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(54) A CONNECTOR HOUSING COMPRISING A COVER

(57) The present application relates to a connector housing comprising a cover for closing an opening in the connector housing, the cover comprising: at least one through hole, adapted to receive a cable, and at least two flexible arms extending from the cover in closing direction adapted to retain a cable received in the through hole, and wherein the connector housing comprises a cavity, adapted to at least partially receive the flexible arms in a closed condition of the cover, and wherein each flexible arm comprises an outer contact surface comprising at least one step, and wherein in closed condition, the at least one step engages a cavity wall, such that the flexible arm is biased towards any cable received in said through hole.

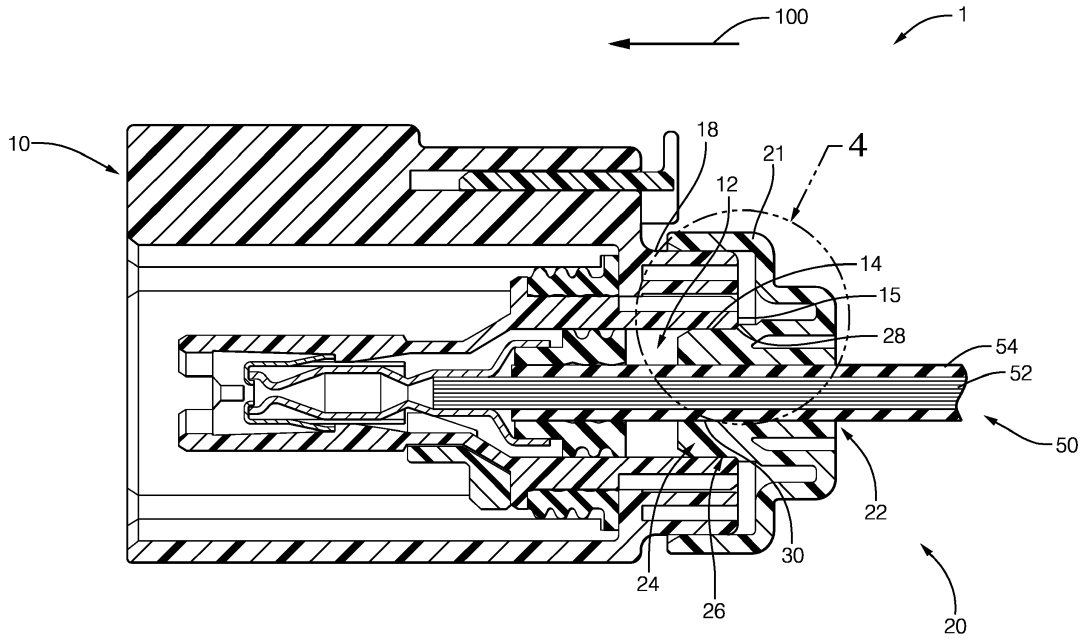

FIG. 3

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Description

1. Field of the invention

[0001] The present application relates to a connector housing comprising a cover for closing an opening in the connector housing.

2. Technical background

[0002] Electrical connector systems are used to establish electrical circuits such as for instance high voltage (HV) circuits. Herein, a cable is connected to an electrical connector comprising a connector housing, wherein the connector housing may provide a strain relief function to reduce mechanical stress occurring at a cable and an electrical connector forming an electrical connection. Said mechanical stress can be caused for instance by vibrations, as it may occur in the field of HV connection systems. Further, connector housings according to the state of the art may provide a sealing function to prevent dirt and/or moisture impairing the electrical connection between the cable and other electrical conducting parts of the connector. Mechanical strains and ingress of dirt or moisture can damage the connection between the cable and electrical conducting parts of the connector and can accordingly result in an undesired interference of the electrical connection up to an interruption of the electrical circuit.

[0003] Strain relief systems for electrical connector assemblies are known in the state of the art, such as for instance connector assemblies disclosed in reference document WO 2010/068291 A1. Herein, a connector assembly is disclosed with a strain relief comprising a collet and a retainer. The collet is disposed around a cable and includes longitudinally extending fingers that are configured to engage the cable when the connector is assembled and serrated edges of the fingers are compressed onto the cable. Further, to prevent ingress of moisture and other contaminants into the interior of the outer housing, a peripheral seal such as an elastomeric body is compressed at the front end of the electrical connector.

[0004] Another strain relief system for an electrical connector assembly according to the state of the art is disclosed in reference document EP 2 816 672 A1. Herein, a connector with a strain relief system is disclosed, wherein the connector comprises actuating jaws which are inserted into a guide retainer. The jaws can be guided towards each other and towards a cable arranged between said jaws, thus allowing for a compression of the cable. Further, to seal the interior components against dust or humidity, the connector assembly is provided with additional sealing components.

[0005] According to the state of the art, a combination of multiple parts is required to provide a strain relief function and a sealing function for an electrical connector housing. Thus, it is the objective of the present invention to provide an electrical connector housing with a simple and robust design while maintaining reliability of strain relief and sealing functionality.

