrangement, the fixing element extends from the main body of the seal in insertion direction of the seal, and the hook is preferably oriented outwardly from the seal.

[0017] The fixing element extends from the main body of the seal in the direction of insertion, so that during the assembly process, the fixing element moves in a linear path aligned with the direction in which the seal is inserted into the connector housing. This extension facilitates the engagement between the fixing element and the opening in the connector housing, ensuring that the seal is properly secured within the reception space. The outward orientation of the hook enhances the locking mechanism by providing a secure grip once the fixing element is inserted into the opening and tilted.

[0018] In a further implementation of the sealable connector arrangement, the fixing element is not a snap-fit element.

[0019] By specifying that the fixing element is not a snap-fit element, the implementation clarifies that the method of securing the seal within the connector housing does not rely on the snap-fit mechanism, which typically involves a quick and forceful engagement between components. Instead, the fixing element may utilize an alter-

native securing method, offering advantages such as reduced risk of damage during installation and an improved suitability for very flexible materials, as often used for sealing elements.

5 **[0020]** In a further implementation of the sealable connector arrangement, the seal comprises at least one outer circumferential lip.

[0021] The circumferential lip is designed to improve the sealing effectiveness by creating a more robust barrier against external elements, such as moisture or dust, which could potentially compromise the integrity of the connection. The lip acts as an additional layer of protection, ensuring that the seal remains secure within the reception space of the connector housing. This feature also contributes to the overall stability of the seal when mounted onto the connector housing, as the lip may assist in maintaining the seal's position and preventing any unwanted movement or dislodgement.

[0022] In a further implementation of the sealable connector arrangement, the seal comprises two outer circumferential lips, the lips being separated by a circumferential recession, which is adapted to partially accommodate the lips in mounted condition of the seal.

[0023] The implementation introduces additional features to the sealable connector arrangement by specifying that the seal comprises two outer circumferential lips. These lips are separated by a circumferential recession, which is designed to partially accommodate the lips when the seal is mounted. Generally speaking, the two lips as well as the recession are arranged in three different, but parallel planes. The circumferential recession ensures that upon mating the sealed connector housing with a counter connector, a radial pressure may be exerted onto the seal to improve the sealing effectiveness, as the lips (i.e., one or both) may be partially displaced into the recession.

[0024] In a further implementation of the sealable connector arrangement, the sloping wall is arranged behind the opening when seen from the insertion direction of the seal into the reception space, such that the fixing element is only tilted after at least a partial insertion of the fixing element into the hole.

[0025] This positioning ensures that the fixing element undergoes a tilting movement only after it has been at least partially inserted into the hole. Thus, the fixing element first enters the opening unobstructed, and only upon further insertion does it encounter the sloping wall, which then facilitates the tilting movement necessary to secure the seal within the reception space. This new feature enhances the functionality of the sealable connector arrangement by ensuring a more controlled insertion of the fixing element into the opening. The arrangement minimizes the risk of premature tilting or misalignment of the fixing element during the insertion process, which could otherwise compromise the integrity of the seal.

[0026] In a further implementation of the sealable connector arrangement, the fixing element comprises a hook

and is designed such that its distal end comes into contact with the sloping wall only after the hook has cleared the opening.

[0027] This feature brings a precise sequence of interaction between the components, ensuring that the hook first passes essentially unobstructed through the opening before engaging with the sloping wall. The design of the hook and its interaction with the sloping wall facilitate a controlled tilting movement, which is crucial for securing the seal inside the reception space of the connector housing. This mechanism enhances the reliability and effectiveness of the sealable connector arrangement, preventing premature contact or misalignment that could compromise the sealing function or the assembly process.

[0028] In a further implementation of the sealable connector arrangement, the seal has an inner diameter of 10 to 30 mm, preferably 15 to 25 mm, and/or an height in the axial direction of 5-15 mm, preferably 5 to 12mm.

[0029] The inner diameter of the seal is significant because it determines the seal's ability to accommodate various sizes of components or cables that may pass through or be enclosed by the connector arrangement. The axial height of the seal is equally important as it influences the seal's ability to provide adequate coverage and protection within the reception space of the connector housing. A taller seal may offer enhanced sealing capabilities by covering more surface area, while a shorter seal may be preferable for applications requiring compactness or where space is limited. The specified height range ensures that the seal can effectively perform its function without compromising the design or operation of the connector arrangement.

[0030] In a further implementation of the sealable connector arrangement, the reception space for the seal in the housing does not have any undercuts to facilitate injection molding.

[0031] This design choice is particularly advantageous for the injection molding process, as it simplifies the mold construction and reduces the complexity of the manufacturing process. The absence of undercuts means that the mold can be easily separated from the molded part without requiring additional mechanisms or complex mold designs to release the part. This facilitates a more straightforward and efficient production process, potentially lowering manufacturing costs and improving the consistency and quality of the produced parts.

