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Published:

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(54) Title: A RING SEAL FOR BEING MOUNTED ON A HOUSING OF A CONNECTOR, A CONNECTOR COMPRISING SUCH A RING SEAL, A CONNECTOR ASSEMBLY COMPRISING SUCH CONNECTOR, AND A METHOD FOR MANUFACTURING SUCH A RING SEAL

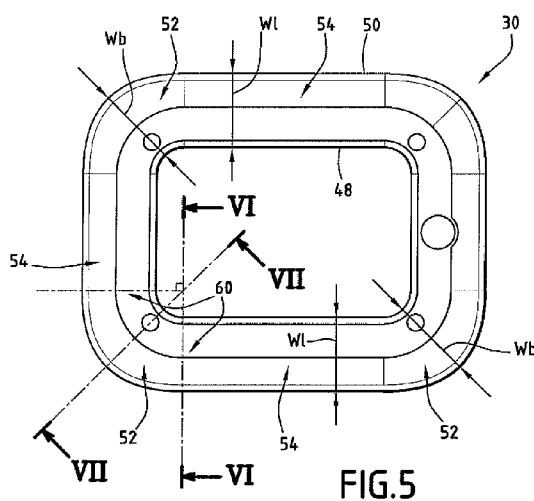


FIG. 5

(57) Abstract: The ring seal (30) for being mounted on a housing of an electrical connector (12), comprises an inner surface (48) intended to be mounted on the housing, and at least one bent section (52), the bent section (52) having two ends (60), each with a respective end width, measured perpendicular to the inner surface (48). The bent section (52) is provided with an intermediate bent width, measured perpendicular to the inner surface (48) strictly between the two ends (60), greater than at least one of the end widths.



A ring seal for being mounted on a housing of a connector, a connector comprising such a ring seal, a connector assembly comprising such connector, and a method for manufacturing such a ring seal

5 The present invention relates to a ring seal for being mounted in a housing of a connector and to connectors, for instance but not limitatively electrical connectors used in the automotive industry to connect spark plugs.

More particularly, the inventions relates to connector sealing technologies. Connectors are used in many fields for connecting cables, wires and/or electrical
10 appliances, as well as connectors for connecting optical devices and/or optical fibers. For certain applications and/or because connectors may be placed in humid, dusty, greasy and/or polluted environments, connector housing need to be sealed for protecting the connection terminations so as to preserve a good connection quality. For instance, a ring seal may be used for ensuring sealing
15 between the housing of a first connector and the skirt of a second connector intended to surround the housing of the first connector when the first and second connectors are mated. Usually, this kind of sealing is referred to as radial sealing, contrarily to axial sealing which involves the axial compression of a seal between two connector parts.

20 The housing may have a rectangular shape with four corners and four sides connecting to the corners two by two. Consequently, the ring seal comprises four bent sections, each intended to be located on a respective corner, and four essentially lateral sections, each intended to be located on a respective side.

The ring seal has an inner perimeter which is generally a little smaller than an
25 outer perimeter of the housing, so as to be stretched when being mounted on the housing.

However, for some applications and/or when the connectors are located in certain environment, humidity has been discovered inside the electrical connector assembly, and it is very difficult to guarantee the watertightness between the
30 housing and the skirt by using prior art seals.

The invention aims at improving the radial sealing efficiency of connectors having at least one corner.

Accordingly, an object of the invention is a ring seal according to claim 1. Other features of the ring seal are presented in the dependent claims 2 to 4.

The inventors have noticed that when the ring seal is deformed in its stretched state in order to be mounted on the housing, the deformation is more important in the most curved regions, such as a round angle region between essentially straight sections. This is due to stretching forces applied on the ring seal by the housing, which concentrates in the most net regions, such as corners. As a consequence for prior art seals, the bent section of the seal corners has, in its stretched state, a bent width smaller than the lateral width of the lateral sections.

The ring seal of the invention involves that the bent width is, in the stretched state of the ring seal, greater than the lateral width or substantially equal to the lateral width. Such a ring seal is adapted for ensuring sealing when a separation distance between the housing and the skirt is substantially constant along the periphery of the housing. Thus, the efficiency of the ring seal of the invention is improved in comparison with the prior art ring seal.

Accordingly, another object of the invention is an electrical connector according to claim 5.

Other features of the electrical connector are presented in the dependent claims 6 to 9.

Another object of the invention is an electrical connector assembly according to claim 10 or claim 11.

Another object of the invention is a method for manufacturing a ring seal according to claim 12 or claim 13.