3. Summary of the invention

[0006] The above noted problems can be solved by a connector housing according to the appended claims. The present invention relates to a connector housing comprising a cover for closing an opening in the connector housing, the cover comprising: at least one through hole, adapted to receive a cable, and at least two flexible arms extending from the cover in closing direction adapted to retain a cable received in the through hole, and wherein the connector housing comprises a cavity, adapted to at least partially receive the flexible arms in a closed condition of the cover, and wherein preferably each flexible arm comprises an outer contact surface comprising at least one step, and wherein in closed condition, the at least one step engages a cavity wall, such that the flexible arm is biased towards any cable received in said through hole. The electrical connectors presented herein fulfill the need of a reliable strain relief function, in particular in terms of vibration absorption, as it may be required in HV systems. At the same time, the electrical connectors according to the present invention provide a proper sealing function to avoid an impact of high pressure spray of liquid, such as for instance water.

[0007] The connector housing according to the present invention allows for a proper sealing, whereas no further additional parts or assembly steps are required to obtain the desired strain relief or sealing functions. Further, a simple closing movement of the cover according to the invention is sufficient to obtain said beneficial functions. The at least one through hole may be adapted to receive a cable, which may or may not comprise an insulation. The flexible arms may comprise a certain degree of flexibility to allow a reversible bending movement during the assembly of the electrical connector. Thus, the at least two flexible arms may be bent away from the cable and are thus biased when the cable is inserted through the at least one through hole of the cover. In another embodiment, the through hole and the flexible arms may be formed in a manner that the cable is only in loose contact with any parts of the cover such that the flexible arms are not biased by a retained cable. Thus, the cover and the housing can be formed dependent on the respective needs of an application. Movement of the cover in closing direction leads to a compression of the flexible arms against the cable via the at least one step arranged at the outer surface of said arms, which engages an inner wall of a cavity of the connector housing. It is appreciated that the cavity of the connector housing, into which the flexible arms are received, may also be formed by further parts, like a separate insert, which may be arranged in the connector housing. Thus, biasing of the arms towards the cable may be realized by a respective wall of a cavity that is formed by said additional parts housed in the connector housing.

[0008] The flexible arms may be guided into the cavity of the connector housing via additional means such as for instance inclined surfaces at the tips or free ends of said flexible arms, which facilitate the guidance of the arms into said cavity during the closing movement of the cover. Further, the arms may be properly formed and may further comprise an appropriate degree of stiffness and/or flexibility for providing a strain relief function such as a damping function for instance against vibrations occurring in HV applications. Thus, also unwanted movement of the terminals housed inside the connector could be prevented. The closing movement of the cover may be guided by the engagement of the biased flexible arms with the cable and/or further means that can suitably guide the flexible arms into the cavity. Thus, an easy assembly of the connector housing according to the invention could be achieved since no complex assembling steps are required. The simple closing movement of the cover towards the connector housing in one direction is sufficient for obtaining a safe and reliable sealing of the connector housing and at the same time a proper strain relief. Thus, also no further additional assembling steps or further additional parts are required for providing both, a proper strain relief function and a sealing function of the connector housing comprising a cover according to the invention.

[0009] In a preferred embodiment, the at least two flexible arms each comprise a continuous inner contact surface, wherein a retained cable is in contact with said continuous inner contact surface in closed condition. A continuous surface may provide the advantage of an improved compression force transfer from the flexible arms to the outer surface of a retained cable. Accordingly, an improved retention of the cable may be achieved compared to an assembly, at which only punctual transmission of compression forces are provided, e.g. by an increased friction between the flexible arms and an outer surface of the cable such as a surface of an insulation. Thus, any movements towards and against the closing direction of the cover can be prevented, as well as for instance torsion movements of the cable around its extension axis. Further, the force distribution may be more homogenous compared to a punctual grabbing of the cable by the flexible arms, which may help to prevent damages at the insulation of the cable which can be for instance a rubber insulation or another suitable soft plastic material insulation. The continuous inner contact surface may further comprise provisions for enhancing the retention between the flexible arms and the cable such as serrations or any other suitable form of a surface.

[0010] In another preferred embodiment, each flexible arm is biased towards any cable received in said hole at the continuous inner contact surface extending from tips of the flexible arms, wherein the continuous inner contact surface preferably extends at least 10% of the length of the flexible arm, more preferably at least 20% of the length of the flexible arm and most preferably at least 30% of the length of the flexible arm. Due to the larger the continuous inner contact surface, a better retention of the cable and a better force transmission can be obtained between the flexible arms and the retained cable and insures proper cable holding. Thus, for instance vibrations may be absorbed particularly well. Further, also the length of the arms required to obtain a desired strain relief or vibration damping may be reduced, allowing for a more compact design of the connector housing and further reducing material costs.

[0011] In another preferred embodiment, the surface of the at least one step overlaps and contacts the cavity wall in closed condition at an overlapping contact portion. Thus, forces transferred between the flexible arms and the cavity wall may be advantageously distributed over a larger contact surface between the cavity wall and the flexible arms. Hence, an improved fixation of the arms within the cavity of the connector housing and of the retained cable may be obtained, which may also improve the damping of vibrations. Further, also the application of compression forces from the flexible arm to the cable may be improved since the larger overlapping contact portion can be used to transfer pressure forces from the cavity wall to the flexible arms and accordingly further to the retained cable. At the same time, also sealing of the cavity of the connector housing can be improved since a larger overlapping portion allows for establishing a good mechanical connection between the flexible arms and the inner cavity wall compared to a sole punctual engagement of the flexible arms and the cavity wall. Further, undesired torsion movements of the flexible arms along their extension axes can be prevented since the flexible arms are clamped at the contact surface side between the flexible arm and the retained cable and further at the overlapping contact portion side between the flexible arms and the inner cavity wall. Accordingly, an increased stability of the flexible arms and thus an enhanced strain relief and vibration damping can be obtained.

