

DescriptionField

[0001] The present disclosure relates to a connector for medium voltage cables and a method for connecting two cables.

Background

[0002] A medium-voltage network is typically used to supply electrical power to a region comprising several localities, or in cities, a city district. The term "medium-voltage" typically refers to voltages in the range above 1 kV up to and including 52 kV. Medium voltage lines usually carry only one conductor that can be in the form of a stranded conductor. In practice, when building or maintaining a medium voltage network, there is a need of connecting the ends of electrical lines. At present, connectors utilizing crimp and screw technology are established on the market. In both systems, the conductor is contacted in radial direction from outside. Regarding the crimp technology, for each diameter of the conductor to be contacted a dedicated crimp connector is required. In contrast, in the screw connection technique a single screw connector can cover a range of different diameters of the conductor to be contacted. To this end, centering rings or metal inserts are used to center different medium voltage conductors in the screw connector. The number of centering rings or metal inserts required for connection depends on the size of cross-section of the conductor. The main cross-section range of cables used in medium voltage networks covers a range from 16 mm² to 400 mm² approximately corresponding to a diameter range from 2 mm to 12 mm. For example, the supplier Nexans covers this cross-section range by screw connectors having different sizes.

[0003] To make a connection, the insulation of the cable must be stripped in a first step. Aluminium conductors are brushed to break their oxide layer and to achieve a better contact. In addition to that, any conductor fillings must be removed. Pressing screws, which are inserted in radial direction into the connector are greased on their face to reduce friction between the screws and the conductor. Furthermore, contact grease is applied inside to the connector to ensure better electrical contact between the conductor and the connector. Due to unspecified conductors, screws occasionally protrude through the connector. This has a negative impact on the quality and reproducibility of the contact. When a protrusion occurs, the connection must be reworked, e.g. by filing. One option to avoid screw protrusions is to utilize shear-off screws. In summary, tried and tested connection concepts are used in sleeves, end closures and connectors. Size scaling is realized by increasing the number of pressing screws in the respective component.

[0004] DE 8914460 U1 discloses a contact element for contacting a stranded conductor. The contact element comprises a sleeve accommodating the bare stranded wire. A tapered contact bolt is screwed into the sleeve and presses the wires of the stranded conductor against a constriction inside the hollow sleeve. The opposite end of the contact bolt is formed as a connector or socket. This contact element is not suitable for connecting medium voltage lines or cables.

[0005] With existing contact technology, many components are needed to make a connection and making the connection is tedious.

[0006] In view of the limitations of existing connection technologies, there remains a desire for a connector to overcome or at least improve one or more of the problems mentioned at the outset.

Summary

[0007] According to a first aspect the present disclosure suggests a connector for contacting a conductor isolated by an insulation. The connector comprises a sleeve and a contact bolt. The sleeve is provided on a first end with a threaded central bore for accepting the contact bolt and on a second end with a bore having at least one tapered section provided with a self-tapping internal thread. The bore is oriented with its tapered end towards the central bore to form a through hole passing the sleeve. The tapered section of the bore is configured to be screwed onto the insulation of the conductor. The contact bolt is screwed into the central bore of the sleeve to reduce the space within the bore.

[0008] Reducing the space in the conical bore has the effect that when the connector is mounted on an electrical line, the wires of the conductor are pressed against an internal wall of the conical bore. Oxide layers on the wires are broken and a good electrical contact between the conductor and the contact bolt is achieved. The conical bore centers conductors of different diameters in the sleeve and makes centering rings and inserts obsolete, which are used in conventional connectors. The conical bore accepts a range of diameters of conductors.

[0009] In an advantageous embodiment the sleeve has more than one tapered section with the same or different opening angles. If the sleeve has more than one tapered sections then it is easier to adapt the sleeve to different diameters of the conductor and insulation.

[0010] Advantageously, a cylindrical section of the bore is arranged between the tapered sections. For a given opening angle of the tapered section the penetration depth of the conductor with a specific diameter is a larger compared with a conical section instead of the cylindrical section.

[0011] It has been found useful to provide for a free cut between the tapered sections there is a free cut. The free cut makes the room for a conductor that is widened by a penetrating contact bolt.

[0012] According to an advantageous embodiment, the contact bolt is a shear-off bolt. The shear-off bolt breaks at a position for enabling proper functioning of the connector. The contact bolt is a stepless bolt or has fixed shearing steps.

[0013] Advantageously, the sleeve comprises at its first end a male or female connector section or a cable lug facilitating the connection of conductors, including conductors of different diameters.

[0014] In case the sleeve includes a cable lug, the cable not advantageously comprises two legs. The two legs permit screwing the contact bolt through the cable up into the sleeve which is integrated with the cable.

[0015] It has been found very useful when the self-tapping thread of the conical bore is configured to cut into the insulating jacket or an external sheath enclosing the stranded conductor to establish a fixed mechanical connection. No other components are required to fix the connector on the insulated conductor.

[0016] In a convenient further development, the female connectors section is provided with a radial screw to fix a connector with a male connector section inserted into the female connector section. The radial screw prevents unintended disconnection of the male and female connectors. Preferably, the radial screw establishes a form and friction locking connection between the male and the female connectors.

[0017] With advantage the contact bolt is provided with an internal or external structure, in particular a polygonal structure and more particularly a hexagonal structure, enabling coupling the contact bolt with a tool enabling screwing the contact bolt into the sleeve. The internal or external structure on the contact bolt facilitates mounting of the contact bolt.