These and other features of the invention will be more readily understood from the following detailed description of various preferred embodiments of the invention. The description refers to the accompanying drawings, in which:

- FIG. 1 is a cross-section view of an electrical connector assembly according to the invention;
- FIG. 2 is a cross-section view according to plane 2 of FIG. 1;
- FIG. 3 is a cross-section view according to plane 3 of FIG. 2;
- FIG. 4 is a three dimensional enlarged view of a ring seal of the connector assembly of FIG. 1, in a unstretched, i.e. unmounted state;

- FIG. 5 is a top view of the ring seal of FIG. 4;
- FIG. 6 is a cross-section view according to plane 6 of FIG. 5; and
- FIG. 7 is a cross-section view according to plane 7 of FIG. 5.

Turning to FIG. 1 and 2, an electrical connector assembly 10 according to the invention comprises a first electrical connector 12 and a second electrical connector 16, intended to mate with each other along a mating direction, defined by an axis XX'.

In the following description, spatial terms as "longitudinal", "transversal", "front", "rear" will refer to the XX' axis, orientated from rear to front, from the first connector 12 towards the second connector 16.

The first electrical connector 12 consists for example in a connecting part of a spark plug for car engine. The first connector 12 comprises a first body 18 having a front mating face 20, a contact housing 22 defining receiving chambers 14 for receiving electrical contacts (not shown), and an outer skirt 23 arranged outwardly at least partially around the contact housing 22. The outer skirt 23 has an outer surface 23A and an inner surface 23B (see Fig. 2).

The second electrical connector 16 comprises a second body 24 having mating face 26 and an inner skirt 28 intended to be introduced during mating into the outer skirt 23 of the first connector 12, in order to surround the contact housing 22, when the connectors 12, 16 are mated. The inner skirt 28 has an outer surface 28A and an inner surface 28B.

The electrical connector assembly 10 comprises a pawl based locking system 29 intended to prevent unmating of the two connectors 12, 16 along the XX' axis.

The inner skirt 28 comprises a skirt portion 32 projecting from the mating face 26, and a body portion 34 wrapped around the electrical contacts (not shown).

Turning to Figure 3, the contact housing 22 is substantially rectangular paralleliped-shaped and has an outer surface 36 with four rounded corners 38 and four flat sides 40, each corner 38 connecting two adjacent sides 40.

The inner surface 28B of the inner skirt 28 has a complementary shape, that is a substantially rectangular parallelepiped cross section perpendicular to the XX' axis, with four rounded corners 44 and four flat sides 46, each corner 44 connecting two adjacent sides 46 of the inner skirt.

The inner skirt 28 and the housing 22 are separated, when the first and the second electrical connectors 12, 16 are mated, along the periphery of the housing 22 by a lateral separation distance Dls measured perpendicular to the outer surface 36 of the housing.

5 In the described embodiment, the inner skirt 28 and the housing 22 are complementary shaped. Thus, the lateral separation distance Dls between them is substantially constant around the outer surface 36 of the housing.

The electrical connector assembly 10 comprises a ring seal 30 mounted on the housing 22 in a stretched state. The ring seal ensures sealing between the
10 housing 22 and the inner skirt 28.

Turning to Figure 4, the ring seal 30 is illustrated unmounted in a unstretched state. The ring seal 30 comprises an inner surface 48 designed to be mounted on the housing 22 and an outer surface 50 designed to come at least partially into contact with the inner skirt 28 when the connectors 12, 16 are mated.

15 In other words, the ring seal 30 is designed for passing, when the first and second electrical connectors 12, 16 are mated, from a non-compressed state to a compressed state between the housing 22 and the inner skirt 28. It should be noticed that the non-compressed state is identical to the stretched state.

The ring seal 30 has a substantially rectangular shape and comprises four
20 bent sections 52 and four lateral sections 54. Each bent section 52 is intended to be located on a corresponding corner 38 of the housing. Each lateral section 54 is connected to a bent section 52 and intended to be located on a corresponding side 40 of the housing.

The outer surface 50 comprises two ribs 56, which extend outwardly from the
25 same. The ribs 56 are designed to come into contact with the inner skirt 28 when the two connectors 12, 16 are mated. The ribs 56 are substantially symmetrical to each other with respect to a plane P perpendicular to the XX' axis.

Each bent section 52 connects two lateral sections 54 and each lateral section 54 has an inner supporting line 58 intended to come into contact with the
30 outer surface 36 of the housing 22. The inner supporting line 58 of each lateral section 54 is substantially straight.

Turning to FIG. 5, each bent section 52 has a bent width Wb measured perpendicular to the inner surface 48 of the ring seal 30. Each lateral section 54

has a lateral width W_l measured perpendicular to the inner surface 48 of the ring seal 30.

