Title: BODY FOR A SENSOR UNIT, SENSOR UNIT COMPRISING SUCH A BODY, ROTATION DETECTION SET COMPRISING SUCH A SENSOR UNIT AND METHOD FOR MANUFACTURING SUCH A SENSOR UNIT

Abstract: This body (46) for a sensor unit of a rotation detection set has a housing for accommodating a sensing element (42) mounted on a printed circuit board (44). Along a first axis (X46), the housing (461) is defined by an abutment surface (462) perpendicular to the first axis (X46) and by at least one elastic hook (463A, 463B) adapted to block a movement of the printed circuit board (44) away from the abutment surface (462). Along a second axis (Y46) perpendicular to the first axis, the housing (461) is defined by two guiding surfaces (466A) substantially parallel to the first axis and converging towards each other in a direction parallel to the first axis. Along a third axis (Z46) perpendicular to the first and second axes, the housing (461) is defined by two slides, each of these slides being adapted to accommodate an edge (446A) of the printed circuit board (44). The sensor unit (40) comprises a printed circuit board (44), at least one sensing element (42) mounted on the printed circuit board and a body (46). The printed circuit board (44) is received in the housing (461) of the body (46) and a filling material fills the volume left by the printed circuit board in the housing.
BODY FOR A SENSOR UNIT, SENSOR UNIT COMPRISING SUCH A BODY,
ROTATION DETECTION SET COMPRISING SUCH A SENSOR UNIT AND METHOD
FOR MANUFACTURING SUCH A SENSOR UNIT

5

TECHNICAL FIELD OF THE INVENTION

This invention relates to a body for a sensor unit of a rotation detection set which
6

can be used to detect a rotation parameter of an encoder washer with respect to a fixed
structure. This is particularly useful for detecting the rotation of a rotatable ring of a
bearing with respect to a fixed ring.

This invention also relates to a sensing unit which belongs to a rotation detection set
and includes, amongst others, such a body. Finally, the invention relates to a rotation
detection set comprising such a sensor unit and to a method for manufacturing such a
sensor unit.

BACKGROUND OF THE INVENTION

Generally speaking, a bearing comprises an inner ring and an outer ring adapted to
rotate around a rotation axis, one with respect to the other. In a plain bearing, the two
rings are in sliding contact. In a rolling bearing, several rolling bodies are installed
between the two rings. These rolling bodies can be balls, rollers or needles. Thus, a rolling
bearing can be, for instance, a ball bearing, a roller bearing or a needle bearing.

In the field of bearings, it is known to use a tachometer in order to determine the
rotation speed of a member supported by a bearing. As explained in EP-A-1 933 155, one
can use an encoder washer with magnetic poles fast in rotation with a rotatable ring of a
bearing, and one or several sensors. The or each sensor is generally mounted on a
printed circuit board or PCB and must be accurately positioned with respect to the
encoder washer in order to efficiently detect a variable magnetic field generated by the
encoder washer in an air gap defined between the encoder washer and the sensor. In
known devices, the printed circuit board is immobilized within a body by various
techniques which do not guarantee that the sensing element of the sensor keeps a given
position with respect to the outer shape of a body which supports the printed circuit board.
The accuracy of the measures obtained by the respective sensor units of a series of
rotation detection sets is thus non constant, which is a drawback in terms of quality control
and effectiveness.
SUMMARY OF THE INVENTION

The invention aims at solving these problems with a new body for a sensor unit which facilitates proper positioning of a sensing element with respect to its environment.

To this end, the invention concerns a body for a sensor unit of a rotation detection set, the sensor unit including at least one sensing element mounted on a printed circuit board and the body forming a housing for the sensing element and the printed circuit board. According to the invention, the housing of the body is geometrically defined:

- along a first axis, by an abutment surface perpendicular to the first axis and by at least one elastic hook adapted to block a movement of the printed circuit board away from the abutment surface,

- along a second axis perpendicular to the first axis, by two guiding surfaces substantially parallel to the first axis and converging towards each other in a direction parallel to the first axis, and

- along a third axis perpendicular to the first and second axes, by two slides, each of these slides being adapted to accommodate a lateral edge of the printed circuit board.

