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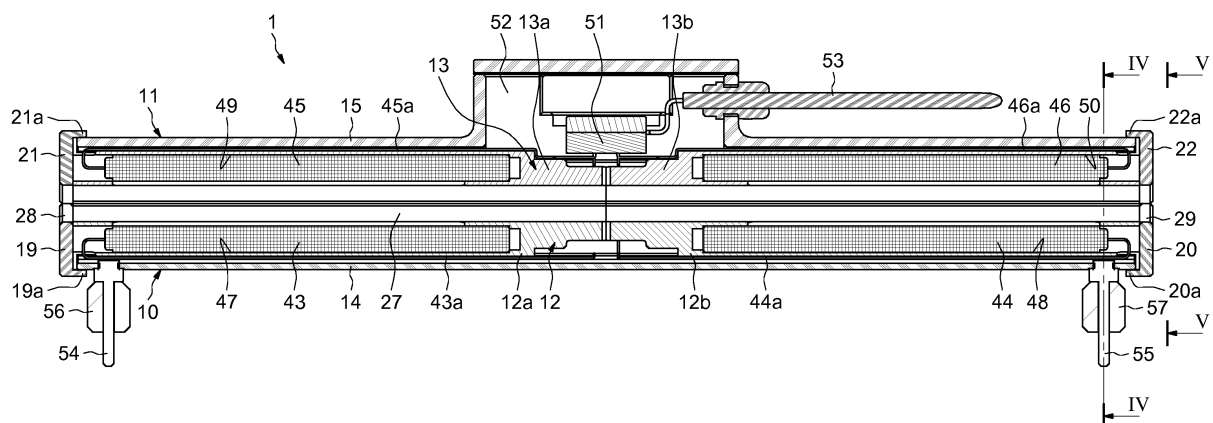
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(54) **HEATING DEVICE FOR HEATING A SEAL FOR A BEARING**

(57) A heating device for heating a seal having to be placed between rings of a bearing, comprising two longitudinal parts (10, 11) able to be moved relative to each other between a close position in which a longitudinal channel (27) is formed there between for being trans-

verse longitudinally by said seal and an open position in which said seal can be introduced in and removed out of said channel ; and in which at least one of the said longitudinal part carries heating means (43-46) for heating the portion of the seal extending in said channel.

FIG.3



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Description

[0001] The present invention relates to the field of bearing assemblies.

[0002] The present invention relates more particularly to the field of large size bearings, for example large-diameter rolling bearings adapted to be used in wind turbines.

[0003] Rolling bearings comprise generally two rings and rolling elements interposed between these rings. For protecting the space where the rolling elements are placed, seals, made from synthetic materials such as elastomeric or thermoplastic materials, are interposed between the rings. The mounting of the seals between the rings induces difficulties due to the rigidity of the seals. In order to soften and reduce the rigidity of the seals, it is current to heat the seals with a warm air flow issued from a hot air blower which is carried by an operator. Such a solution is not satisfying because it is difficult to obtain a controlled temperature of the seals and because there is a risk of overheating of the seals.

[0004] One aim of the present invention is to facilitate the heating and the mounting of seals between rings of bearings.

[0005] In one embodiment, it is proposed a heating device for heating a seal having to be placed between rings of a bearing.

[0006] This heating device comprises two longitudinal parts able to be moved relative to each other between a closed position in which a longitudinal channel is formed there between for being transverse longitudinally by said seal and an open position in which said seal can be introduced in and removed out of said channel, at least one of the said longitudinal part carrying heating means for heating the portion of the seal extending in said channel.

[0007] The said longitudinal parts can be provided with articulating means having a longitudinal rotation axis and are provided with locking means for maintaining the said longitudinal parts in the said close position.

[0008] The said longitudinal parts can comprise half longitudinal bodies which form there between said longitudinal channel in said close position and which carries said heating means.

[0009] The heating means can comprise at least a longitudinal elongated element including at least an electrical resistance.

[0010] The said longitudinal parts can comprise half longitudinal internal bodies which form there between said longitudinal channel in said close position and half longitudinal external fairings surrounding said half longitudinal internal bodies, the half longitudinal internal bodies carrying heating means.