In the described embodiment, each lateral section 54 is substantially straight and the lateral width W_l is substantially constant.

5 Turning to FIG. 6, each bent section 52 has two ends 60. Each end 60 has a respective end width W_{be} , and a respective end cross section 62 with a respective end cross section area A_e .

Turning to FIG. 7, each bent section 52 is provided with an intermediate bent width W_{bi} measured perpendicular to the inner surface 48 and strictly between the
10 two ends 60.

In the described embodiment, the intermediate bent width W_{bi} is greater than each one of the end widths W_{be} .

Each bent section 52 has an intermediate cross section 64 located strictly between the two end cross sections 62 with an intermediate cross section area A_i
15 greater than the end cross section area A_e of at least one end cross sections 62.

The intermediate bent width W_{bi} divided by the at least one of the end widths W_{be} is comprised between 1.05 and 1.15, preferably equal to 1.09.

In the embodiment of the FIG. 5 to 7, the bent width W_b is, in the unstretched state of the ring 30, greater than the lateral width W_l , so that the bent width W_b is,
20 in the stretched state of the ring seal 30 equal to the lateral width W_l preferably within 2%, and more preferably within 1%.

The lateral width W_l along each lateral section 54 is, in the unstretched state of the ring seal 30, greater than the lateral separation distance D_l along the corresponding side 30 of the housing 22 by a first ratio R_1 (e. g. $R_1=1.35 \pm 0.05$).
25 The bent width W_b along each bent section 52 is, in the unstretched state of the ring seal 30, greater than the lateral separation distance D_l along the corresponding corner 38 of the housing 22 by a second ratio R_2 (e. g. $R_2=1.50 \pm 0.05$).

Since the second ratio is greater than the first ratio, when the electrical
30 connectors are mated, the ring seal will be in contact with the skirt in the corner, even if the deformation of the stretched ring seal is more important in the bent sections than in the lateral sections. Thus, the greater deformation in the bent sections is compensated by the fact that the second ratio is greater than the first

ratio. Such a ring seal is adapted for ensuring sealing when the separation distance between the housing and the skirt is not constant along the periphery of the housing, because the shape of the seal is determined in accordance with the separation distance along the periphery, i.e. in accordance with the respective
5 shape of the housing and the skirt.

In the described embodiment, the first ratio is substantially constant as the lateral width W_l and the lateral separation distance D_l s along the corresponding side 30 are constant. The greatest second ratio corresponds to the middle of the bent section 52. In particular, the bent width W_b increases from one end of the
10 bent section 52 to the middle of the bent section 52, and then decreases from the middle of the bent section 52 to the other end of the bent section 52.

The lateral width W_l along each lateral section 54 is, in the stretched state of the ring seal 30, greater than the lateral separation distance D_l s along the corresponding side 40 of the housing 22, by a third ratio R_3 (e.g. $R_3=1.2 \pm 0,02$).
15 The bent width W_b along each bent section 52 is, in the stretched state of the ring seal 30, greater than the lateral separation distance D_l s along the corresponding corner 38 of the housing 22, by a fourth ratio R_4 (e.g. $R_4=1.2 \pm 0,02$).

In order to ensure a substantially regular and uniform compression of the ring seal 30 along its periphery when the connectors 12, 16 are mated, the fourth ratio
20 R_4 is equal to the third ratio R_3 preferably within 2%, and more preferably within 1%.

In other words, each section 52, 54 of the seal 30 has a non-compressed width in the non-compressed stated of the seal 30, and a compressed width in the compressed state of the seal 30. When the outer surface 50 of the ring seal 30 is
25 in contact with the inner skirt 28, the compressed width of each section 52, 54 is equal to the respective lateral separation distance D_l s between the housing 22 and the inner skirt 28.

A method for manufacturing the ring seal 30 comprises

- measuring the lateral separation distance D_l s along each corner 38 and
30 along each side 40 of the contact housing 22,
- providing a ring seal 30 with four bent sections 52 and four lateral sections 54, as described above.

Thus, it involves that the bent width W_b is greater than the lateral width W_l , whatever is the shape of the housing 22 and the skirt 28, in particular with a lateral separation distance D_l that is not constant around the periphery of the housing.

During the engagement of the inner skirt 28 of the second connector with the
5 outer skirt 23 of the first connector 12, the inner skirt 28 comes into contact with the outer surface 50 of the ring seal 30 which is mounted on the contact housing 22. More precisely, the inner surface 28B of the inner skirt comes into contact with the ribs 56 of the ring seal.

When the electrical contacts are received in the respective receiving
10 chambers 14, the pawl based locking system 29 locks the two connectors 12, 16. The ring seal 30 is compressed between the contact housing 22 and the inner skirt 28.