Thanks to the invention, the abutment surface, the hook(s), the two guiding surfaces and the slides can efficiently immobilize a printed circuit board when it is inserted into the housing. Once the printed circuit board has been connected to a multiconductor cable for connection to an electronic control unit, it is then possible to definitely fix the position of the printed circuit board, and thus of the sensing element, within the housing by injecting a resin or overmolding a synthetic material within the housing in order to fill the space left by the printed circuit board in the housing.

According to further aspects of the invention which are advantageous but not compulsory, the body might incorporate one or several of the following features, taken in any technically admissible configuration:

- The two guiding surfaces are inclined by less than 5°, preferably less than 2°, more preferably by 0.5° with respect to the first axis.

- Each guiding surface forms the bottom of one slide.

- The body is made of a molded synthetic material, in particular a polyamide.

- The hook extends from the abutment surface in a direction parallel to the first axis and this hook has a protrusion oriented towards a zone of the housing extending between the slides.

- The body includes two hooks which extend along parallel directions from the abutment surface.
- The body is made of a first material and partially surrounded by an annular jacket made of a second material with a hardness higher than the hardness of the first material.
- The annular jacket is made of stainless steel, in particular x20Cr13 (grade 420) steel.
- The annular jacket has a surface hardness larger than 35 HRC.

The invention also concerns a sensor unit of a rotation detection set which comprises a printed circuit board, at least one sensing element mounted on this printed circuit board and a body as mentioned here-above, the printed circuit board being received in the housing of the body and a filling material filling the volume left by the printed circuit board in the housing.

The printed circuit board advantageously has two lateral edges which converge towards a central axis of the PCB with the same angle as a convergence angle of the two guiding surfaces of the body with respect to the first axis.

The printed circuit board can be provided with at least one relief engaged with the hook of the housing. This relief is preferably a notch or a hole provided in the printed circuit board.

According to another aspect, the invention concerns a rotation detection set which comprises an encoder washer adapted to rotate around a rotation axis and a sensor unit as mentioned here-above.

Finally, the invention concerns a method for manufacturing a sensor unit as mentioned here-above, this method comprising at least the following steps:

a) molding a body as mentioned here-above in one operation
b) inserting the printed circuit board in the housing of the body and
c) filling the volume left by the printed circuit board in the housing with a filling material.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be well understood on the basis of the following description which is given in correspondence with the annexed figures and as an illustrative example, without restricting the object of the invention. In the annexed figures:

- figure 1 is a perspective exploded view of a rolling bearing assembly comprising a rotation detection set according to the invention,
- figure 2 is a section of the bearing and rotation detection set of figure 1 as used to support a wheel of a two-wheeler,
- figure 3 is a perspective view of a body and a printed circuit board belonging to the assembly of figures 1 and 2, with a portion of a sensor unit body taken out for the sake of clarity,
- figure 4 is a cut view of the body represented on figure 3, in the plane of cut of figure 3,
- figure 5 is a top view of a printed circuit board belonging to the rotation detection set,
- figure 6 is a partial perspective view of the sensor unit body represented on figures 1 to 4,
- figure 7 is a partial perspective view of the sensor unit body and the printed circuit board,
- figure 8 is a perspective view of the sensor unit body and printed circuit board during a manufacturing step of the sensor unit,
- figures 9 and 10 are perspective views similar to figure 8 during further manufacturing steps, and
- figure 11 is a partial cut along line XI-XI on figure 4 with the molding parts used to manufacture the body.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

The rolling bearing assembly A represented on the figures includes a rolling bearing 2 with a fixed inner ring 4 and an outer ring 6 rotating around a central axis X2 of rolling bearing 2. Several balls 8 forming rolling bodies are received within a chamber 10 defined between rings 4 and 6. These balls 8 are held in position with respect to these rings by a cage 12.

An encoder washer 20 is fast in rotation with outer ring 6 and includes a metallic armature 22 and a magnetic body 24 which defines several magnetic North and South poles. Encoder washer 20 is centered on an axis X20 which is superimposed with axis X2 when encoder washer is mounted onto outer ring 6.