[0011] The heating device can comprise end flanges for fixing together, respectively, half longitudinal internal bodies and half longitudinal external fairings.

[0012] The heating means can comprise at least one longitudinal elongated element inserted in a longitudinal

hole of at least one of the half longitudinal internal bodies.

[0013] The heating device can comprise guiding protuberances (54, 55) able to cooperate with the bearing for guiding the heating device along a circumferential path.

[0014] The present invention and its advantages will be better understood by studying a heating device and its using, given by way of non-limiting example and illustrated by the appended drawings on which:

- Figure 1 is a top view of a heating device, in a closed position, installed on a bearing;
- Figure 2 is a radial cross-section of figure 1 referenced on figure 1;
- Figure 3 is a longitudinal section of the heating device, referenced on figure 1, in a closed position;
- Figure 4 is a radial cross-section of the heating device referenced on figure 3, in a closed position;
- Figure 5 is an end view of the heating device referenced on figure 3, in an open position; and
- Figure 6 is a perspective exploded view of the heating device.

[0015] As illustrated on figures 1 and 2, a heating device 1 is intended to heat an annular seal 2, this seal 2 being provided with lips and having to be mounted between an internal ring 3 and an external ring 4 of a bearing assembly 5. For example, the bearing assembly 5 comprises at least a row 6 of rolling elements, such as balls, interposed between annular raceways of the rings 3 and 4, the seal 2 being intended to be mounted in an annular location 7 provided at an annular end portion of the space 8 between the ring 3 and 4, in which the rolling elements 6 move.

[0016] As illustrated more particularly on figures 3, 4, 5 and 6, the heating device 1 comprises two half longitudinal elongated parts 10 and 11.

[0017] The longitudinal elongated parts 10 and 11 comprise respectively half tubular longitudinal inner bodies 12 and 13, formed as half cylinders, and half longitudinal tubular outer fairings 14 and 15, formed as half cylinders, recovering the half tubular longitudinal inner bodies 12 and 13.

[0018] The half tubular longitudinal inner bodies 12 and 13 are divided in two successive portions 12a, 12b and 13a, 13b, aligned longitudinally, which are respectively connected by longitudinal ankles 17 and 18 (figure 6).

[0019] The longitudinal parts 10 and 11 comprise further half radial end flanges 19, 20 and 21, 22, formed as half crowns, which are provided at the opposed ends of the inner bodies 12 and 13 and the outer fairings 14 and 15.

[0020] The half radial end flanges 19, 20 and 21, 22 comprise edges 19a, 20a and 21a, 22a, which extend over the outer faces of the outer fairings 14 and 15. Longitudinal mounting screws 23, 24 and 25, 26 are provided through the end flanges 19, 20 and 21, 22 and are screwed in the opposed end portions of the portions 12a,

12b and 13a, 13b, of the inner bodies 12 and 13.

[0021] When the two longitudinal parts 10 and 11 are in a close position (figures 1-4), in which the heating device 1 is in the form of an elongated cylinder, the half longitudinal inner bodies 12 and 13 form a longitudinal central channel 27 between them and the opposed half end flanges 19, 20 and 21, 22 form opposed end apertures 28 and 29 between them, at the ends of the longitudinal channel 27.

[0022] The longitudinal parts 10 and 11 are provided with a pair of articulating means 30, which are longitudinally spaced apart and which comprise respectively pairs of projecting lugs 31 and 32 respectively on the outer fairings 14 and 15 and longitudinal axes 33 which transverse the lugs 31 et 32.

[0023] By these articulating means, the longitudinal parts 10 and 11 can be pivoted between the said close position (figures 1-4) and an open position (figure 5) in which the longitudinal parts 10 and 11 are spaced apart, such that the channel 27 and the apertures 28 and 29 are opened.

[0024] The longitudinal parts 10 and 11 are also provided with a pair of locking means 34 for maintaining them in said close position. The locking means 34 are spaced apart longitudinally and are located at a position diametrically opposed to the articulating means 30.