As a second ratio R_2 between the bent width W_b in the unstretched state of the ring seal and the lateral separation distance D_l along the corresponding
15 corner 38 of the housing is greater than the first ratio R_1 between the lateral width W_l in the unstretched state of the ring seal and the lateral separation D_l along the corresponding side 40 of the housing, it involves that the ring seal 30 is outwardly in contact with the inner surface 28B of the inner skirt 28 along its whole periphery.

The invention thus permits to improve the efficiency of the ring seal 30 and
20 the watertightness of the electrical connector assembly 10 between the housing of the first electrical connector 12 and the inner skirt of the second electrical connector 16.

A second embodiment of the invention will now be described.

The second embodiment is substantially similar to the first embodiment of the
25 invention. Consequently, elements that have already been described will not be described again.

In the second embodiment, the bent width W_b is, in the unstretched state of the ring seal 30, greater than the lateral width W_l , so that the bent width W_b is, in the stretched state of the ring seal 30, equal to the lateral width W_l preferably
30 within 2%, and more preferably within 1%.

The second embodiment of the invention thus permits to improve the watertightness of the electrical connector assembly 10, when one of the two electrical connectors 12, 16, is caught by the electrical cables so that the ring

seal 30 is more compressed in one corner than in the corner which is diametrically opposed to said one corner according to XX' axis.

The method for mating the two connectors 12, 16 is identical to the one described for the first embodiment and will not be described again.

- 5 In a general way, within the scope of the invention, a lateral section 54 of the ring seal 30 is not necessary straight, and may also be curved. A bent or corner section 52 of the ring seal 30 is different from a lateral section 54 in that its radius of curvature is smaller than the radius of curvature of the lateral section 54.

CLAIMS

1. A ring seal (30) for being mounted on a housing (22) of a connector (12), comprising:

5 an inner surface (48) intended to be mounted on the housing (22),
 at least one bent section (52), the bent section having two ends (60), each
 with a respective end width (W_{be}), measured perpendicular to the inner surface
 (48),

 wherein the bent section (52) is provided with an intermediate bent width
10 (W_{bi}), measured perpendicular to the inner surface (48) strictly between the two
 ends (60), greater than at least one of the end widths (W_{be}).

 2. The ring seal (30) of claim 1, wherein the intermediate bent width (W_{bi}),
 measured perpendicular to the inner surface (48) strictly between the two ends
 (60), is greater than each one of the end widths (W_{be}).

15 3. The ring seal (30) of claim 1 or 2, wherein the intermediate bent width
 (W_{bi}) divided by the at least one end width (W_{be}) is comprised between 1.05 and
 1.15, preferably equal to 1.09.

 4. The ring seal (30) of any one of claims 1 to 3,
 wherein each end (60) has a respective end cross-section (62) with a
20 respective end cross-section area (A_e),

 wherein each bent section (52) has an intermediate cross-section (64)
 located strictly between the two end cross-sections (62) and with an intermediate
 cross-section area (A_i) greater than the end cross-section area (A_e) of at least one
 end cross-section (62).

25 5. An electrical connector (12) comprising:

 a housing (22) having at least one corner (38) and at least one side (40)
 connected to the corner (38),

 a ring seal (30) having an inner surface (48) intended to be mounted on the
 housing (22), the ring seal (30) being laterally deformable between a unstretched
30 state and a stretched state when being mounted on the housing (22), the ring seal
 (30) comprising at least one bent section (52) intended to be located on said
 corner (38) of the contact housing (22), and at least one lateral section (54)

connected to the bent section (52) and intended to be located on said side (40) of the contact housing (22),

wherein the ring seal (30) is provided with a bent width (Wb) along each bent section (52) and with a lateral width (Wl) along each lateral section (54), each
5 width (Wb, Wl) being measured perpendicular to the inner surface (48),

wherein the bent width (Wb) is, in the unstretched state of the ring seal (30), greater than the lateral width (Wl), so that the bent width (Wb) is, in the stretched state of the ring seal (30), equal to the lateral width (Wl) preferably within 2%, and more preferably within 1%.