[0032] In a further implementation of the sealable connector arrangement, the seal has an essentially rectangular cross-section in a plane perpendicular to the insertion direction, and fixing elements are arranged at the corner portions of the seal, the fixing elements extending in insertion direction.

[0033] This geometric configuration is significant as it provides a stable and consistent profile for the seal, which can be crucial for ensuring a reliable connection and preventing leakage or dislodgement. The rectangular cross-section can offer increased surface area contact

with the connector housing, thereby improving the sealing capability and resistance to external forces. Additionally, the implementation specifies that the fixing elements are strategically positioned at the corner portions of the seal. This arrangement of fixing elements at the corners is an important design choice that facilitates the secure attachment of the seal to the connector housing. By extending in the insertion direction, these fixing elements are designed to engage with the opening in the connector housing, as described above. The positioning at the corners allows for a balanced distribution of forces during insertion, which can reduce the risk of deformation or damage to the seal.

[0034] In a further implementation of the sealable connector arrangement, the seal is a radial seal.

[0035] This introduces a particular type of seal that operates by exerting pressure in a radial direction, enhancing the sealing efficiency and reliability of the connector arrangement. The radial seal's mechanism of communication between components involves the seal's interaction with the connector housing, where the radial pressure ensures a tight fit and prevents leakage.

[0036] In a further implementation of the sealable connector arrangement, the seal is designed to exert pressure in a radial direction when the connector housing is mated with a counter connector housing.

[0037] This radial pressure exerted by the seal enhances the sealing effect, providing a more robust and reliable connection between the connector housing and the counter connector housing. This radial pressure mechanism ensures that the seal is tightly compressed against the surfaces of both the connector housing and the counter connector housing, thereby preventing the ingress of contaminants, moisture, or other unwanted materials that could compromise the integrity of the connection.

[0038] In a further implementation of the sealable connector arrangement, the opening is formed as a through hole in a wall of the connector housing, and the fixing element engages an edge of the exit of the through hole, when tilted.

[0039] The through hole in the wall of the connector housing serves as a precise point of engagement for the fixing element. The tilting movement of the fixing element, which is enabled by the sloping wall adjacent to the opening, ensures that the fixing element can properly engage with the edge of the exit of the through hole. This feature brings an added level of precision to the sealing mechanism, ensuring that the seal is firmly secured in place and reducing the likelihood of dislodgement or leakage.

Figure 1A: shows a prior art example of a sealable connector arrangement.

Figure 1B: shows the example of Fig. 1A in assembled condition.

Figure 2: shows an embodiment of a seal with fixing elements from two different perspectives.

Figure 3: shows an embodiment of a connector housing in a schematic view and a detail thereof.

Figure 4: shows the connector housing of Fig. 3 in a bottom view.

Figure 5: shows an embodiment of a sealable connector arrangement in a cut side view.

Figure 6: shows the embodiment of Fig. 5 with the fixing elements partially inserted into the openings.

Figure 7: shows the embodiment of Figs. 5 and 6 with the seal in its final position inside the housing.

[0040] Figure 1A illustrates a prior art sealable connector arrangement. A connector housing 40 is depicted as having multiple cylindrical openings for the reception of electrical contacts. The housing 40 includes a reception space 43, which is intended to accommodate a seal 50.

[0041] The seal 50 is an axial seal and shown as a generally flat, rectangular frame with four fixing elements 51 extending downward from its corners. These fixing elements 51 are designed to engage with the connector housing 40 to secure the seal 50 in place. The fixing elements 51 have arrowhead shaped ends, which are intended to fit into four corresponding holes 41 in the reception space 43 of the connector housing 40. These holes 41 (of which only one is visible due to the perspective) are designed with a smaller diameter than the arrowhead shaped end of the fixing elements 51.

[0042] Figure 1B illustrates how the seal 50 is mounted onto the housing 40. The figure shows mounting tools 52, which push the seal 50 downwards and press the fixing elements 51 into the respective holes 41. As the arrowhead shaped ends of the fixing elements 51 are slightly larger than the holes, relatively large forces must be applied to press the elements 51 into the holes 41. This leads to a strong connection, it bears however the risk to damage the delicate seal during the mounting process and it is only suitable for arrangements, in which the mounting tools 52 can engage the seal 50 very close to the position of the fixing elements 51. Thus, it is not well suited for radial seals, which tend to have much larger dimensions in axial direction (i.e., in mounting/insertion direction).

[0043] Figure 2 illustrates an embodiment of an inventive seal 20. Fig. 2(a) shows the seal 20 in a three-dimensional perspective view and Fig. 2(b) shows the seal in a front view.

[0044] The seal 20 generally has a rectangular cross-section, as evidenced by its elongated form with defined corner portions. Extending from these corner portions are four fixing elements 30, which are integral to the seal's design. The fixing elements 30 are shown to extend in the insertion direction, which is indicated by the arrow in figure 5.