[0025] The locking means 34 comprise respectively pairs of projecting lugs 35 and 36 respectively on the outer fairings 14 and 15, which respectively come one on the other in the said close position, and comprise threaded rods 37 articulated on the lugs 35 through longitudinal axle 38.

[0026] The rods 37 can be pivoted between locking positions (figures 1-4) in which the rods 37 are introduced in slots 39 of the lugs 36 and released positions (figure 5) in which the rods 37 are out of the slots 39. The rods 37 carry rings 40, nuts 41 and springs 42 between the rings and the nuts. In the locking position, the nuts 41 apply the ring 40 on the lugs 36 through the springs 42, so as to maintain the heating device 1 in the said close position.

[0027] The heating device 1 comprises further elongated longitudinal heating elements 43, 44, 45 and 46, respectively inserted in longitudinal holes 47, 48, 49 and 50 of the longitudinal portions 12a, 12b and 13a, 13b of the longitudinal inner bodies 12 and 13. The longitudinal holes 47 and 48 are aligned, the longitudinal holes 49 and 50 are aligned, the longitudinal holes 47 and 49 are diametrically opposed and the longitudinal holes 48 and 50 are diametrically opposed.

[0028] The heating elements 43, 44, 45 and 46, which include electrical resistances, are connected to a common connector 51, via electrical wires 43a, 44a, 45a and 46a, which is placed in a lateral projecting chamber 52 of the outer fairing 15. The connector 51 is connected to a feeding wire 53 connected to an electrical source (not shown). When the heating elements 43, 44, 45 and 46 are connected to the electrical source, the produced heat

is transferred to the longitudinal inner bodies 12 and 13, such that the temperature of these bodies 12 and 13 is controlled and substantially homogenous.

[0029] The outer fairing 14 is provided with projecting radial guiding rods 54 and 55 which are longitudinally spaced apart. The rods 54 and 55 are provided with collar 56 and 57 such that the end portions of the rods 54 and 55 are free.

[0030] The heating device 1 can be used as following.

[0031] As illustrated on figures 1 and 2, an operator places the heating device 1 on the bearing 5, with the end portions of the guiding rods 54 and 55 introduced in the space 8 between the rings 3 and 4 and the collar 56 and 57 abutting external annular radial surfaces 59 and 60 of the rings 3 and 4. So, the heating device 1 extends in a parallel position and at a distance of the radial face of the bearing 5.

[0032] The operator places the heating device 1 in its open position previously mentioned (Figure 6).

[0033] The operator introduces a portion of the annular seal 2, longitudinally, between the half longitudinal elongated parts 10 and 11.

[0034] The operator brings closer the half longitudinal elongated parts 10 and 11 to the close position previously mentioned and places the blocking means 34 in blocking position (Figure 1-4).

[0035] So, the portion of the annular seal 2 extends longitudinally and freely in the channel 27 and through the end apertures 28 and 29.

[0036] The portion of the annular seal 2 is heated by the heat of the bodies 12 and 13 including the heating elements 43, 44, 45 and 46, such that the rigidity of this portion is decreasing. As the temperature in the channel 27 is controlled and homogenous, the heating of the portion of the seal 2 extending in the channel 27 is controlled and homogenous.

[0037] The operator moves the heating device 1 circumferentially along the space 8 of the bearing 5, the heating device 1 being guided by the guiding rods 54 and 55 engaged in the circumferential edge portion of the space 8 between the rings 3 and 4.

[0038] As the moving of the heating device 1, the seal 2 slides longitudinally in the channel 27 and portions of the annular seal 2 are heated. The operator introduces successively or continuously heated portions of the annular seal 2 into the space 8 of the bearing 5, to the location 7.

[0039] At the end of the heating operations, the operator can open the heating device 1, extract the portion of the seal 2 from the heating device 1 and remove the heating device 1 for finishing the installation of the annular seal 2 in the location 7.

[0040] The present invention is illustrated by the description of an application of a heating device for heating an annular seal having to be mounted in a bearing including one or several rows of rolling elements. The present invention can also be applied to plain bearings.