10 6. An electrical connector assembly (10) comprising:

a connector housing (22) having at least one corner (38) and at least one side (40) connected to the corner (38), the housing (22) having an outer surface (36),

a connector skirt (28) intended to surround the housing (22),

15 wherein the skirt (28) and the housing (22) are separated by a lateral separation distance (Dls) measured perpendicular to the outer surface (36) of the housing (22), when the skirt (28) surrounds the housing (22),

a ring seal (30) having an inner surface (48) intended to be mounted on the housing (22) for ensuring sealing between the housing (22) and the skirt (28), the
20 ring seal (30) being laterally deformable between a unstretched state and a stretched state for being mounted on the housing (22), the ring seal (30) comprising at least one bent section (52) intended to be located on the corner (38) of the housing (22), and at least one lateral section (54) connected to the bent section (52) and intended to be located on the side (40) of the housing (22),

25 wherein the ring seal (30) is provided with a bent width (Wb) along each bent section (52) and with a lateral width (Wl) along each lateral section (54), each width (Wb, Wl) being measured perpendicular to the inner surface (48) of the ring seal (30),

30 wherein the lateral width (Wl) along each lateral section (54) is, in the unstretched state of the ring seal (30), greater than the lateral separation distance (Dls) along the corresponding side (40) of the housing (22), by a first ratio (R1),

wherein the bent width (Wb) along each bent section (52) is, in the unstretched state of the ring seal (30), greater than the lateral separation distance

(DIs) along the corresponding corner (38) of the housing (22), by a second ratio (R2) greater than the first ratio (R1).

8. The electrical connector assembly (10) of claim 7,

wherein the lateral width (WI) along each lateral section (54) is, in the stretched state of the ring seal (30), greater than the lateral separation distance (DIs) along the corresponding side (40) of the housing (22), by a third ratio (R3),

wherein the bent width (Wb) along each bent section (52) is, in the stretched state of the ring seal (30), greater than the lateral separation distance (DIs) along the corresponding corner (38) of the housing (22), by a fourth ratio (R4) equal to the third ratio (R3) preferably within 2%, and more preferably within 1%.

9. A method for manufacturing a ring seal (30) having an inner surface (48) intended to be mounted on a connector housing (22) intended to be surrounded by a connector skirt (28), the ring seal (30) being laterally deformable between an unstretched state and a stretched state for being mounted on the housing (22), the housing (22) having an outer surface (36), and at least one corner (38) and at least one side (40) connected to the corner (38), wherein the skirt (28) and the housing (22) are separated by a lateral separation distance (DIs) measured perpendicular to the outer surface (36) of the housing (22), when the skirt (28) surrounds the housing (22),

the method comprising:

measuring the lateral separation distance (DIs) along each corner (38) and along each side (40) of the contact housing (22),

realizing the ring seal (30) with at least one bent section (52) intended to be located on the corner (38) of the housing (22), and at least one lateral section (54) connected to the bent section (52) and intended to be located on the side (40) of the housing (22), for ensuring sealing between the housing (22) and the skirt (28),

providing the ring seal (30) with a bent width (Wb) along each bent section (52), and with a lateral width (WI) along each lateral section (54), each width (Wb, WI) being measured perpendicular to the inner surface (48) of the ring seal (30), so that the lateral width (WI) along each lateral section (54) is, in the unstretched state of the ring seal (30), greater than the lateral separation distance (DIs) along the corresponding side (40) of the housing (22), by a first ratio (R1), and the bent width (Wb) along each bent section (52) is, in the unstretched state of the ring seal

(30), greater than the lateral separation distance (Dls) along the corresponding corner (38) of the housing (22), by a second ratio (R2) greater than the first ratio (R1).

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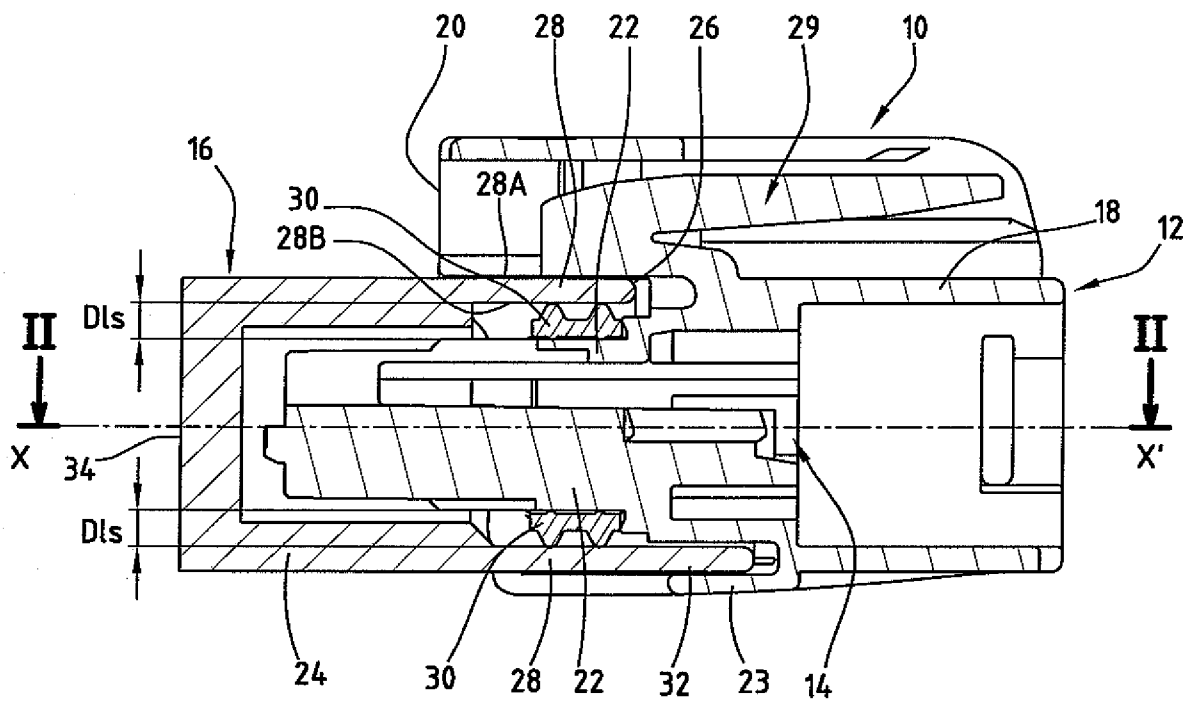