[0045] The seal 20 is further detailed with outer, parallel, circumferential lips 21 and 22. The lips 21 and 22 are separated by a, parallel, circumferential recession 23, which is adapted to partially accommodate the lips when

the seal is mounted and the connector housing is mated with a counter connector. This design aspect allows for compression and expansion of the lips 21 and 22 into the recession, enhancing the sealing effect when the seal is in its operational position.

[0046] View (b) provides a side view of the seal 20, offering a clearer view of the fixing elements 30 and their structural configuration. The fixing elements 30 are shown to include hooks 31, which are designed to engage with a connector housing. The hooks 31 exhibit a generally L-shaped geometry. The distal end of each hook 31 is oriented outwardly from the seal, and the hooks comprise engagement faces 33. This outward orientation is advantageous, as it facilitates the engagement of the hooks with the edges of openings in the connector housing, as will be described in more detail below.

[0047] As the skilled person will recognize, the seal 20 is designed to function as a radial seal. This is inferred from the arrangement of the circumferential lips 21 and 22 and the relatively large height in axial direction. The seal is adapted to be pressed in a radial direction when the connector housing is mated with a counter connector housing. The radial pressure enhances the sealing effect, ensuring that the connector arrangement remains leakproof under operational conditions.

[0048] Figure 3 illustrates a connector housing 10 designed to accommodate the seal 20. The housing 10 comprises cylindrical structures or cable receiving openings 15. Adjacent to the cylindrical structure 15, the housing 10 features a reception space intended for the insertion and securement of the seal 20, although the seal itself is not depicted in this figure.

[0049] The housing 10 incorporates four openings 11 (only two of which are visible due to the perspective), which are positioned to allow the insertion of the four fixing elements 30. The figure also highlights sloping walls 12, situated adjacent to the openings 11. Each sloping wall 12 is specifically designed to facilitate a tilting movement of the fixing element as it is inserted into the opening 11.

[0050] The detailed view within the figure emphasizes the interaction between the sloping wall 12 and the opening 11. The sloping wall 12 is positioned behind the opening 11, relative to the insertion direction of the seal, ensuring that the fixing element only undergoes a tilting movement after at least a partial insertion into the opening 11.

[0051] The housing 10 further comprises fixing clamps 16, which serve to fix the housing onto a corresponding counter connector housing upon mating.

[0052] Figure 4 shows the connector housing 10 in a bottom view. The housing 10 includes four openings 11 positioned to receive the fixing elements 30 of seal 20. Each opening 11 comprises an adjacent sloping wall 12 which facilitates the tilting movement of the fixing elements upon insertion into the openings 11. The housing 10 features the reception space 13, which is intended to

receive the seal 20. This reception space 13 is configured without any undercuts, thus facilitating the injection molding process.

[0053] Figures 5 to 7 illustrate the insertion or mounting process of the seal 20 into the reception space 13 of the housing 10.

[0054] Fig. 5 illustrates a sealable connector arrangement 10 comprising the connector housing 10 and the seal 20 in a cut view. The seal 20 is accommodated in the reception space 13 of the housing 10, but not yet attached thereto. The two arrows indicate the direction of insertion of the seal 20. The reception space 13 features four openings 11 (only two of which are visible in the cut view of Fig. 5) intended for the insertion of the fixing elements 30.

[0055] Adjacent to the openings 11, the connector housing 10 incorporates sloping walls 12. The sloping walls 12 are designed to facilitate the tilting movement of the fixing elements 30 as they are inserted through the respective openings 11. The sloping walls 12 are positioned behind the openings 11, relative to the insertion direction of the seal 20 into the reception space 13. The openings 11 are formed as through holes in the wall of the connector housing 10.

[0056] In Fig. 6 the seal 20 is further inserted into the housing 10 and the fixing elements 30 are now partly inserted into the respective openings 11. The fixing element 30 is not yet tilted and not engaged in a fastening relationship with the housing 10. Only upon further insertion, the sloping wall 12 induces a tilting movement in the fixing element 30, bringing it into engagement with an edge of the opening 11. Thus, the fixing element 30 is not a snap-fit element, but requires the tilting force transferred by the sloped wall.

[0057] As one can take from Fig. 6, the openings 11 in the connector housing 10 are larger than the head of the fixing element 30, so that the fixing element can enter the opening 11 essentially unobstructed. Thereby, any undesired bending of the fixing element 30 upon initial insertion into the opening 11 is prevented.

[0058] Figure 7 shows the seal fully inserted and in its final position. The sloping walls 12 have tilted the fixing elements 30 as indicated by the arrows, such that the tilted fixing elements 30 now engage with the housing in a fastening relationship. More specifically, the fixing elements 30, respectively the hooks 31 thereof, engage with the edge 17 of the exit of the openings 11. This engagement ensures that the seal 20 remains securely in place within the connector housing 10, providing an effective seal for the connector arrangement.