Claims

1. A heating device for heating a seal, for example having to be placed between rings of a bearing, comprising two longitudinal parts (10, 11) able to be moved relative to each other between a closed position in which a longitudinal channel (27) is formed there between for being transverse longitudinally by said seal, and an open position in which said seal can be introduced in and removed out of said channel ; and in which at least one of the said longitudinal part carries heating means (43-46) for heating the portion of the seal extending in said channel. 5
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2. Device according to claim 1, in which the said longitudinal parts (10, 11) are provided with articulating means (30) having a longitudinal rotation axis and are provided with locking means (30) for maintaining the said longitudinal parts in the said close position. 15
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3. Device according to one of claims 1 and 2, in which the said longitudinal parts (10, 11) comprise half longitudinal bodies (12, 13) which form there between said longitudinal channel (27) in said close position and which carries said heating means (43-46). 25
4. Device according to anyone of claims 1 to 3, in which the heating means comprise at least a longitudinal elongated element (43-46) including at least an electrical resistance. 30
5. Device according to one of claims 1 and 2, in which the said longitudinal parts (10, 11) comprise half longitudinal internal bodies (12, 13) which form there between said longitudinal channel (27) in said close position and half longitudinal external fairings (14, 15) surrounding said half longitudinal internal bodies, the half longitudinal internal bodies carrying heating means (43, 46). 35
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6. Device according to claim 5, comprising end flanges (19-22) for fixing together, respectively, half longitudinal internal bodies (12, 13) and half longitudinal external fairings (14, 15). 45
7. Device according to one of claims 5 and 6, in which the heating means comprise at least one longitudinal elongated element (43-46) inserted in a longitudinal hole (47-50) of at least one of the half longitudinal internal bodies. 50
8. Device according to anyone of the preceding claims, comprising guiding protuberances (54, 55) able to cooperate with the bearing for guiding the heating device along a circumferential path. 55