[0012] In another preferred embodiment, an outward bending of the flexible arms is prevented in closed condition by the engagement of the outer contact surface with the cavity walls. Thus, any unwanted flexible movements of the arms in a direction away from the cable are prevented when the cover is in a closed condition, since the outer surfaces of the flexible arms engage the cavity walls. Further, any movement of the retained cable in the cavity is prevented. This increases reliability of an electrical connection since the cable is prevented from moving out of position once the cover is in a closed condition.

[0013] In another preferred embodiment, a second step is provided at the outer contact surface, wherein the second step engages a front edge of the cavity wall in closed condition, and wherein the second step blocks further movement of the flexible arms in closing direction. The second step may be arranged at the outer contact surface of the flexible arms after the first step, as seen in direction from the tips along the flexible arms. Thus, when the flexible arms are inserted into the cavity of the

connector housing and further moved in closing direction, said movement in closing direction can be blocked by the second step when the cover arrives at a position at which the closing of the connector housing is completed. This may be realized by an engagement of the second step with a front edge of the cavity wall. Hence, a user may be supported by verifying that the connector housing is in a correctly closed condition, since said desired, correctly closed condition of the connector housing may be obtained by a simple movement of the cover in closing direction until no further movement is possible. Thus, a secure and simple assembly of the cover with the connector housing may be provided. Accordingly, any unwanted condition at which the cover is not fully closed may be prevented. Further, it may be prevented that the cover, and accordingly the flexible arms, are moved too far in closing direction, thus avoiding damages of any parts of the electrical connector that are arranged within the cavity. Hence, movement of the cover may be guided just by the shape of the outer surface of the flexible arms comprising a first and a second step and by the shape of the inner cavity wall of a respective connector housing. Accordingly, no additional means for guiding said cover to the closed position are necessary.

[0014] In another preferred embodiment, any steps are integrally formed with the flexible arms. This allows for a well-defined force transmission and a reduced complexity of the connector housing, since the flexible arms can be mold or cast as one piece for instance from a suitable plastic material.

[0015] In another preferred embodiment, at least three flexible arms are provided, preferably at least five flexible arms, most preferably seven arms, preferably wherein the flexible arms are circumferentially and equally spaced around the through hole. Thus, a homogenous force distribution from and towards the cable can be obtained, providing a proper sealing, as well as an improved strain relief or vibration damping. Therefore, preferably, multiple flexible arms are provided wherein the number of flexible arms can be adapted to ensure proper cable holding.

[0016] In another preferred embodiment, the flexible arms are designed to damp vibrations of a retained cable equally in all directions. Accordingly, the dimensioning of each flexible arm, such as thickness and length, as well as physical properties, such as stiffness or flexibility may be adjusted to obtain a particular well damping of any vibration profiles that the connector potentially should withstand. Thus, movement of the cable during said vibrations is prevented.

[0017] In another preferred embodiment, the flexible arms are integrally formed with the cover. Thus, the flexible arms may be made of the same material as the cover, which may be for instance a suitable plastic material. Further, no further additional parts are required since the flexible arms are integrally formed with the cover, which simplifies the manufacturing and assembly of the electrical connector according to the invention. The integral forming of the flexible arms with the cover also increases robustness against mechanical strains such as bending or torsion forces acting on the flexible arms. Further, no additional connections between the flexible arms and the cover are required, which would otherwise form weak points regarding force transmission and may thus be disadvantageous. Accordingly, also wear resistance and durability of the cover is improved.

[0018] In another preferred embodiment, the cover seals the cavity of the connector housing against spray water ingress in closed condition. In other words, the cover protects seals that are provided inside the cavity of the connector housing against spray water ingress in closed condition. Thus, water, dust or any other potentially damaging materials are prevented from penetrating the interior of the connector housing. Further, no additional parts for sealing the cavity are required since the cover already fulfils the required sealing functionality. This simplifies assembly and manufacturing of the electrical connector according to the invention. Also, no additional parts made from a different material such as for instance a separate rubber sealing are required and thus also no replacement of any additional worn out sealing parts are necessary which increases robustness and durability of the electrical connector housing and the cover according to the present invention.

[0019] In another preferred embodiment, sealing is obtained up to a pressure of the spray water of XY 0.5 bar, preferably 1 bar, more preferably 5 bar. Thus, pressurized water spray may be prevented from penetrating the inside of the connector housing even under conditions of higher impact pressures, as it may occur for instance in certain HV applications. Thus, the electrical connector housing according to the present invention may be used in a broad scope of conditions at which these sealing properties are required. In particular, when using standard automotive single wire seals (SWS), the sealing complies with the standardized IPX6K9K test with a high pressure jet. In particular, the seal is covered such that there is no direct access to the seal.

[0020] In another preferred embodiment, the cover comprises a second through hole adapted to receive and retain a second cable in the same manner as a first cable. Hence, the connector housing according to the invention may be suitable for two-way connectors which establish an electrical connection using two cables. It is acknowledged that also three and more through holes for retaining respective cables may be utilized while obtaining the inventive retaining and sealing functionality. So, the cover comprises the second through hole or more adapted to receive and retain a corresponding second cable or more in the same manner as a first cable. Thus, the cover according to the present invention allows to provide the functionality according to the present invention for different connectors, cables and/or terminal sizes and thus allows for a broad scope of application.