FIG.1

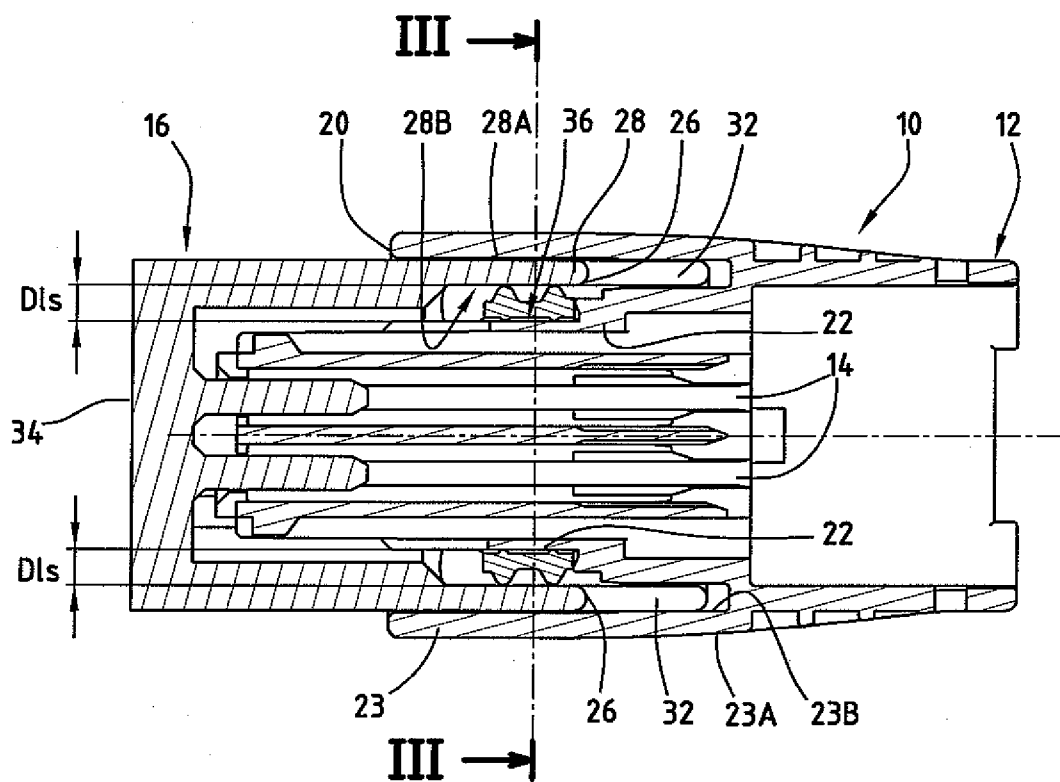


FIG.2

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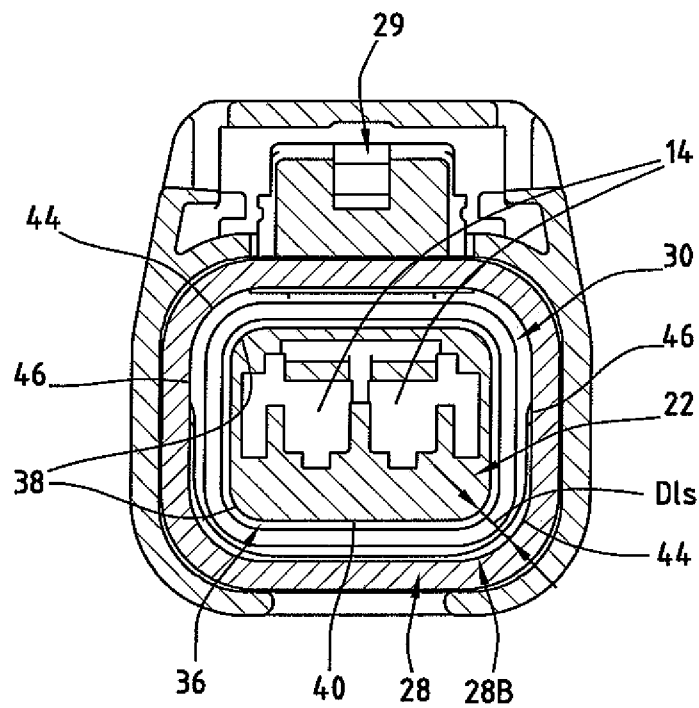