FIG.1

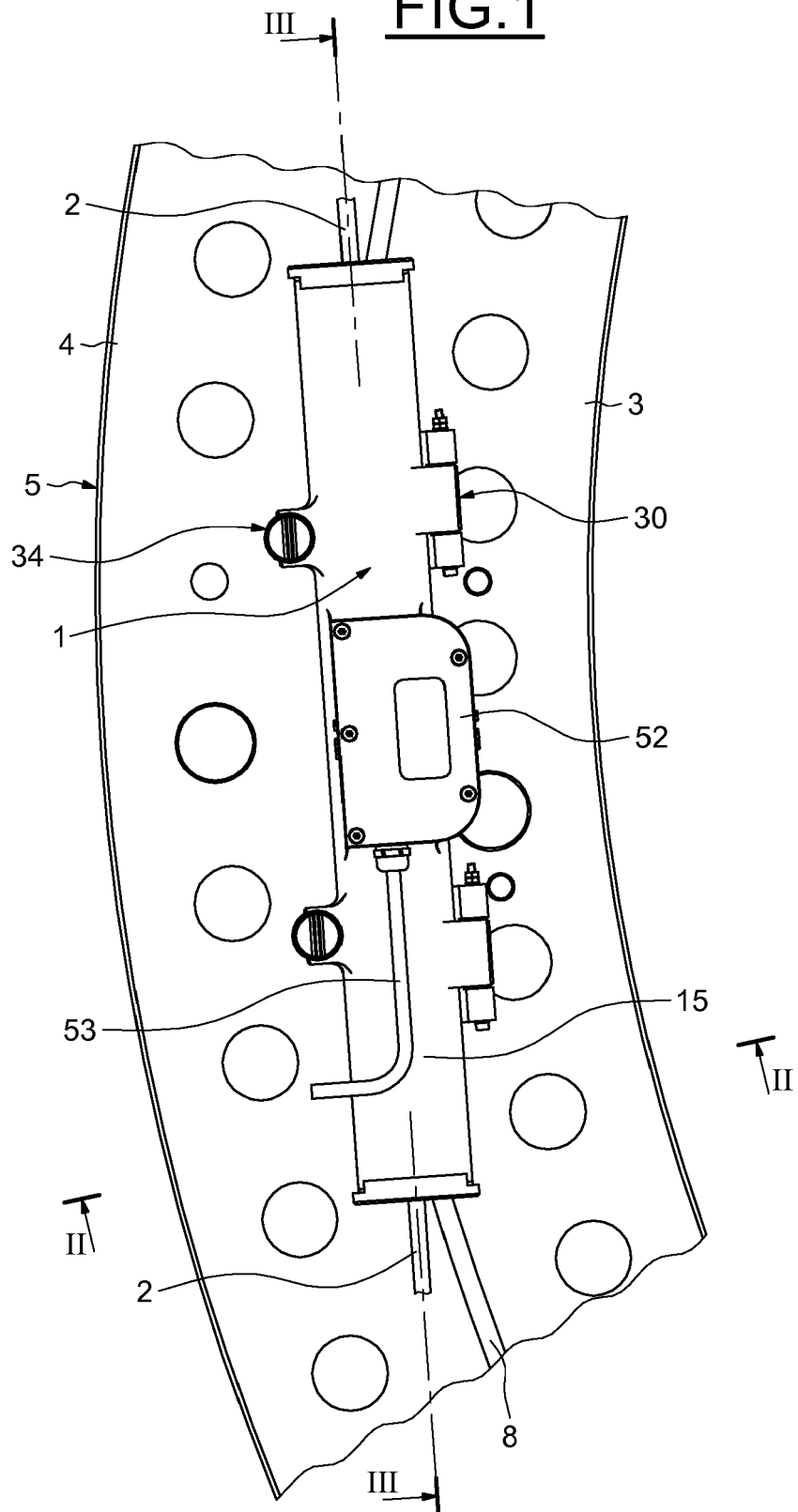


FIG.2

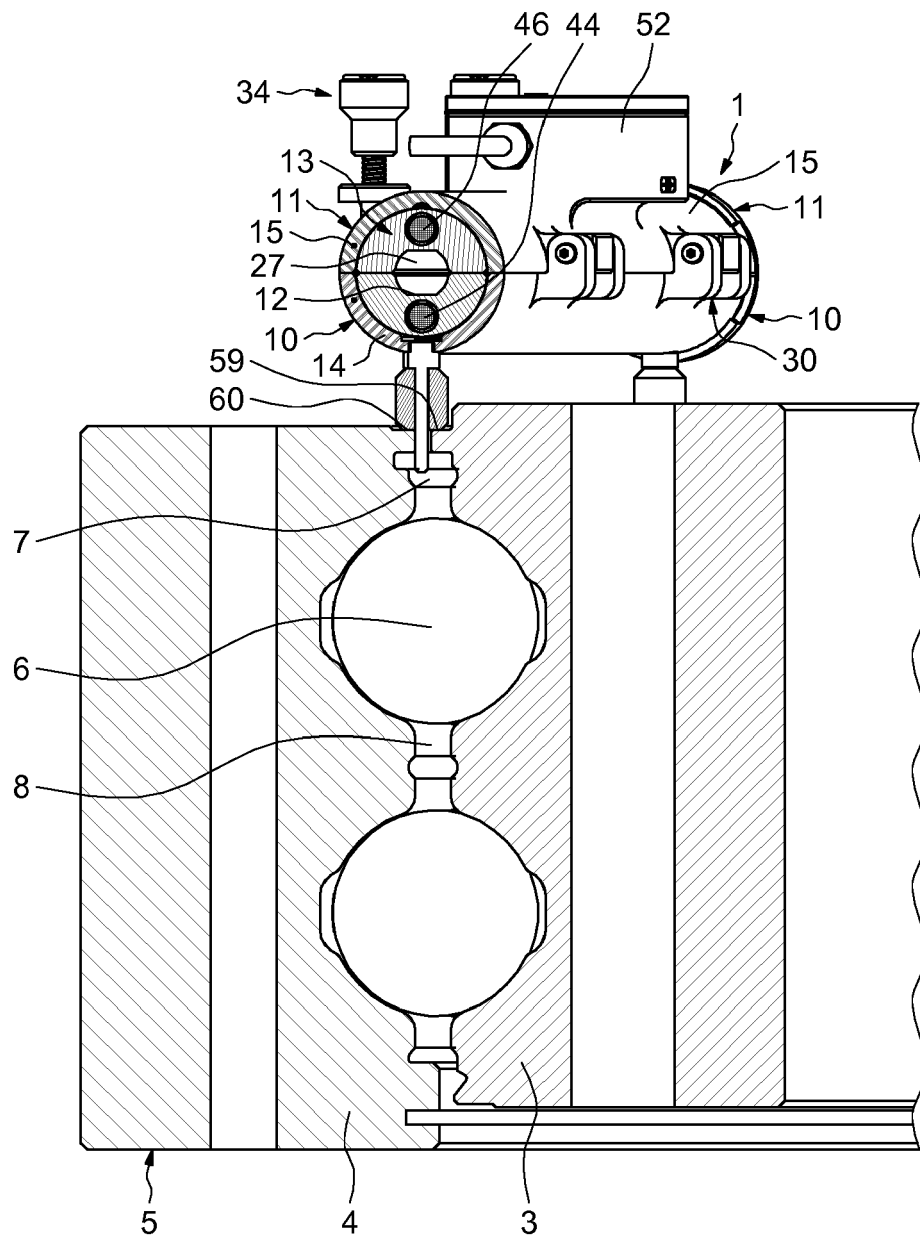