[0021] In another preferred embodiment, the cover comprises locking means for locking the cover with the connector housing in the closed condition, preferably

wherein the locking means of the cover is a locking recess, which is integrally formed with the cover for locking with a respective locking latch, which is integrally formed with the connector housing arranged at an outer housing surface of the connector housing. Thus, a particular safe locking is achieved, which further improves reliability in closing the opening of the electrical connector. The cover can be held in place and the cable is accordingly safely retained also under the influence of larger mechanical strains. Further, a user may be visually or acoustically supported via respective means like colored latches and recesses and/or a clicking sound to confirm that the cover is securely locked with a connector housing. The integral formation of the locking means, such as the locking latch of the housing and the locking recess of the cover allows for a safe connection without the need of additional parts to lock the cover with the connector housing. The locking means can of course also be arranged differently such that the recess may be provided at the connector housing and the latch may be provided at the cover. The locking means may be provided at lateral walls of the connector housing and respective overlapping lateral walls of the cover such that an unwanted opening of the cover can be prevented.

[0022] In another preferred embodiment, the flexible arms are adapted to receive cables comprising an outer diameter of 1.5 mm, preferably, 2.8 mm. Thus, the connector housing and the cover according to the invention may be suitable for HV applications, wherein the cables usually comprise such outer diameters. It is foreseen that the flexible arms are adapted to receive cables comprising different outer diameters depending on the application.

4. Description of the drawings

[0023] For a better understanding of the present invention and to appreciate its practical applications, the following figures are provided in reference hereafter. It should be noted that the figures are given as examples only and in no way limit the scope of the present invention.

Fig. 1 shows a top front view of the connector housing according to the present invention with a cover arranged in a fully closed condition.

Fig. 2 shows a rear view of a cover according to the present invention.

Fig. 3 shows in a cross-sectional side view the connector housing according to the present invention with a cover arranged in a mounted but not fully closed condition.

Fig. 4 shows a cross-sectional side view of an enlarged detail of the connector housing according to the present invention with a cover arranged in a fully closed condition.

5. Description of the preferred embodiments

[0024] In the following, the present invention will now be described in more detail hereinafter with reference to the accompanying figures in which exemplary embodiments of the invention are illustrated. However, the present invention may be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these examples are provided so that this disclosure will be thorough and will convey the scope of the invention to persons skilled in the art. Further, same reference signs identify similar parts of the following embodiments.

[0025] **Fig. 1** shows an electrical connector 1 comprising a connector housing 10 and a cover 20 according to the present invention, mounted to an opening at a front side of the connector housing 10. The cover 20 comprises two circularly shaped through holes 22 at which two cables 50, which each comprise a conductor 52 and an insulation 54, are retained. The cover 20 is locked by locking means 36, namely locking latches 16, which are integrally formed at the outer housing surface 18 at opposed lateral walls 21 of the connector housing 10 and locking recesses 38, which are integrally formed at respective opposed lateral walls 21 of the cover 20. As can be seen from Fig. 1, lateral walls of the outer housing surface 18 and the lateral walls 21 of the cover 20 at least partially overlap when the cover 20 is arranged in a fully closed condition. The connector housing 10 and the cover 20 are each formed as integral parts.

[0026] **Fig. 2** shows a detailed rear view of a cover 20 according to the present invention. The cover 20 comprises locking recesses 38 at two oppositely arranged lateral sides 21 of the cover 20, which are adapted to lock with corresponding counteracting locking means of a connector housing 10. Further, two circularly shaped through holes 22 are provided in the cover 20 adapted to retain two cables 50, wherein the through holes 22 are each surrounded by flexible arms 24, which are circumferentially arranged and equally spaced from each other. The flexible arms 24 extend from the cover 20 in closing direction 100. Each flexible arm 24 comprises an outer contact surface 26, which has a first step 28 and a second step 34 and an overlapping contact portion 40 arranged between the two steps, as seen in a direction from the tips 32 of the flexible arms 24 towards the front side of the cover 20. The flexible arms 24 each further comprise a continuous inner contact surface 30. At this continuous inner contact surface 30, contact is established between a cable 50 and the flexible arms 24. The continuous inner contact surface 30 extends from the tip 32 of the flexible arm 24 in a direction towards the front side of the cover 20. As depicted, all parts of the cover 20 are integrally formed and accordingly of the same material.

[0027] **Fig. 3** shows a cross-sectional side view of an electrical connector 1 comprising a connector housing 10 according to the present invention, wherein a cable 50 is retained in a through hole 22. A cover 20 is mounted

to the connector housing 10 but however in a position at which the connector housing 10 is not yet in a fully closed condition. Herein, the trough hole 22 of cover 20 retains the cable 50 which comprises a conductor 52 and an insulation 54. The cable extends through the through hole 22 into the cavity 12 of the connector housing 10. Each flexible arm 24 contacts cable 50, in particular at the outer surface of insulation 54, but is not yet fully biased against cable 50 at a continuous inner contact surface 30. This is because each flexible arm 24 is not yet biased by the cavity wall 14 at the outer contact surface 26. As the cover 20 was previously moved in closing direction 100, each flexible arm 24 of the cover 20 was initially guided along the cavity wall 14 towards the interior of cavity 12. As depicted in Fig. 3, the front edge 15 of cavity wall 14 engages a first step 28 of the outer surface 26. Additionally, guidance of cover 20 during the movement in closing direction 100 is achieved by inner surfaces of the lateral walls 21 of the cover 20, which slide along the lateral sides of outer housing surface 18.