FIG.3

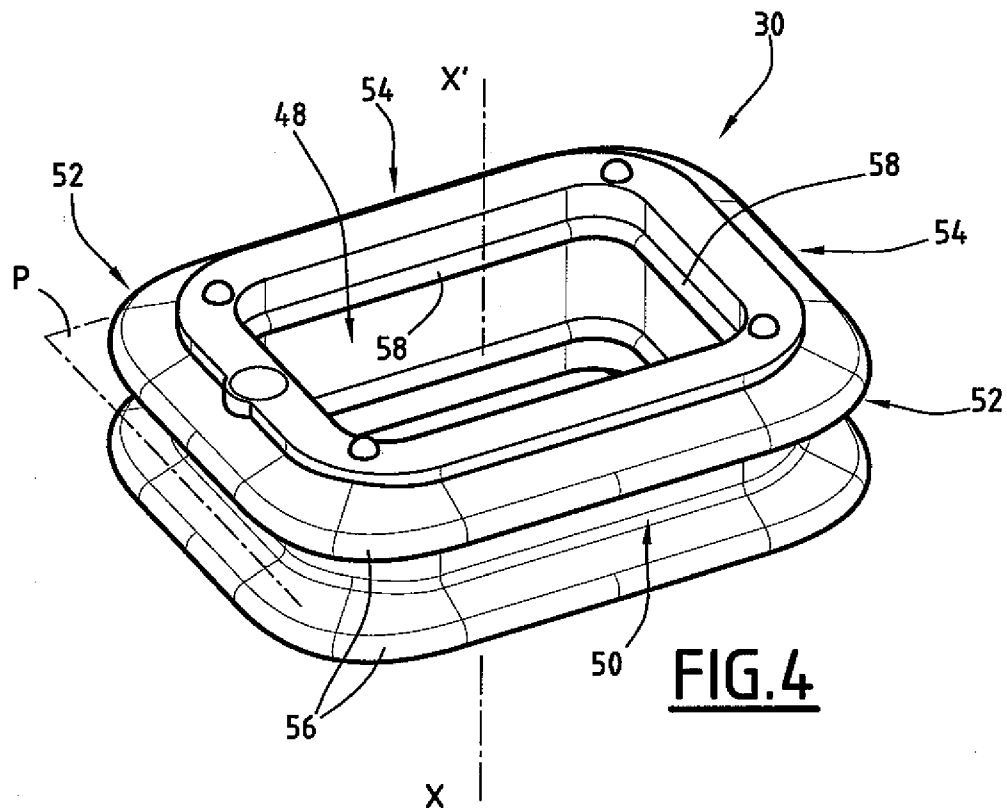
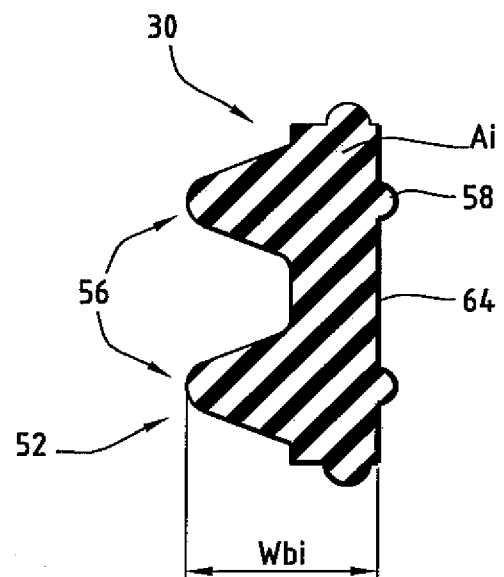
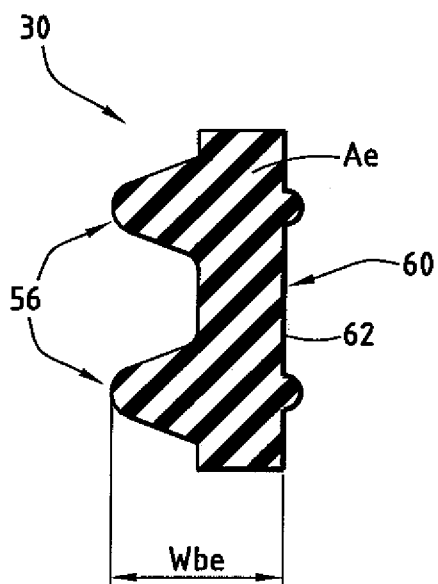
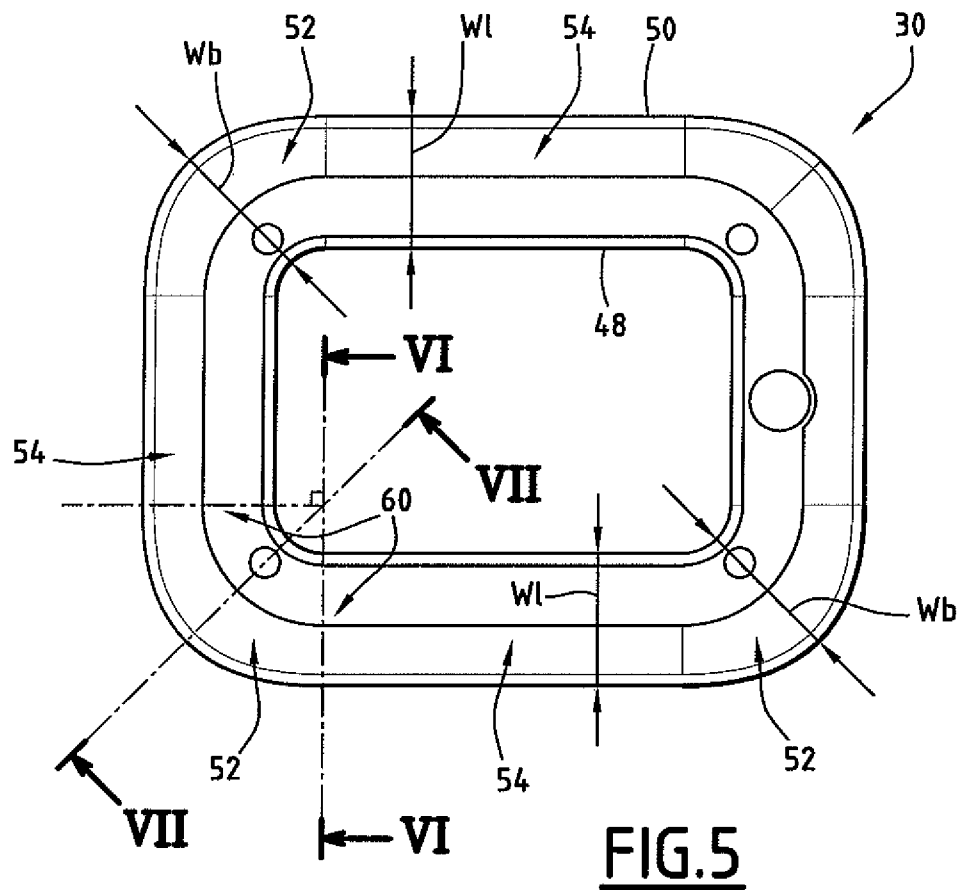


FIG.4

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2008/055615

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R13/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	DE 195 48 069 A1 (KOSTAL LEOPOLD GMBH & CO KG [DE]) 11 July 1996 (1996-07-11) column 1, line 65 - column 2, line 30 figures 1-6	1,2,4-6 9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

19 June 2009

Date of mailing of the international search report

29/06/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Ledoux, Serge

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2008/055615

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 7, 8
because they relate to subject matter not required to be searched by this Authority, namely:
—
2. ☒ Claims Nos.: 7, 8
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 7, 8

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Continuation of Box II.2

Claims Nos.: 7,8

Claim 8 is dependent on claim 7 which is missing. A meaningful search of claim 8 is therefore impossible, since the subject-matter of claim 8 is not entirely defined.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2008/055615

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
DE 19548069	A1	11-07-1996	BR 9503164 A	27-05-1997