As shown on figure 2, inner ring 4 can be mounted on a shaft 101 supported by a fork 102 of a non represented motorcycle. A nut 103 immobilizes shaft 101 with respect to fork 102. Inner ring 4 is fast in rotation with shaft 101, by tight fitting or via a key. X1 denotes a central longitudinal axis of shaft 101 which is superimposed with axis X2 when rolling bearing 2 is mounted onto shaft 101.

Outer ring 24 is fast with a hub 104 of a non represented wheel. Hub 104 has a central opening 106 with a recess 108 adapted to accommodate outer ring 6. Outer ring 6 is tight fitted or otherwise fast in rotation with hub 104.
A sensing device 40 forms with encoder washer 20 a rotation detection set which enables to detect a rotation parameter of encoder washer 20. A rotation parameter can be a position, a speed, an acceleration or any other parameter representative of the rotation of encoder washer 20 around axis X20.

Sensing device 40 includes a sensing element 42 such as a Hall effect cell. Sensing element 42 is mounted on a printed circuit board or PCB 44 which is connected by a cable 50 to a non represented electronic control unit adapted to treat the output signal of sensing element 42. Cable 50 is represented on figure 2 by its central axis, for the sake of simplicity.

A synthetic body 46 is used to hold sensing element 42 and PCB 44 in position with respect to rolling bearing 2, in a position such that sensing element 42 is located radially inside magnetic body 24, so that a radial air gap G is defined between sensing element 42 and the inner radial surface 242 of magnetic body 24. Sensing element 42 reads magnetic body 24 along a direction D which is radial and centrifugal with respect to axes X2 and X20.

Body 46 is molded in polyamide, preferably PA66. Body 46 surrounds and is fast with an axial spacer 48 which comes into abutment against inner ring 4 in order to axially position sensing element 42, with respect to encoder washer 20, along axis X2.

PCB 44 is equipped with sensing element 42 and with some other electronic components 43 adapted to feed sensing element 42 with power and to treat the output signal of sensing element 42. PCB 44 is also provided with non represented connecting zone for the connection of the conductors of cable 50.

PCB 44 is received within a housing 461 defined by body 46 and obtained when body 46 is molded.

Housing 461 is shaped to efficiently hold PCB 44 in position before a quantity 60 of resin or synthetic material, such as polyamide is overmolded in housing 461 and around an end of cable 50. Quantity 60 is actually made of a first part 62 which lies within housing 461, in the volume of housing 461 which is not occupied by PCB 44 and items 42 and 43, and a second part 64 which extends along cable 50, outside body 46.

On figure 3, a part of body 46 is not represented in order to better show housing 461 and PCB 44.

X4 denotes a central axis of body 46 and spacer 48 which is superimposed with axes X2 and X20 in the mounted configuration of rolling bearing assembly A. X46 denotes an axis parallel to axis X4 and going through a center zone of housing 461. Y46 denotes an axis crossing axis X46 and orthoradial with respect to axis X4. Z46 denotes an axis perpendicular to axes X46 and Y46 and radial with respect to axis X4.
46A denotes the front side of body 46 which is oriented towards bearing 2 in the mounted configuration of assembly A. 46B denotes the back side of body, oriented opposite to front side 46A and to bearing 2.

Housing 461 has means to efficiently hold PCB 44 in position prior to overmolding of part 62.

Housing 461 is limited, along axis X46, by an abutment surface 462 which is parallel to axes Y46 and Z46.

Two elastically deformable hooks 463A, 463B extend from abutment surface 462, along two directions D463A and D463B, which are parallel to axis X46. Each hook 463A, 463B has a protrusion or nose 464A, 464B which extends towards a plane surface 465 parallel to axes X46 and Y46 and along which PCB 44 slides when it is introduced within housing 461.

As shown on figure 5, PCB 44 is provided with two notches 444A, 444B which are respectively adapted to accommodate noses 464A and 464B when PCB 44 is in position within housing 461.

445 denotes an edge of PCB 44 which is opposite to sensing element 42. When PCB 44 is introduced within housing 461 in the direction shown by arrow F1, that is pushed in a direction parallel to axis X46 from front side 46A to back side 46B or towards abutment surface 462, PCB 44 is pushed along surface 465 so that edge 445 comes into abutment against abutment surface 462. Thus, the displacement of PCB 44 along axis X46 in a direction towards the back side 46B of body 46 is limited by the cooperation of edge 445 with abutment surface 462.