[0018] According to a second aspect, the present disclosure suggests a method for connecting two stranded conductors provided with an insulation. The method comprises

- screwing the cutting sleeve according to claim 1 on the insulation of each conductor;
- screwing the contact bolt into each cutting sleeve;
- shearing-off the contact bolts;
- connecting the cutting sleeves.

[0019] Advantageously, the method further comprises screwing a pressing screw into one of the cutting sleeves for making a friction locking in connection between the cutting sleeves.

[0020] Implementing the suggested method allows for realizing the advantages that have been mentioned regarding the connector according to the first aspect of the present disclosure.

Brief description of the drawings

[0021] Exemplary embodiments of the present disclosure are illustrated in the drawings and are explained in more detail in the following description. In the figures, the same or similar elements are referenced with the same or similar reference signs. It shows:

- Fig. 1 a male and a female connector according to the present disclosure;
- Fig. 2A the connectors of Figure 1 with screwed in contact bolts;
- Fig. 2B the contact bolt in detail;
- Fig. 2C an alternative contact bolt
- Fig. 3A-3C different mounting stages of a connection comprising the connectors shown in Figure 2;
- Fig. 4 a male connector and a corresponding cable lug according to the present disclosure;
- Fig. 5 an alternative male connector according to the present disclosure;
- Fig. 6 another alternative male connector according to the present disclosure;
- Fig. 7A,7B a cutting sleeve with an integrated cable lug; and
- Fig. 8 a schematic flow diagram for making a connection between two cables.

[0022] In the figures the same or similar components are labelled with the same or similar reference signs.

Detailed description

[0023] Figure 1 illustrates a male and a female connector 101 and 102 according to the present disclosure. The connectors 101, 102 comprise essentially two main components, namely a cutting sleeve 103M, 103F and a contact bolt 201 (Figure 2B). The cutting sleeve 103M, 103F has a threaded central bore 104 and a conical bore 106 that is provided with a conical thread 107. The conical thread 107 is a self-tapping thread that is threaded onto an insulation 108 of a stranded conductor 109 that is composed of a multitude of wires 110. The stranded conductor 109 and its insulation 108 are for example a medium voltage line or cable. However, it is noted that to the present disclosure is not limited to

medium voltage is in the range of 1 kV to 52 kV.

[0024] The cutting sleeve 103M, 103F is screwed onto the insulation 108 by means of the conical internal thread 107 which cuts or roles an external thread on the insulation 108 that consequently mates with the conical thread 107. The conical bore 106 of the sleeve 103M, 103F enables connecting the sleeve 103M, 103F to conductors 109 with different diameters. This feature is also referred to as "multi-range capability" of a connection including connectors 101, 102. The insulation 108 is always centered inside the conical bore 106 of the sleeve 103 which entails centering the conductor 109 within the sleeve 103 as well. Consequently, the use of centering rings or metal inserts etc. is no longer required.

[0025] The sleeve 103M of connector 101 comprises a male connector section 112 having a smaller diameter than the opposite section of the sleeve 103M which contains the conical bore 106. Adjacent to the connector section 112 a hexagonal structure 113 is arranged on the sleeve 103M allowing the coupling of the connector 101 with an open-ended spanner or wrench (not shown). The connector section 112 further comprises a circular indent 114, the function of which will be explained further below.

[0026] The sleeve 103F of connector 102 has a similar structure except for a female connector section 116 replacing the male connector section 112. The female connector section 116 comprises a cylindrical cavity 117. The diameter of cavity 117 is chosen such that the male connector section 112 can readily enter into the cavity 117 with some play. The cavity 117 includes a radial threaded hole 118. A pressing screw 119 is threaded into the hole 118. A tip 121 of the screw 119 has a form complementary to the form of the circular indent 114.

[0027] Figure 2A shows the connectors 101, 102 with contact bolts 201 threaded into the central bore 104 of the sleeves 103M, 103F. The contact bolt 201 is also shown in Figure 2A. The contact bolt 201 is composed of a cylindrical elongated section 202 carrying an external thread 203. The elongated section 201 terminates in a tapered tip 204. The elongated section 203 is provided with an internal hexagonal structure 206 allowing the coupling with a tool to screw the contact bolt into the sleeve 103M, 103F. An alternative embodiment of the contact bolt 201 has an external hexagonal structure for the same purpose. Just for the sake of clarity it is noted that the present disclosure is not limited to the specific shape of the internal or external structure.

[0028] The contact bolt 201 is sheared-off by means of a union nut 207 which is tightened until the contact bolt 201 breaks and is flush with the end of the connector section 112. The connector 101 is shown with the union nut 207 screwed on the contact bolt 201, while the connector 102 is shown with contact bolt 201 which is already sheared off. The contact bolt 201 in connector 102 is sheared-off to be flush with a bottom 208 of the cavity 117.

[0029] In the following the making of connection using the example of connecting a 70 mm²/20 kV, AL class 2 conductor with a 300 mm²/20 kV, AL class 2 conductor will be described with reference to Figure 2. The cutting sleeve 103M is mounted on the 70 mm²/20 kV, AL class 2 conductor and the cutting sleeve 103F is mounted on the 300 mm²/20 kV, AL class 2 conductor. The proposed concept works not only with stranded conductors but also with fine stranded conductors or massive conductors. Massive conductors need to be provided with slits, which can be made with a saw for instance.