Reference sign list:

[0059]

- 1 sealable connector arrangement
- 10 connector housing
- 11 opening

- 12 sloping wall
- 13 reception space
- 15 cable receiving openings
- 16 fixing clamp
- 17 edge of opening
- 20 seal
- 21 first circumferential sealing lip
- 22 second circumferential sealing lip
- 23 circumferential recession
- 30 fixing element
- 31 hook
- 33 engagement face of hook
- 50 axial seal
- 51 fixing pins
- 52 mounting tool
- 40 housing
- 43 reception for axial seal

Claims

1. A sealable connector arrangement (1), comprising:

a seal (20) with at least one fixing element (30); and

a connector housing (10) with a reception space (13) for receiving the seal (20), which reception space (13) comprises an opening (11) to receive the fixing element (30), when the seal (20) is mounted onto the connector housing (10) for securing the seal (20) inside the reception space (13); wherein

the connector housing (10) comprises a sloping wall (12) adjacent to the opening (11), adapted to facilitate a tilting movement of the fixing element (30) upon insertion of the fixing element (30) into the opening (11).

2. The sealable connector arrangement (1) of claim 1, wherein the fixing element (30) comprises a hook (31), said hook (31) having a generally L-shaped geometry for engaging the housing (10), and wherein preferably the hook (31) is designed to not engage in a fastening relationship with the housing (10) when un-tilted.

3. The sealable connector arrangement (1) of claim 2, wherein upon being set into a tilting movement by the sloping wall (12), the hook (31) is brought into engagement with an edge (17) of the opening (11).

4. The sealable connector arrangement (1) of claims 2 or 3, wherein the openings are larger than the hook (31), such that the fixing element (30) is not bend upon initial insertion of the hook (31) into the opening (11).

5. The sealable connector arrangement (1) of any one

of the preceding claims 2 to 4, wherein the fixing element (30) extends from the main body of the seal (20) in insertion direction of the seal (20), and the hook (31) is preferably oriented outwardly from the seal.

6. The sealable connector arrangement (1) of any one of the preceding claims, wherein the fixing element (30) is not a snap-fit element. 10
7. The sealable connector arrangement (1) of any one of the preceding claims, wherein the seal (20) comprises at least one outer circumferential lip (21; 22). 15
8. The sealable connector arrangement (1) of the preceding claim, wherein the seal (20) comprises two outer circumferential lips (21; 22), the lips (21; 22) being separated by a circumferential recession (23), which is adapted to partially accommodate the lips (21; 22) in mounted condition of the seal (20). 20
9. The sealable connector arrangement (1) of any one of the preceding claims, wherein the sloping wall (12) is arranged behind the opening (11) when seen from the insertion direction of the seal (20) into the reception space (13), such that the fixing element (30) is only tilted after at least a partial insertion of the fixing element (30) into the hole. 25
10. The sealable connector arrangement (1) the preceding claim, wherein the fixing element (30) comprises a hook (31) and is designed such that its distal end comes into contact with the sloping wall (12) only after the hook (31) has cleared the opening (11). 30
11. The sealable connector arrangement (1) of any one of the preceding claims, wherein the seal (20) has an inner diameter of 10 to 30 mm, preferably 15 to 25 mm, and/or an height in the axial direction of 5-15 mm, preferably 5 to 12mm. 35
12. The sealable connector arrangement (1) of any one of the preceding claims, wherein the reception space (13) for the seal (20) in the housing (10) does not have any undercuts to facilitate injection molding. 40
13. The sealable connector arrangement (1) of any one of the preceding claims, wherein the seal (20) has an essentially rectangular cross-section in a plane perpendicular to the insertion direction, and fixing elements (30) are arranged at the corner portions of the seal, the fixing elements (30) extending in insertion direction. 45
14. The sealable connector arrangement (1) of any one of the preceding claims, wherein the seal (20) is a radial seal. 50

15. The sealable connector arrangement (1) of the preceding claim, wherein the seal (20) is designed to exert pressure in a radial direction when the connector housing (10) is mated with a counter connector housing, to enhance the sealing effect. 55