Noses 464A and 464B have the same geometry. As shown on figure 11, nose 464A is defined between a first surface 464A1, which is inclined with respect to direction D463A with an angle of about 45°, and a second surface 464A2, which is perpendicular to direction D463A.

Upper surface 443 of PCB 44 is opposite to its lower surface 441 which slides onto plane surface 465, as explained here-above.

When PCB 44 is pushed towards abutment surface 462, hooks 463A and 463B are elastically deformed in order for the inclined surfaces 464A1 or equivalent of their respective noses 464A and 464B to slide on the upper surface 443 of PCB 44, up to when they come in register with notches 444A and 444B. At this stage, noses 464A and 464B penetrate into notches 444A and 444B, which locks PCB 44 in position, in a direction away from abutment surface 462.

Thus parts 462, 463A and 463B form immobilization means of PCB 44, within housing 461, along axis X46.
A44 denotes an axis of PCB 44 superimposed with axis X46 when PCB 44 is mounted within housing 461. Axis A44 is perpendicular to edge 445. 446A and 446B denote the lateral rectilinear edges of PCB 44. Notches 444A and 444B respectively extend from edges 446A and 446B towards axis A44. Edges 446A and 446B are rectilinear and convergent towards axis A44 in a direction going from sensing element 42 to edge 445. \( \alpha \) denotes the convergence angle of each of edges 446A and 446B with respect to axis A44. \( \alpha \) is the angle between edge 446A and an axis parallel to axis X44 and tangent to edge 446A at its corner opposite to edge 445. The same applies for edge 446B. The value of \( \alpha \) is chosen less than 5°, preferably less than 2°, more preferably equal to 0,5°.

When PCB 44 is received within housing 461, edges 446A and 446B are perpendicular to axis Z46 and non parallel to axis Y46. Actually, edges 446A and 446B are almost perpendicular to axis Y46.

466A and 466B denote the lateral surfaces of housing 461. These surfaces guide PCB 44 when it is introduced within housing 461 in the direction of arrow F1. Guiding surfaces 466A and 466B are parallel to axis Z46 and substantially parallel to axis X46. Guiding surfaces 466A and 466B converge towards axis X46 in a direction going from front side 46A to back side 46B. \( \beta \) denotes the convergence angle of each of surfaces 466A and 466B with respect to axis X46. The value of angle \( \beta \) is chosen equal to the value of angle \( \alpha \). Thus, angle \( \beta \) is chosen less than 5°, preferably less than 2° and more preferably equal to 0,5°.

In the sense of this invention, a line or a surface is substantially parallel to an axis when it makes an angle of less than 10° with respect to this axis. When PCB 44 is pushed within housing 461 in the direction of arrow F1, lateral edges 446A and 446B are respectively guided by surfaces 466A and 466B. The fact that angles \( \alpha \) and \( \beta \) have the same value avoid an undesired pivoting movement of PCB 44 around axis Z46 or around an axis parallel to axis Z46 when edge 445 reaches abutment surface 462.

Two slides or guideways 467A and 467B are respectively formed next to surfaces 466A and 466B. Actually, surface 466A forms the bottom of slide 467A, whereas surface 466B forms the bottom of slide 467B. Surface 465 extends between slides 467A and 467B, at the level of the lower sides of slides 467A and 467B.

Each of slides 467A and 467B is designed to accommodate one edge 446A, respectively 446B, of PCB 44, so that they prevent a movement of PCB 44 along axis Z46 when PCB 44 is inserted within housing 461, as shown by arrow F1. In other words, each slide 467A and 467B forms a sort of a guide track for the corresponding edge 446A or
446B. The height \( H_{46} \) of each of slides 467A and 467B is chosen slightly larger than the thickness \( T_{44} \) of PCB 44, between surfaces 441 and 443, at the level of edges 446A and 446B, in order to define a functional play permitting sliding of edges 446A and 446B within slides 467A and 467B. Since edges 446A and 446B are respectively accommodated within slides 467A and 467B, movements of PCB 44 along axis \( Z_{46} \) are blocked, apart from a short displacement corresponding to the functional play mentioned here-above.