[0030] As a first step, the insulation 108 of the conductors 109 must be removed. The set-off length depends on the outer diameter of the insulation and the opening angle of the conical bore 106. Specifically, a wide opening angle of the conical bore 106 permits deeper penetration of the insulation 108 into the conical bore than a small opening angle does. This difference may have to be compensated by a longer set-off length of the insulation 108 in the case of a small opening angle compared to the connector with a wide opening angle. Depending on the geometry, i.e. the length and the opening angle of the cutting sleeve 103M, 103F, a different number of conductors of the same and different voltage levels can be contacted with the same set-off length. With reference to Figures 1 and 2 the opening angles of the cutting sleeves 103M and 103F are the same. In consequence the 70 mm²/20 kV, AL class 2 conductor reaches deeper into the conical bore 106 of cutting sleeve 103M than the 300 mm²/20 kV, AL class 2 conductor into the conical bore 106 of cutting sleeve 103F. In either case the conical internal thread 107 cuts into the insulation 108, centers the cutting sleeve 103M, 103F on the respective conductor and allows for multi-range capability as mentioned above.

[0031] To contact the conductor 109, the contact bolt 201 is screwed into the cutting sleeve 103M, 103F and penetrates into the conductor 109. When the contact bolt 201 is screwed into the cutting sleeve 103M, 103F, the conductor 109 is pressed and spread open by the contact bolt 201 exerting a force that is at least partially radially directed from a central axis of the cutting sleeve 103M, 103F to the outside of the sleeve 103M, 103F. As a result, the conductor wires are pressed against the internal thread 107 of the conical bore 106, which brings the outer wires 110 of the conductor 109 into contact with the internal thread 107 and, hence, with the cutting sleeve 103M, 103F. The inner wires 110 of the conductor 109 are contacted by the tapered tip 204 of the contact bolt 201. Due to the tapered nature of the tip 204, it exerts a large contact force even if only a small torque is applied to the contact bolt 201. The tip 204 contacts the inner wires 110 of the conductor 109 and compresses the entire conductor. The forces applied on the inner and outer wires result in breaking any oxide layers, e.g. on Al conductors. When the contact bolt 201 is screwed in the cutting sleeve 103M, 103F, the conductor 109 is fixed in the cutting sleeve 103M, 103F by the thread cut on the insulation 108.

[0032] The shape of the tip 204 can be conical/ball-shaped/conical, pyramid-shaped or trapezoidal, wedge-shaped or arrow-shaped, etc. The thread of the contact bolt 201 extends along the elongated section 202 of the contact bolt

201 while the tip 204 has a smooth surface. In another embodiment the thread of the contact bolt extends over the tip 204 as well.

[0033] Figure 2C displays an alternative contact bolt 211 comprising an elongated section 212 which is provided with an external thread 213. The contact bolt 211 has a smooth conical tip 214 and a hexagonal structure 216 at the end opposite to the tip 214. The structure 216 allows for the coupling of the contact bolt 211 with an open-ended spanner or wrench. A blind hole 217 extends from the end carrying the hexagonal structure 216 through the elongated section 212. When tightened in a cutting sleeve 103M, 103F the contact bolt 211 shears-off to be flush with the male connector section 112 or the bottom 208 of the cavity 117, respectively.

[0034] Figures 3A-3C illustrate different stages of making a connection between the conductors of two medium voltage cables 301 and 302. Figure 3A displays the cutting sleeve 103M mounted on the cable 301. The cutting bolt 201 is already screwed into the sleeve 103M and carries on its rear portion the union nut 207 to shear-off the contact bolt 201 to be flush with the male contact section 112. The cutting sleeve 103F is mounted on the cable 302. The contact bolt 201 is already mounted in the cutting sleeve 103F and sheared off. The pressing screw 119 is a shear-off screw and located on the cutting sleeve 103F.

[0035] In Figure 3B the contact bolt 201 in contact to sleeve 103M is sheared-off and the context sleeves 103M and 103F are ready to be connected.

[0036] In Figure 3C the cutting sleeves 103M and 103F are connected and the pressing screw has been screwed into the cutting sleeve 103F and sheared-off. The rounded tip 121 of the pressing screw 119 mates with the circular indent 114 in the male connector section 112 and creates a form and friction locking connection between the male and female connector sections 114, 116. Finally, an insulating sleeve (not shown) is arranged as electrical insulation of the connection composed of the two connectors 101, 102.

[0037] Figure 4 shows a male connector 101 and a cable lug 401. The cable lug 401 comprises a female connector section 116 enabling the connection between the male connector 101 and the cable lug 401. The pressing screw 119 establishes a form and friction locking connection when, firstly, the male connector 101 is inserted into the female connector section 116 and, secondly, the pressing screw 119 is tightened until it shears-off.

[0038] Figure 5 shows a male connector 501 with an alternative embodiment of a cutting sleeve 503M with a tapered bore 506 with an internal thread 507. The tapered bore 506 has four different sections 506a-d. Section 506a has a conical shape and the next section 506b has a cylindrical shape. Following section 506c is again conical and the final section 506d is cylindrical. Figure 5 shows contact bolt 211 screwed into the cutting sleeve 503M. The concatenated conical and cylindrical sections 506a-d of tapered bore 506 facilitate accommodating cables with different diameters. For instance, due to the cylindrical section 506b a cable having a conductor with large diameter can enter deeper into the sleeve 503M compared with the sleeve 103M which has a continuously conical bore 106. The same applies to cables with conductors having a smaller diameter regarding the cylindrical section 506d.