[0028] **Fig. 4** shows a detailed view of a cross-section of cover 20, wherein cover 20 is arranged in a position at which the electrical connector housing 10 is in a fully closed condition. Herein, cover 20 and accordingly also the flexible arms 24 have been moved further in closing direction 100 compared to the condition as previously shown in Fig. 3, until the front edge 15 of cavity wall 14 contacts the second step 34, which is arranged at the outer contact surface 26 of each flexible arm 24. Thus, further movement of the cover 20 in closing direction 100 is prevented. Cavity wall 14 engages the top surface of the first step 28, forming an overlapping contact portion 40, which is arranged between the first step 28 and the second step 34 and thus the flexible arm 24 is forced in biasing direction 200. The flexible arm 24 is accordingly pressed towards cable 50 in biasing direction 200 at a continuous inner contact surface 30. Since the front edge 15 of cavity wall 14 engages the second step 34, cover 20 and flexible arm 24 cannot be moved further into the cavity 12 in closing direction 100. Additionally, a further movement in closing direction 100 is prevented by the engagement of the front surface of the electrical connector housing 10 and the surface of the frontside wall of cover 20. The overlapping contact portion 40 is formed between the first step 28 and the second step 34, at which cavity wall 14 engages the flexible arm 24. Thus, a sealing of cavity 12 of the connector housing 10 is accordingly obtained.

Reference signs

[0029]

1	electrical connector
10	connector housing
12	cavity
14	cavity wall
15	front edge
16	locking latch
18	outer housing surface
20	cover
21	lateral wall
22	through hole
24	flexible arm
26	outer contact surface
28	first step
30	continuous inner contact surface
32	tip
34	second step
36	locking means
38	locking recess
40	overlapping contact portion
50	cable
52	conductor
54	insulation
100	closing direction
200	biasing direction

Claims

1. A connector housing (10) comprising a cover (20) for closing an opening in the connector housing (10); the cover (20) comprising:

   at least one through hole (22), adapted to receive a cable (50); and
   at least two flexible arms (24) extending from the cover (20) in closing direction (100) adapted to retain a cable (50) received in the through hole (22); and
   wherein the connector housing (10) comprises a cavity (12), adapted to at least partially receive the flexible arms (24) in a closed condition of the cover (20); and
   wherein at least one of the flexible arms (24), and preferably each of the flexible arms (24), comprises an outer contact surface (26) comprising at least one step (28); and
   wherein in closed condition, the at least one step (28) engages a cavity wall (14), such that the flexible arm (24) is biased towards any cable (50) received in said through hole (22).

2. The cover (20) of claim 1, wherein the at least two flexible arms (24) each comprise a continuous inner contact surface (30), wherein a retained cable (50) is in contact with said continuous inner contact surface (30) in closed condition.

3. The cover (20) of the previous claim, wherein each flexible arm (24) is biased towards any cable (50) received in said hole at the continuous inner contact surface (30) extending from tips (32) of the flexible arms (24),
   wherein the continuous inner contact surface pref-

erably extends at least 10% of the length of the flexible arm (24), more preferably at least 20% of the length of the flexible arm (24) and most preferably at least 30% of the length of the flexible arm (24).

4. The cover (20) of any preceding claim, wherein the surface of the at least one step (28) overlaps and contacts the cavity wall (14) in closed condition at an overlapping contact portion (40).

5. The cover (20) of any preceding claim, wherein an outward bending of the flexible arms (24) is prevented in closed condition by the engagement of the outer contact surface (26) with the cavity walls (14).

6. The cover (20) of any preceding claim, wherein a second step (34) is provided at the outer contact surface (26),
wherein the second step (34) engages a front edge (15) of the cavity wall (14) in closed condition; and
wherein the second step (34) blocks further movement of the flexible arms (24) in closing direction (100).

7. The cover (20) of any preceding claim, wherein any steps (28; 34) are integrally formed with the flexible arms (24).

8. The cover (20) of any preceding claim, wherein at least three flexible arms (24) are provided, preferably at least five flexible arms (24), most preferably seven arms (24),
preferably wherein the flexible arms (24) are circumferentially and equally spaced around the through hole (22).

9. The cover (20) of any preceding claim, wherein the flexible arms (24) are designed to damp vibrations of a retained cable (50) equally in all directions.

10. The cover (20) of any preceding claim, wherein the flexible arms (24) are integrally formed with the cover (20).

11. The cover (20) of any preceding claim, wherein the cover (20) seals the cavity (12) of the connector housing (10) against spray water ingress in closed condition.

12. The cover (20) of the preceding claim, wherein sealing is obtained up to a pressure of the spray water of 0.5 bar, preferably 1 bar, more preferably 5 bar.

13. The cover (20) of any preceding claim, wherein the cover (20) further comprises a second through hole (22) adapted to receive and retain a second cable (50) in the same manner as a first cable (50).

14. The cover (20) of any preceding claim, wherein the cover (20) comprises locking means (36) for locking the cover (20) with the connector housing (10) in the closed condition,
preferably wherein the locking means (36) of the cover (20) is a locking recess (38), which is integrally formed with the cover (20) for locking with a respective locking latch (16), which is integrally formed with the connector housing (10) arranged at an outer housing surface (18) of the connector housing (10).

15. The cover (20) of any preceding claim, wherein the through holes (22) and the flexible arms (24) are adapted to receive cables (50) comprising an outer diameter of 1.5 mm, preferably, 2.8 mm.