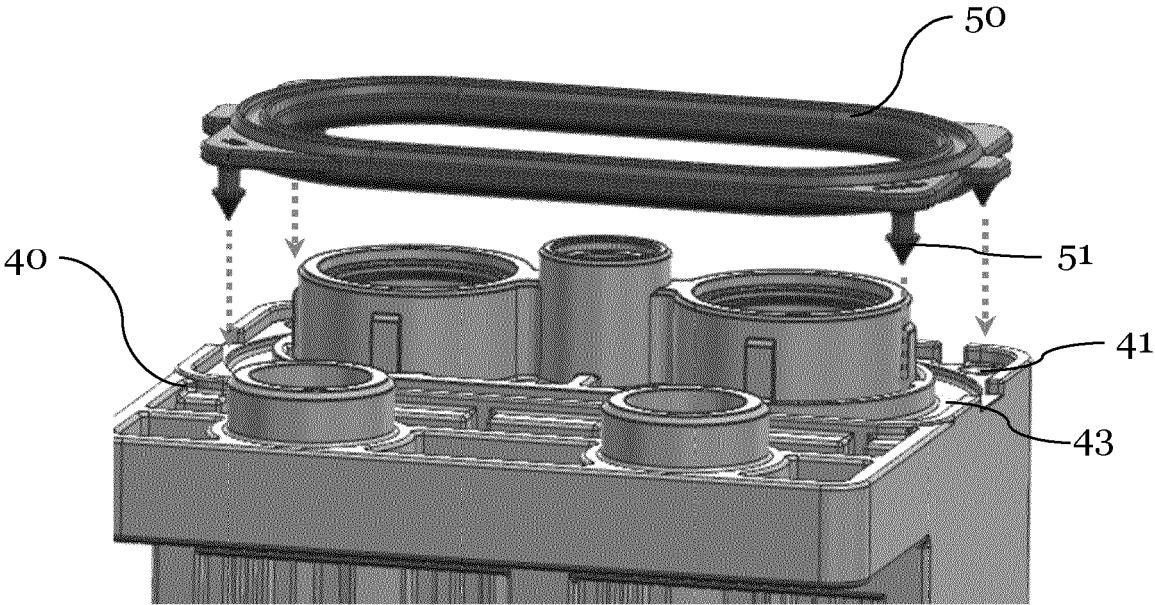


Fig. 1A (Prior Art)

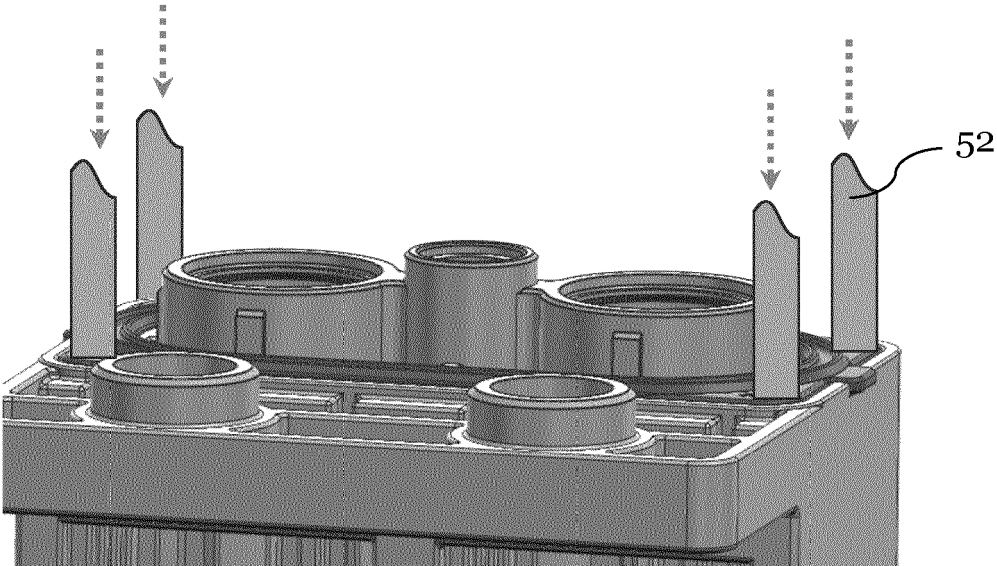


Fig. 1B (Prior Art)