[0039] Figure 6 shows a male connector 601 a further alternative embodiment of a cutting sleeve 603M with a tapered bore 606 with an internal thread 607. The tapered bore 606 has four different sections 606a-d. Section 606a has a conical shape and is provided with the internal thread 607. Adjacent section 606b is a free cut that increases in diameter opposite to the decreasing diameter of section 606a. In the direction from left to right in Figure 6, next section 606c has again a conical shape with internal thread 607. Finally, section 606d is again a free cut that also increases in diameter opposite to the decreasing diameter of section 606c. Cutting sleeve 603 provides for the same advantages then cutting sleeve 503M. In addition to that, the free cuts in sections 606b and 606d provide additional space for a conductor that is widened by the penetrating contact bolt 200 one or 211.

[0040] The conical sections 506a, 506c, 606a, and 606c in Figures 5 and 6, respectively, have the same opening angle. However, in other embodiments the opening angles are different. The relative and absolute lengths of sections 506a-d and 606a-d may be different in other embodiments. The description regarding the male connectors 501, 601 with cutting sleeves 503M, 603M also applies mutatis mutandis to corresponding female connectors (not shown).

[0041] Figure 7A shows a cutting sleeve 701 with a cable lug 702 as integral part. The cutting sleeve 701 is screwed onto the cable 703. The cable lug 702 has two legs 704a, 704b enabling the passage of the contact bolt 211 into the cutting sleeve 701. Once the contact bolt 211 is sheared-off the cable lug 702 can be mounted as any other conventional cable lug as it is shown in Figure 7B. The cutting sleeve 701 with integrated cable lug 702 is a structural simplification compared to the cable lug 401 that requires the male connector 101 as a prerequisite.

[0042] Making a connection between two medium voltage cables comprising two stranded conductors provided with an insulation comprises the following steps as illustrated in a schematic flow diagram shown in Figure 8. In a first step S1 cutting sleeves 103M, 103F are screwed on the insulation 108 of each conductor 109. In a step S2, a contact bolt 201 is screwed into each cutting sleeve 103M, 103F. In a step S3, the contact bolts 201 are sheared-off which brings the cutting sleeves 103M, 103F into a connectable state, i.e. the cutting sleeve 103M forms male connector and the cutting sleeve 103F forms a female connector. In step S4 the cutting sleeves are connected with each other. The pressing screw 119 is screwed into the female connector for making a form and friction locking connection between the male and female connectors.

[0043] Even though the invention has been described in connection with medium voltage cables and medium voltage connectors it is equally applicable to high and low voltage cables and connectors.

[0044] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" does not exclude a plurality. The fact that individual functions and elements are recited in different dependent claims does not mean that a combination of those functions and elements could not advantageously be used.

List of reference signs

101	male connector	214	Tip
102	female connector	216	Hexagonal structure
103M,F	cutting sleeve	217	Blind hole
104	central bore	301,302	Cables
106	conical bore		
107	conical thread	401	Cable lug
108	insulation		
109	stranded conductor	501	male connector
110	wire	503M 506	cutting sleeve Tapered bore
112	male connector section	506a-d	Sections
113	Hexagonal structure	507	Internal thread
114	Circular indent	601	male connector
116	Female connector section	603M	Male cutting sleeve
117	Cavity	606	Tapered bore
118	Threaded hole	606a-d	Sections
119	Pressing screw	607	Internal thread
121	Tip	701	Cutting sleeve
201	Contact bolt	702	Cable lug
202	Elongated section	703	Cable
203	External thread	704a,b	Leg
204	Tapered tip		
206	hexagonal structure		
207	Union nut		
208	Bottom of cavity		
211	Contact bolt		
212	Elongated section		
213	External thread		

Claims

1. Connector (101,102) for contacting a conductor (109) isolated by an insulation (108), wherein the connector comprises a sleeve (103M,103F) and a contact bolt (201), wherein the sleeve (103M,103F) is provided on a first end with a threaded central bore (104) for accepting the contact bolt (201) and on a second end with a bore (106) having at least one tapered section provided with a self-tapping internal thread (107), wherein the bore (106) is oriented with its tapered end towards the central bore (104) to form a through hole passing the sleeve (103M,103F), **characterized in that**

- the at least one tapered section of the bore (106) is configured to be screwed onto the insulation (108),
- that the contact bolt (201) is screwed into the central bore (104) of the sleeve (103M,103F) to reduce the space within the bore (106).

2. Connector according to claim 1, wherein the sleeve (503M,603M) has more than one tapered section (506a,c;606a,c) with the same or different opening angles.

3. Connector according to claim 2, wherein between the tapered sections (506a,c) there is a cylindrical section (506b,d) of the bore (506).

4. Connector according to claim 2, wherein between the tapered sections (606a,c) there is a free cut (606a,c).

5. Connector according to one of the preceding claims, wherein the contact bolt (201,211) is a shear-off bolt.

5 6. Connector according to one of the preceding claims, wherein the sleeve (103M,103F) comprises at its first end a male or female connector section (112,116) or a cable lug (702).

7. Connector according to claim 6, wherein the cable lug (702) comprises two legs (704a,704b).

10 8. Connector according to one of the preceding claims, wherein the self-tapping thread (107) of the conical bore (106) is configured to cut into the insulation (108) or an external sheath enclosing the stranded conductor (109) to establish a fixed mechanical connection.

15 9. Connector according to one of claims 7 or 8, wherein the female connector section (116) is provided with a radial screw (119) to fix a connector (101) with a male connector section (112) inserted into the female connector section (116).

20 10. Connector according to one of the preceding claims, wherein the contact bolt (201,211) is provided with an internal or external structure (206,216), in particular a polygonal structure and more particularly a hexagonal structure, enabling coupling the contact bolt (201) with a tool enabling screwing the contact bolt into the sleeve (103M,103F).