Thus, when PCB 44 is introduced within housing 461, in the direction of arrow \( F_1 \), as mentioned here-above, up to a position where edge 445 is stopped by abutment surface 462, PCB 44 is blocked along axis \( X_{46} \) by the cooperation of edge 445 and abutment surface 462 and by the cooperation of noses 464A and 464B with notches 444A and 444B. PCB 44 is blocked along axis \( Y_{46} \) by the sliding contact of edges 446A and 446B along guiding surfaces 466A and 466B. PCB 44 is blocked along axis \( Z_{46} \) by the sides of slides 467A and 467B which interact with its lateral surfaces 441 and 443. Thus PCB 44 is blocked in all directions, so that sensing element 42 is accurately positioned with respect to body 46 prior part 62 of quantity 60 is overmolded within housing 461.

A notch 468 is provided in body 46 and opens in housing 461 through surface 462. This notch defines a channel for the passage of the ends of the conductors of cable 50 which are connected to PCB 44.

As shown on figure 4, hooks 463A and 463B have a width which decreases along directions \( D_{463A} \) and \( D_{463B} \) when going away from abutment surface 462. \( \gamma \) denotes the half-convergence angle between their lateral surfaces, \( \gamma \) is between 4° and 10°, preferably equal to 6°.

An annular jacket 9 is mounted around the part of body 46 which forms housing 461. This jacket 9 locally surrounds body 46 and it is made of stainless steel, for example \( \text{x20Cr13 (grade 420)} \) steel, that is a material with a higher harness than the material of sensor body 46.

The material of annular jacket 9 is chosen so that it has a surface harness larger than 35 HRC according to EN-ISO-6508-1 norm.

When the rotation detection set comprising sensor unit 40 and encoder washer 20 is used, in the configuration of figure 2, a sealing gasket 5 provided with two lips 52 and 54 is mounted within a recess 109 of hub 104 and the lips 52 and 54 are in sliding contact with the outer radial surface 92 of jacket 9.

Thus, sealing gasket 5 efficiently isolates air gap \( G \) from dust and water and jacket 9 protects body 46 from abrasion. Sealing gasket 5 is advantageously made of an
elastomeric material, such as NBR (Nitrile Butadiene Rubber, a well known material in the field of sealing devices).

As shown on figure 11, body 46 can be molded in one operation with two molding parts 200 and 300 which are pushed towards each other, as shown by arrows F200 and F300. Mold parts 200 and 300 have protrusions 201 and 301 which define together housing 461 and hooks 463A and 463B, together with their respective noses 464A, 464B. As shown on figure 11, jacket 9 is advantageously installed within the molding cavity when body 46 is being molded.

As shown on figure 11, nose 464A is defined between first surface 464A1 and second surface 464A2. Surface 464A1 can slide on the upper surface 443 of PCB 44 whereas surface 464A2 forms an efficient stop for an edge 444A2 of notch 444A in case of a movement of printed circuit board 44 away from abutment surface 462 in the position of figure 9.

Instead of notches, the reliefs of printed circuit board adapted to cooperate with the noses 464A, 464B of elastically deformable hooks 463A, 463B can be blind holes or through holes.

According to a non represented embodiment of the invention, body 46 can be made of aluminum or an aluminum based alloy.

The invention has been represented with two hooks 463A, 463B in housing 461. However, it can also be implemented with one hook only or with more than two hooks, depending on the size of PCB 44.

The invention has been represented with a rolling bearing. However, it is also usable with a plain bearing.

The invention has been represented with a fixed inner ring and a rotatable outer ring. However, it is also usable with a fixed outer ring and a rotatable inner ring.

The invention has been represented in case the PCB 44 bears one sensing element 42. However, the invention can also be implemented with a PCB equipped with several sensing elements.
1. A body (46) for a sensor unit (40) of a rotation detection set, said sensor unit including at least one sensing element (42) mounted on a printed circuit board (44) and said body forming a housing (461) for said sensing element and said printed circuit board, wherein said housing is geometrically defined:

- along a first axis (X46), by an abutment surface (462) perpendicular to said first axis (X46) and by at least one elastic hook (463A, 463B) adapted to block a movement of said printed circuit board away from said abutment surface,

- along a second axis (Y46) perpendicular to said first axis, by two guiding surfaces (466A, 466B) substantially parallel to said first axis and converging towards each other in a direction parallel to said first axis, and

- along a third axis (Z46) perpendicular to said first and second axes, by two slides (467A, 467B), each of these slides being adapted to accommodate a lateral edge (446A, 446B) of said printed circuit board (44).