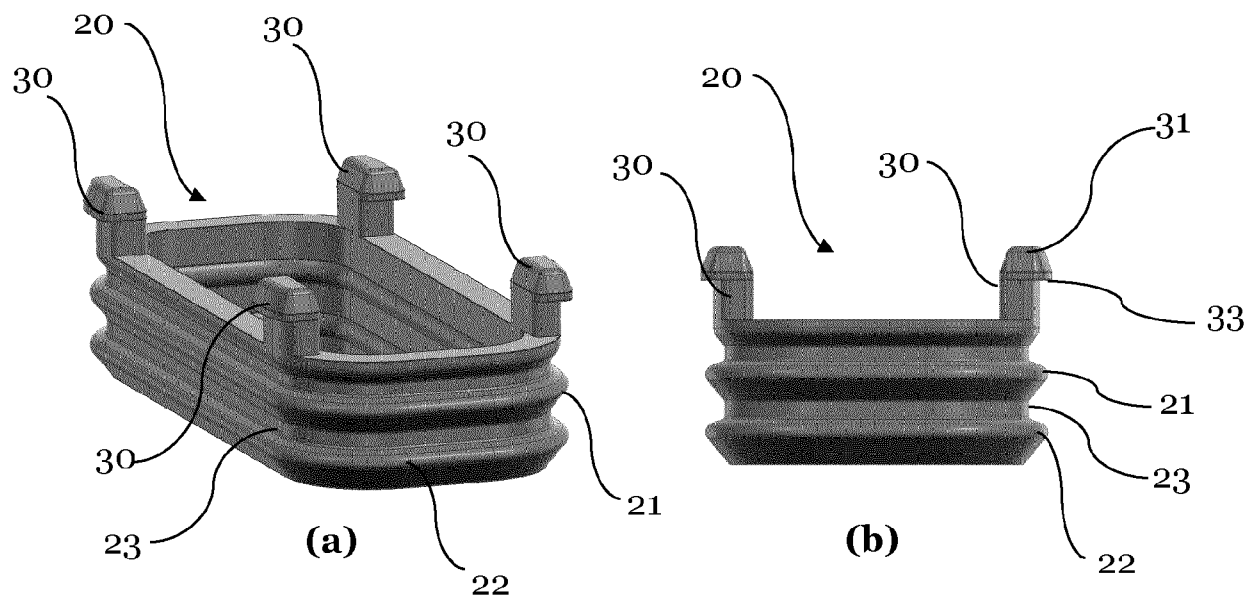


Fig. 2

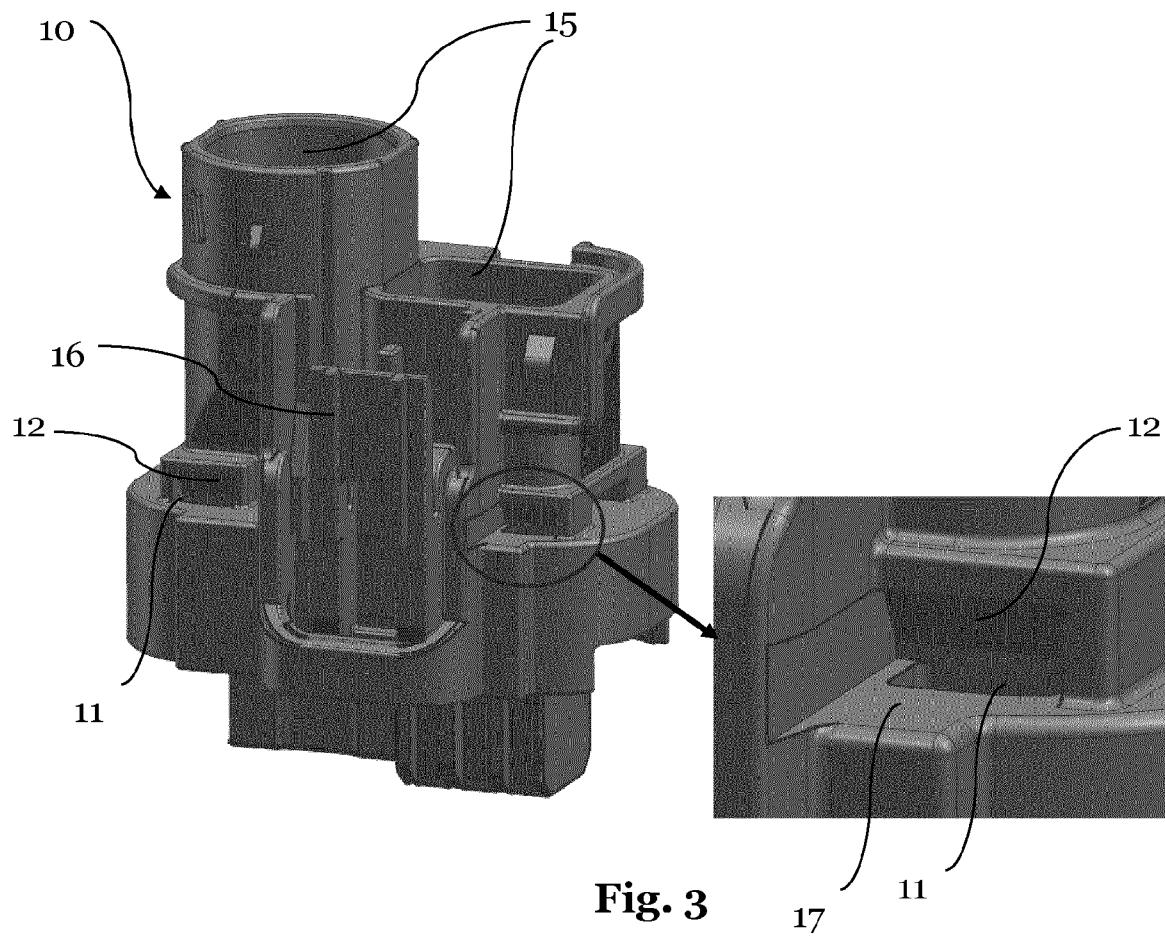


Fig. 3

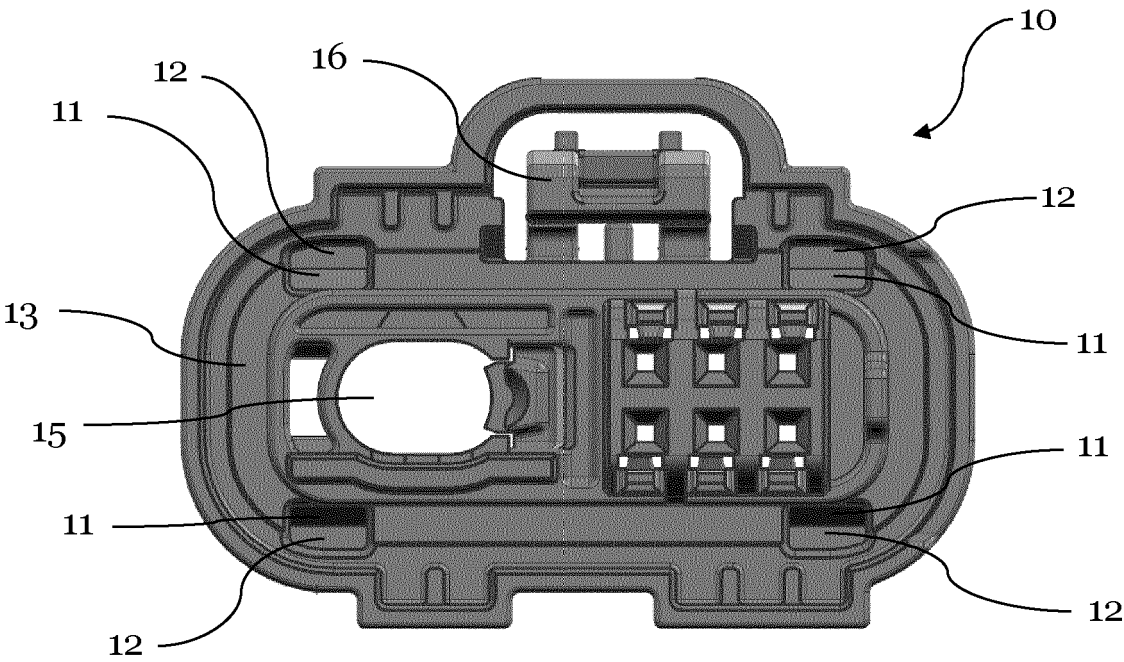


Fig. 4

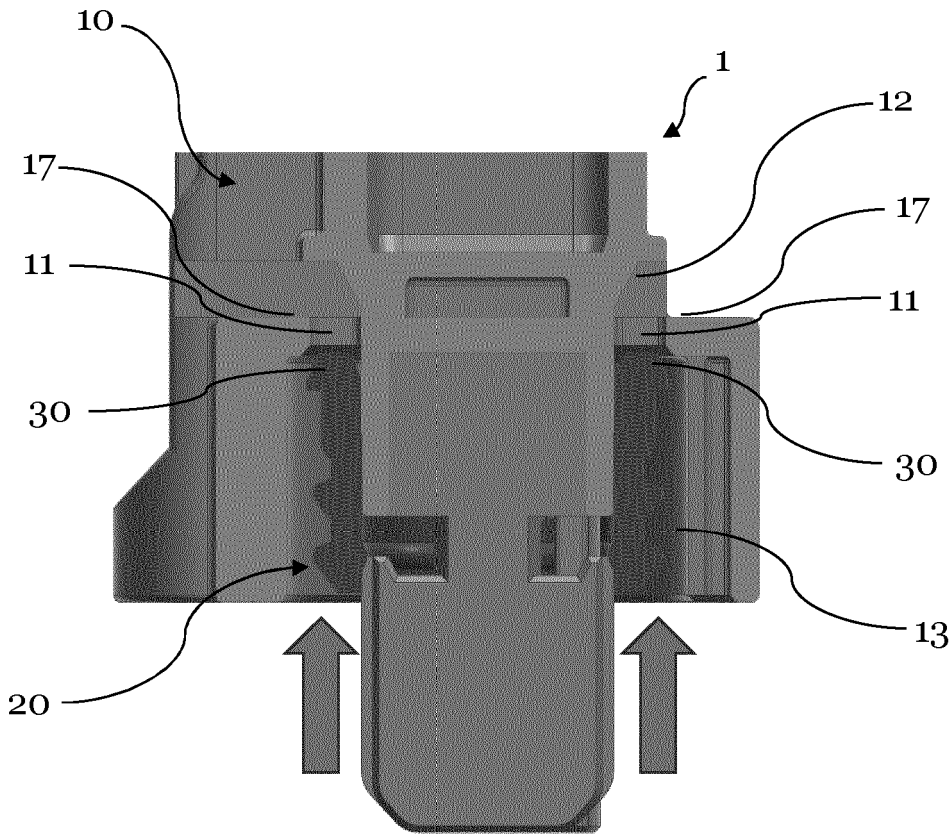


Fig. 5

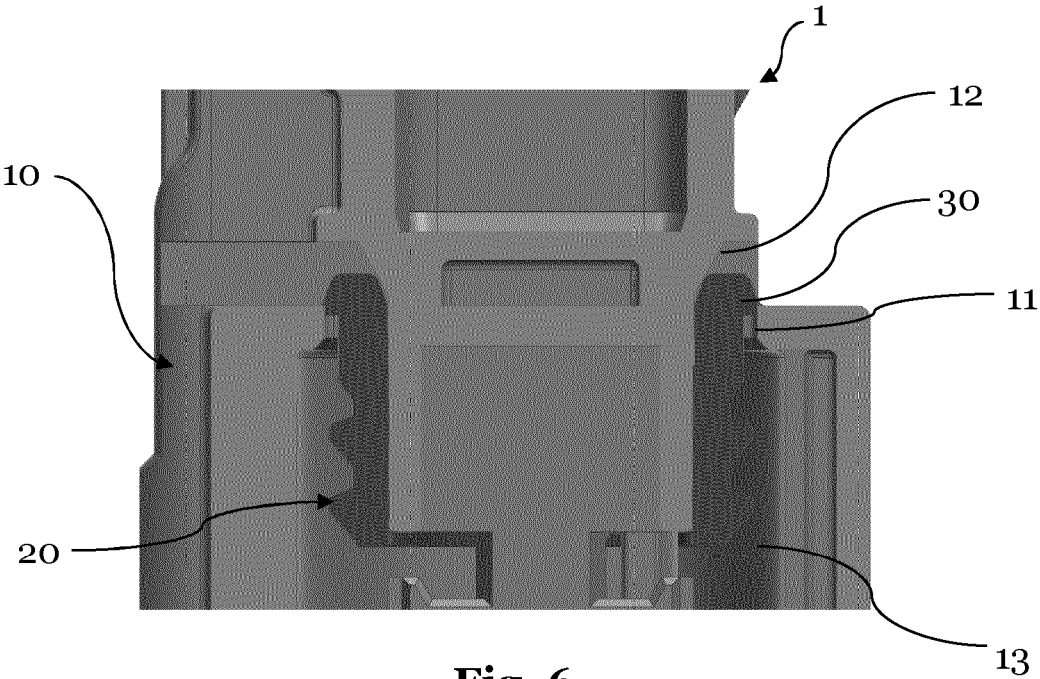


Fig. 6

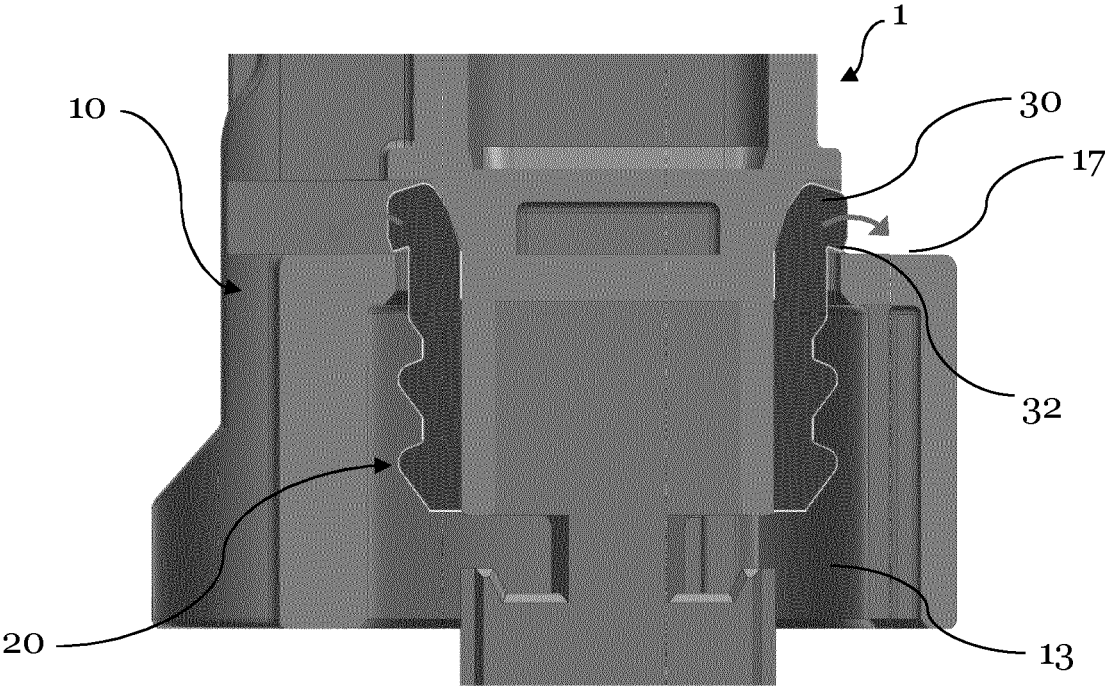


Fig. 7



EUROPEAN SEARCH REPORT

Application Number

EP 25 16 8453

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2006 147474 A (SUMITOMO WIRING SYSTEMS) 8 June 2006 (2006-06-08)	1-5, 7-12, 14, 15	INV. H01R13/52
Y	* paragraph [0034]; figures 3-4 *	13	
A	-----	6	
Y	JP 2012 128959 A (SUMITOMO WIRING SYSTEMS) 5 July 2012 (2012-07-05) * figure 7 *	13	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
Place of search		Date of completion of the search	Examiner
The Hague		10 September 2025	Esmiol, Marc-Olivier
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P24C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2006147474 A	08-06-2006	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82