11. Method for connecting two stranded conductors provided with an insulation, wherein the method comprises

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- screwing (S1) the cutting sleeve (103M,103F) of a connector (101,102) according to claim 1 on the insulation (108) of each conductor (109);
 - screwing (S2) the contact bolt (201) into each cutting sleeve (103M,103F);
 - shearing-off (S3) the contact bolts (210);
 - connecting (S4) the cutting sleeves (103M,103F).

30 12. Method according to claim 7, wherein the method further comprises

- screwing (S5) a pressing screw (119) into one of the cutting sleeves (103M,103F) for making a friction locking connection between the cutting sleeves (103M,103F).

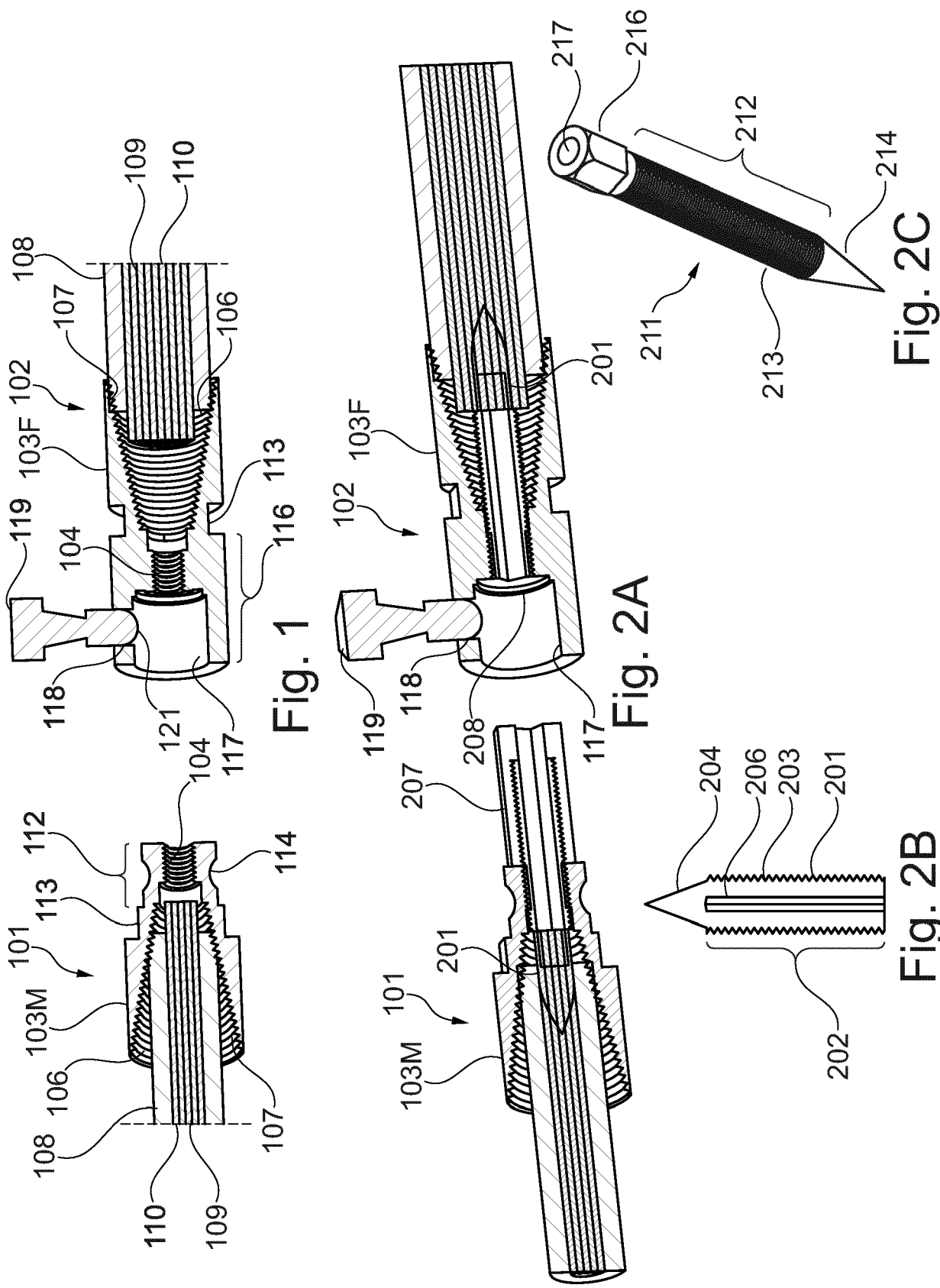
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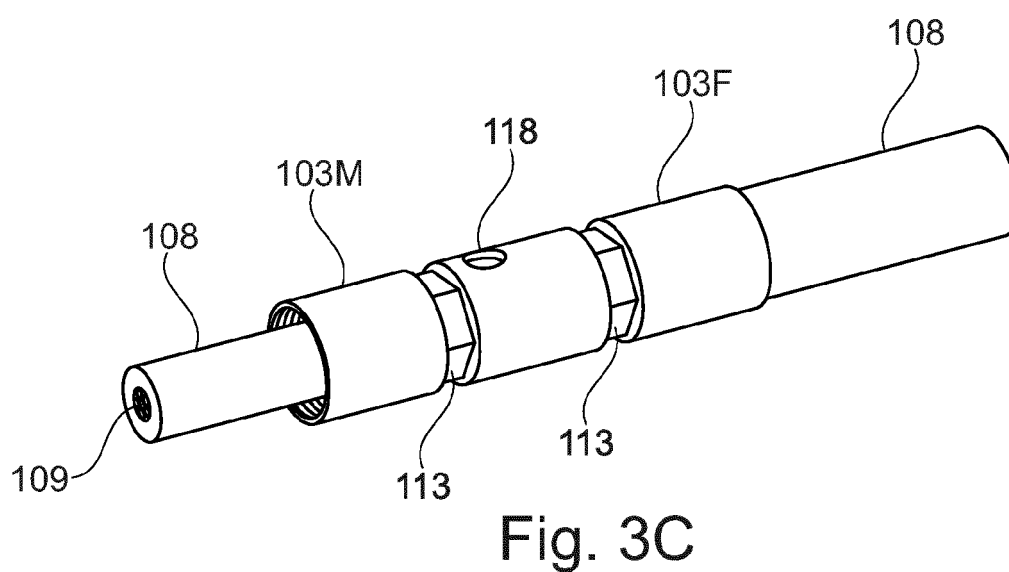
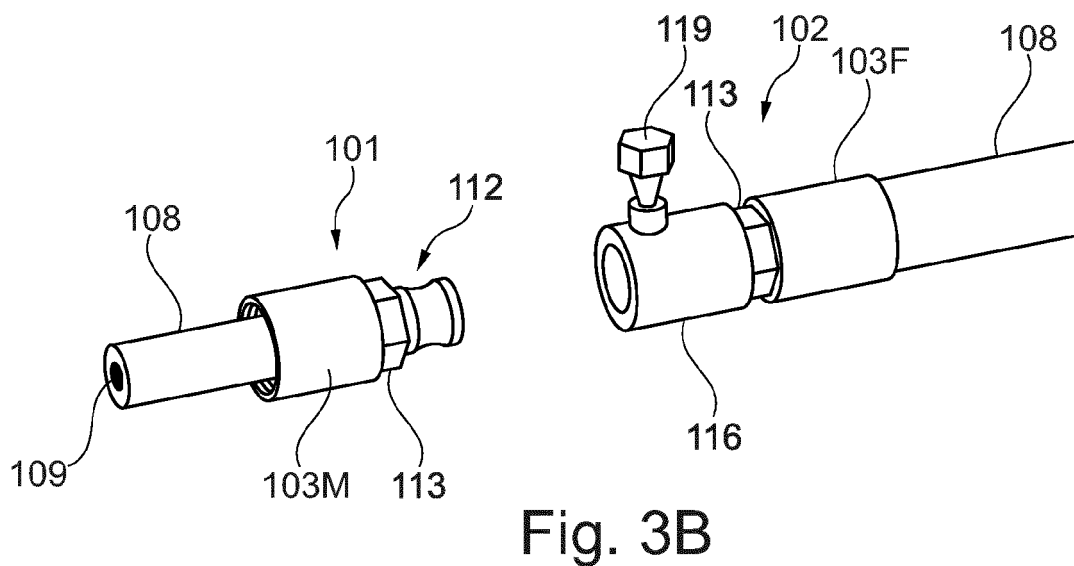
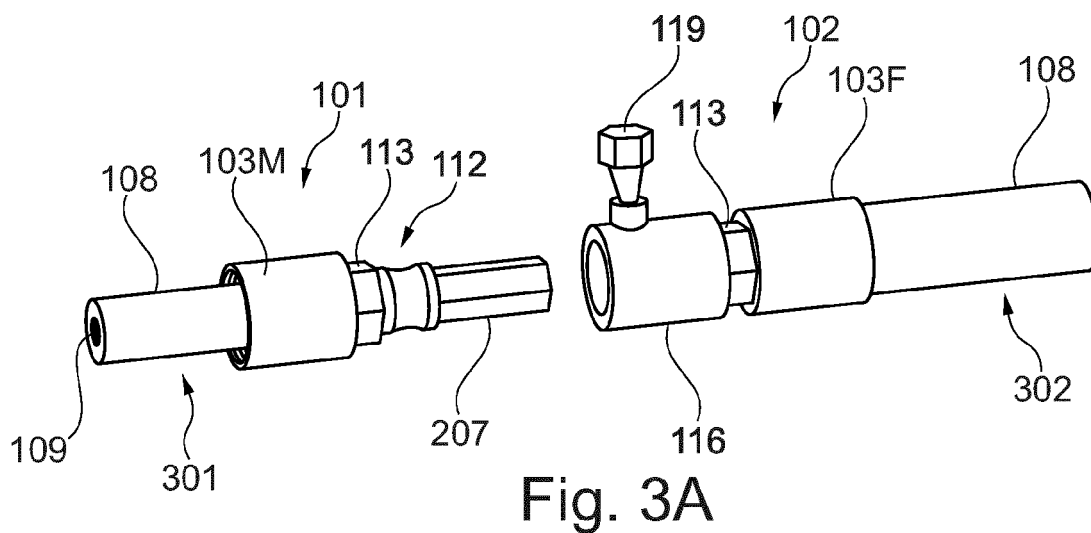
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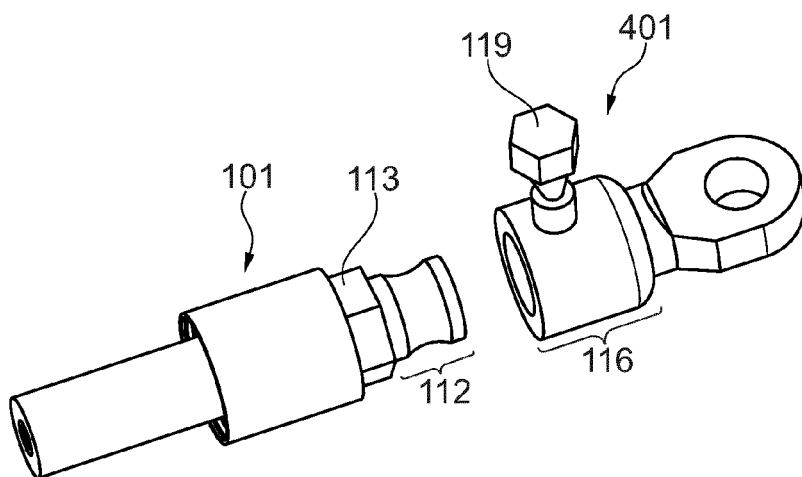