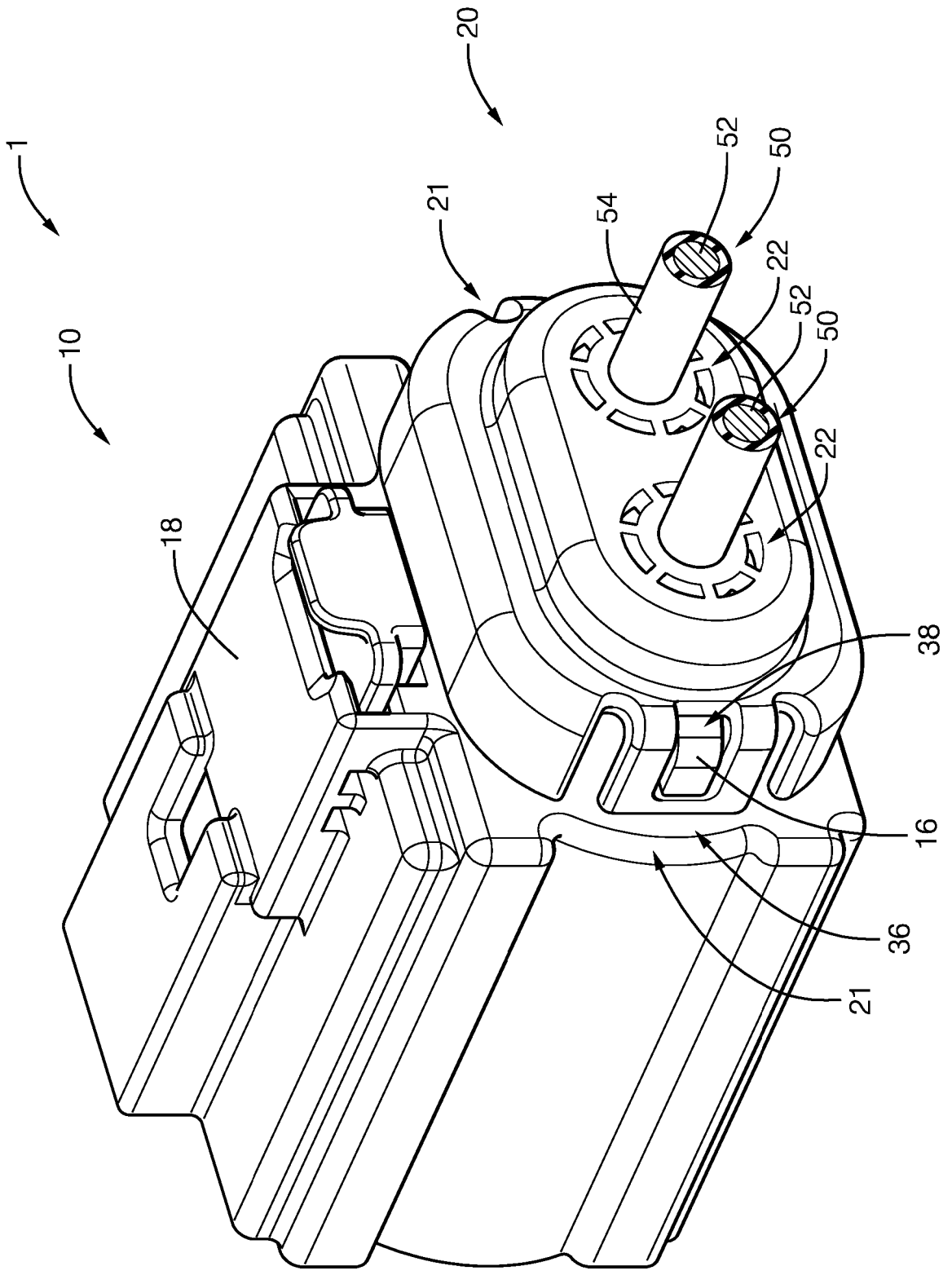

FIG. 1

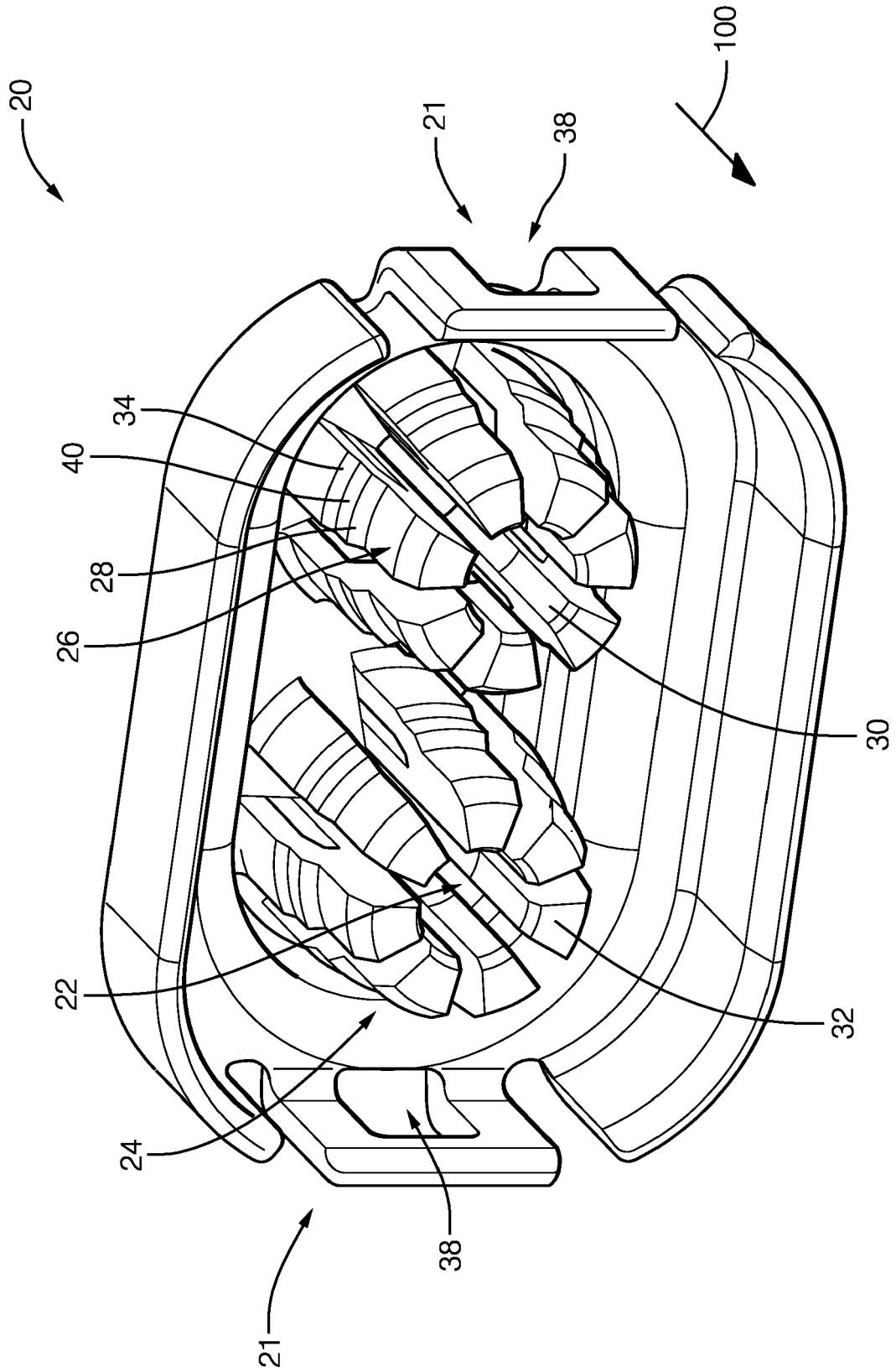

FIG. 2

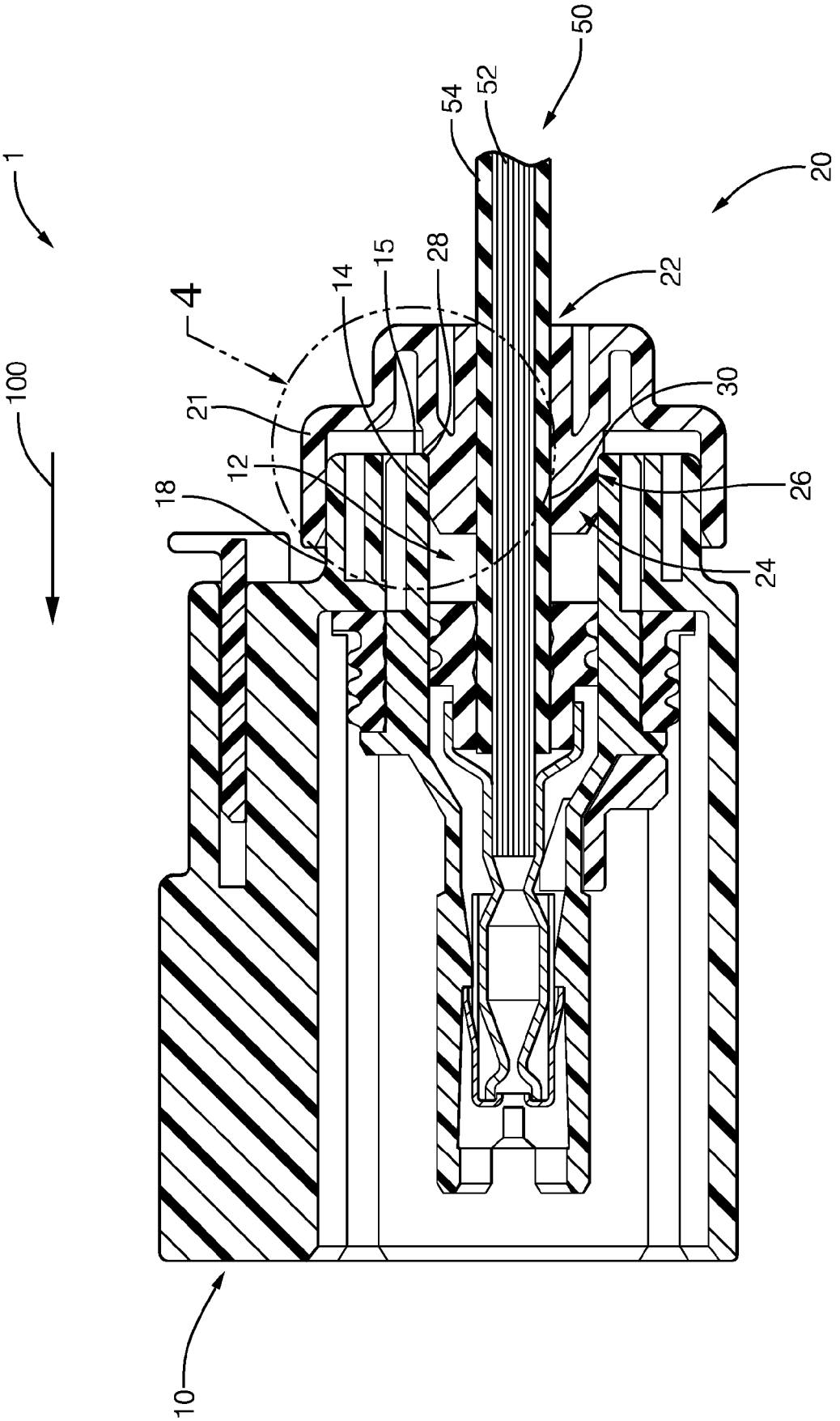

FIG. 3

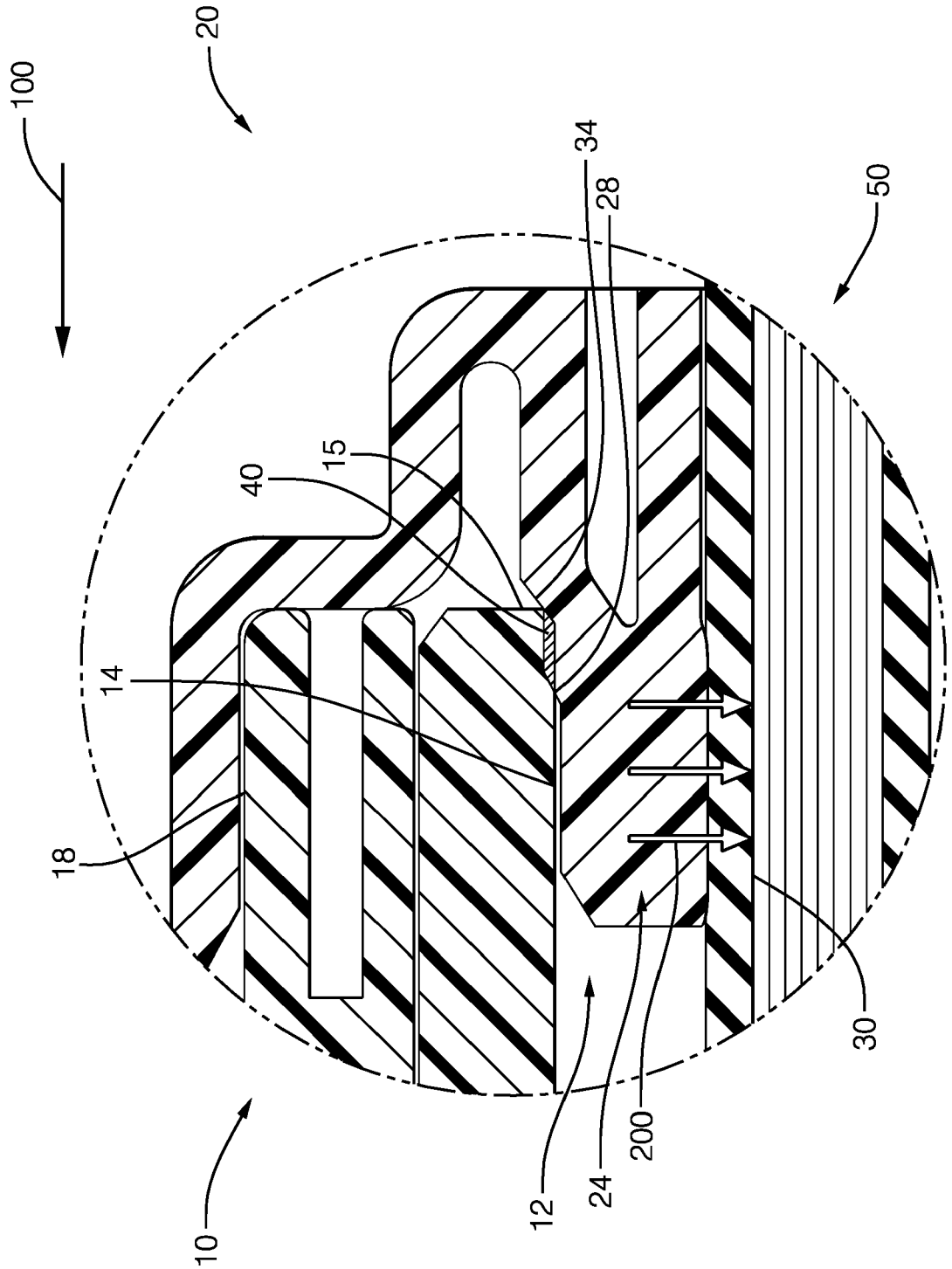

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 1760

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 Y	DE 20 2015 103733 U1 (LISA DRÄXLMAIER GMBH [DE]) 26 August 2015 (2015-08-26) * paragraph [0033] * * figures 1-7 * * paragraph [0036] * * paragraph [0044] *	1-12,14, 15 13	INV. H01R13/58
Y	EP 0 646 991 A1 (SUMITOMO WIRING SYSTEMS [JP]) 5 April 1995 (1995-04-05) * figure 4 *	13	
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			TECHNICAL FIELDS SEARCHED (IPC) H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 March 2018	Hugueny, Bertrand

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 19 1760

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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14-03-2018

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