2. Body according to claim 1, wherein said two guiding surfaces (466A, 466B) are inclined by an angle (β) of less than 5°, preferably less than 2°, more preferably by 0.5° with respect to said first axis (X46).

3. Body according to one of the preceding claims, wherein each guiding surface (446A, 446B) forms the bottom of one slide (467A, 467B).

4. Body according to one of the previous claims, wherein it is made of a moulded synthetic material, in particular a polyamide.

5. Body according to one of the previous claims, wherein each hook (463A, 463B) extends from said abutment surface (462) in a direction (D463A, D463B) parallel to said first axis (X46) and has a protrusion (464A, 464B) orientated towards a zone (465) of said housing extending between said slides (467A, 467B).

6. Body according to one of the previous claims, wherein it includes two hooks (463A, 463B) which extend along parallel directions (D463A, D463B) from said abutment surface (462).
7. Body according to one of the previous claims, wherein it is made of a first material and partially surrounded by an annular jacket (9) made of a second material with a hardness higher than the hardness of said first material.

8. Body according to claim 7, wherein said annular jacket (9) is made of stainless steel, in particular x20 Cr13 (grade 420) steel.

9. Body according to one of claims 7 or 8, wherein said annular jacket (9) has a surface hardness larger than 35 HRC.

10. A sensor unit (40) of a rotation detection set comprising:
- a printed circuit board (44),
- at least one sensing element (42) mounted on said printed circuit board,
- a body (46) according to one of the previous claims,
the printed circuit board (44) being received in said housing (461) of said body (46) and a filling material (62) filling the volume left by said printed circuit board in said housing.

11. Sensor unit according to claim 10, wherein said printed circuit board (44) has two lateral edges (446A, 446B) which converge towards a central axis (X44) of said printed circuit board with an angle (a) having the same value as a convergence angle (β) of said two guiding surfaces (466A, 466B) with respect to said first axis (X46).

12. Sensor unit according to one of claims 10 or 11, wherein said printed circuit board (44) is provided with at least one relief (444A, 444B) engaged with said at least one hook (463A, 463B) of said housing.

13. Sensor unit according to claim 12, wherein said relief of said printed circuit board is a notch (444A, 444B) or a hole provided in said printed circuit board (44).

14. A rotation detection set comprising:
- an encoder washer (20) adapted to rotate around a rotation axis (X2)
- a sensor unit (40) according to one of claims 10 to 13.

15. A method for manufacturing a sensor unit (40) according to one of claims 10 to 13, said method comprising at least the following steps:
a) molding (F200, F300) a body (46) according to one of claims 1 to 9 in one operation

b) inserting (F1) said printed circuit board (44) in said housing (461) of said body and

c) overmolding a filling material (62) at least in the volume of said housing left by said printed circuit board in said housing.
INTERNATIONAL SEARCH REPORT

International application No:
PCT/IB2010/003530

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01P1/02 G01P3/44 G01D11/24 G01D5/244 B60B27/02

ADD.
According to International Patent Classification (IPC) onto both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01P G01D B60B F16C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<td>wo 2009/116445 AI (NTN TOYO BEARING CO LTD [JP]; ITO HIROYOHI [JP]) 24 September 2009 (2009-09-24) paragraphs [0014], [0019], [0023], [0028], [0029], [0034] - [0036] ; figures 1-3</td>
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<td>DE 93 18 589Ul (MANNESMANN KLENZLE GMBH [DE]) 20 January 1994 (1994-01-20) page 6, paragraph 2 page 7, paragraph 1 page 9, lines 19-29 page 10, paragraph 1; figures 1, 1A, 2</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search: 30 August 2011

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Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
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Authorized officer: Pfl ugel der, Gunther
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<td>A</td>
<td>FR 2 927 962 AI (SNR ROULEMENTS SA [FR] ROULEMENTS SOC NOUVELLE [FR]) 28 August 2009 (2009-08-28) paragraph [0042] ; figures 5a, 5b; la, lb</td>
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