Fig. 4

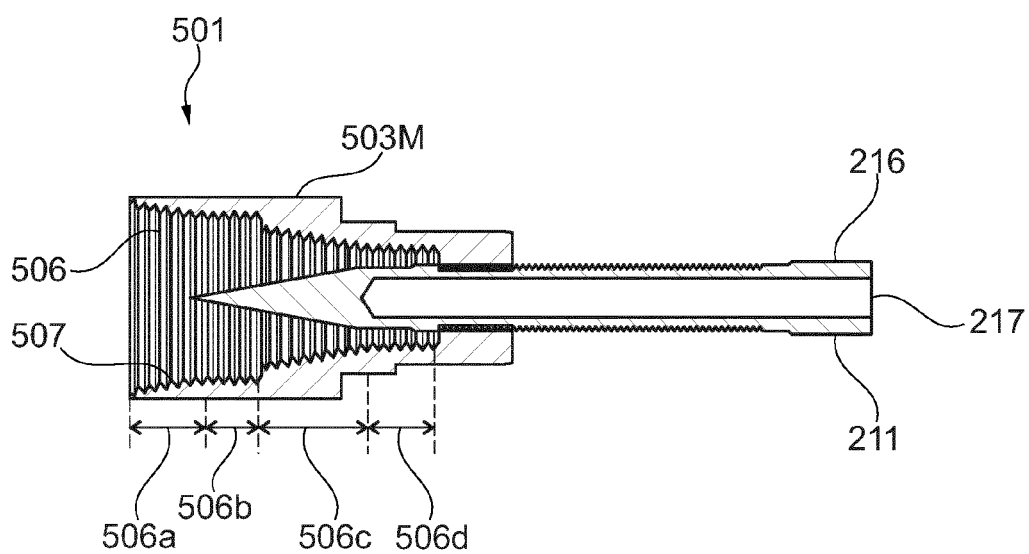


Fig. 5

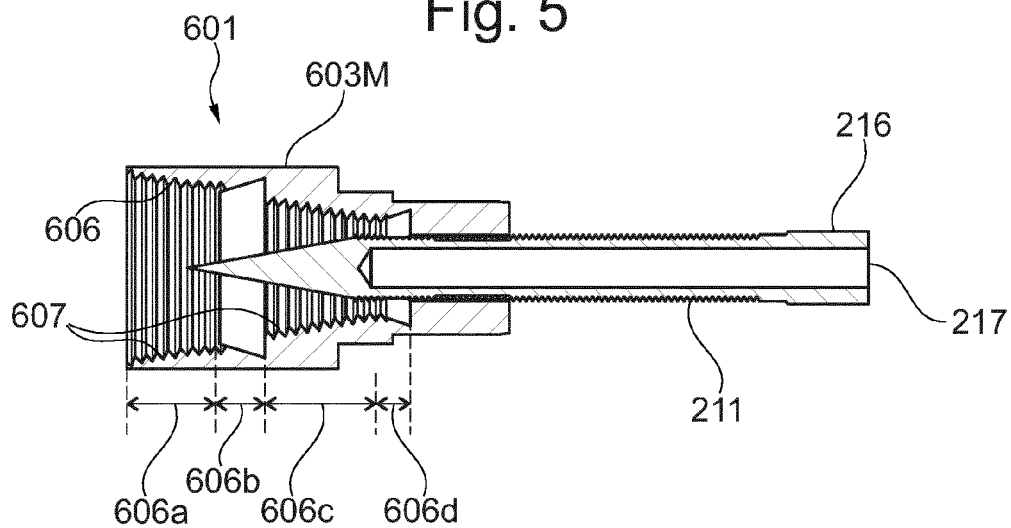


Fig. 6

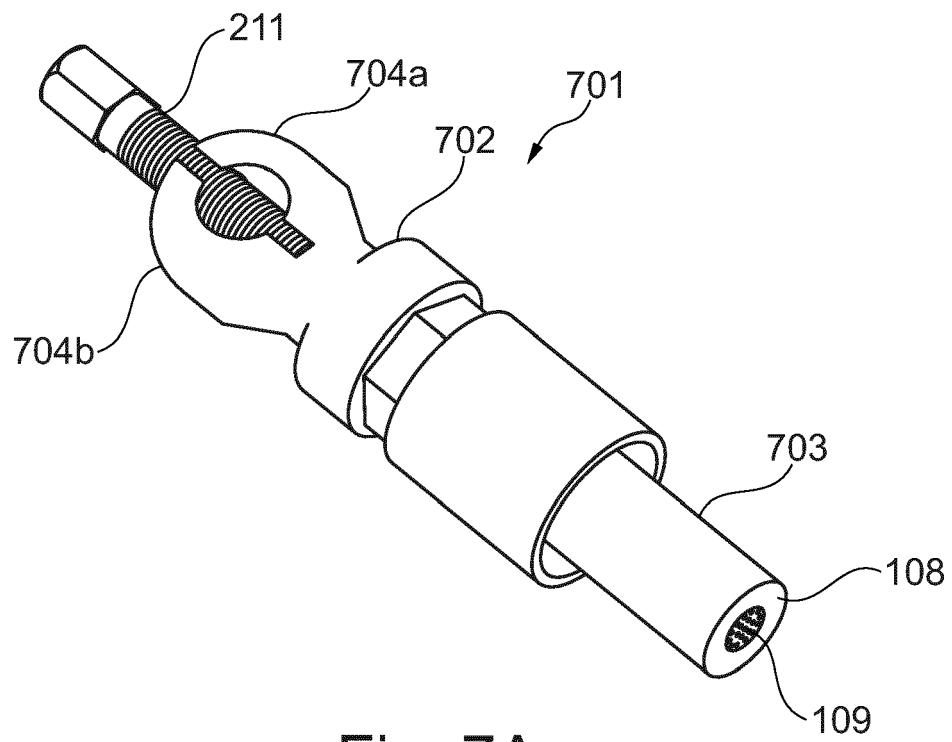


Fig. 7A

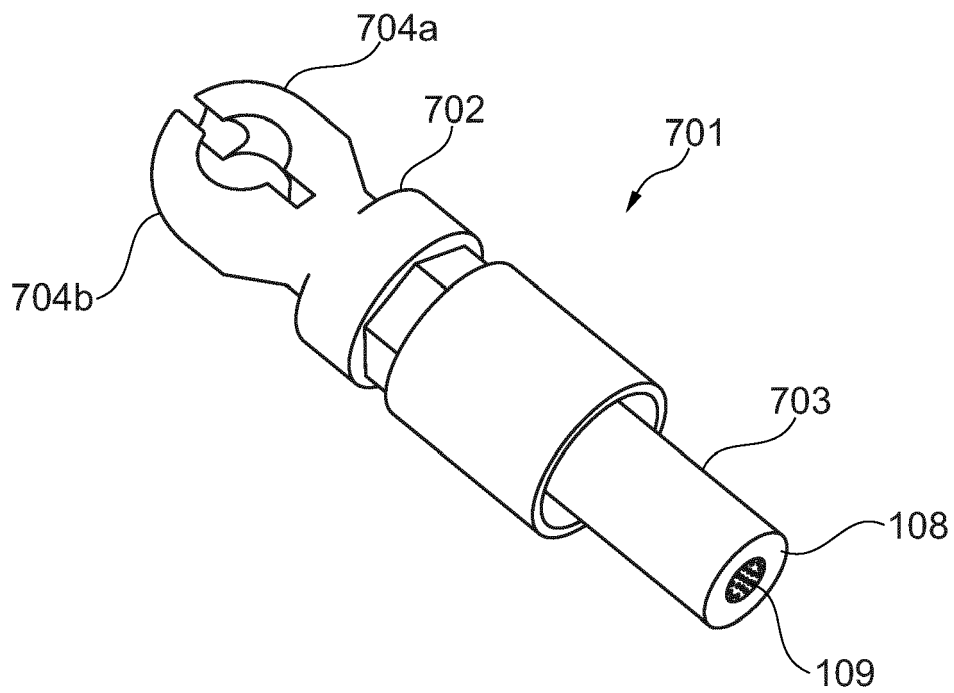


Fig. 7B

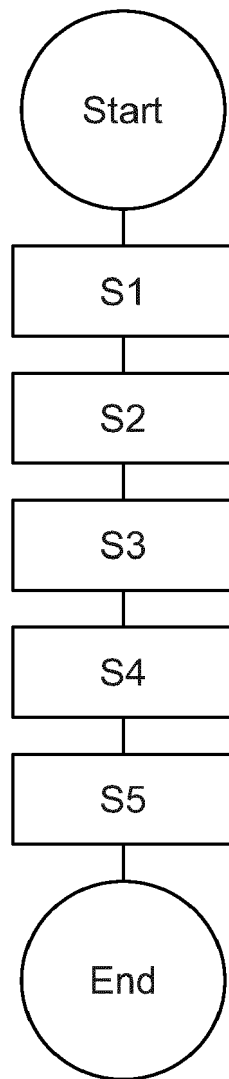


Fig. 8



EUROPEAN SEARCH REPORT

Application Number

EP 22 30 5198

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EPO FORM 1503 03.82 (P04C01)

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	FR 560 808 A (MAURICE-ALEXANDRE MAZADE) 11 October 1923 (1923-10-11)	1-8	INV.
Y	* page 2, line 19 - line 35 * * figure 10 *	9, 10	H01R4/56 H01R4/50 H01R4/30
Y	EP 3 499 646 A1 (TYCO ELECTRONICS RAYCHEM GMBH [DE]; TYCO ELECTRONICS SIMEL [FR]) 19 June 2019 (2019-06-19) * paragraphs [0050], [0062] * * figure 8 *	9, 10, 12	
X	US 2008/233791 A1 (HANKS RIP [US]) 25 September 2008 (2008-09-25)	11	
Y	* paragraph [0112] * * figures 19A, 19B *	12	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 July 2022	Examiner Henrich, Jean-Pascal
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	

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

EP 22 30 5198

5 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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28-07-2022

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	FR 560808	A	11-10-1923	NONE

15	EP 3499646	A1	19-06-2019	NONE

	US 2008233791	A1	25-09-2008	NONE

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

REFERENCES CITED IN THE DESCRIPTION

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