FIG.3

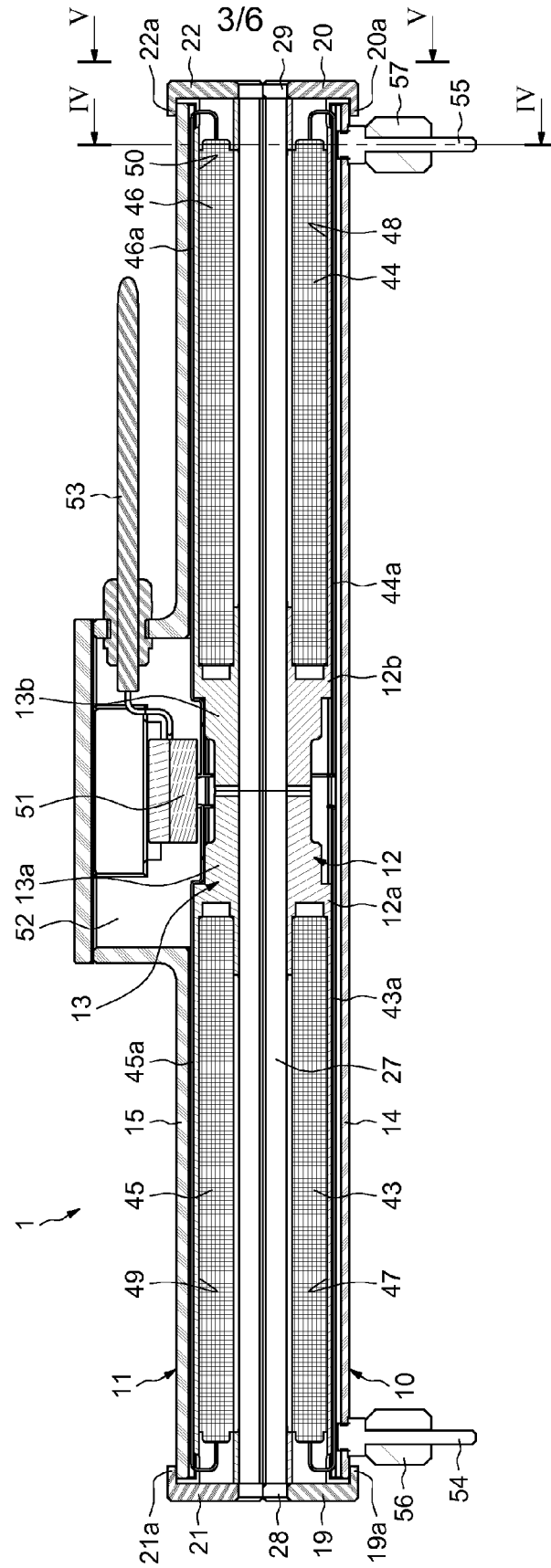


FIG.4

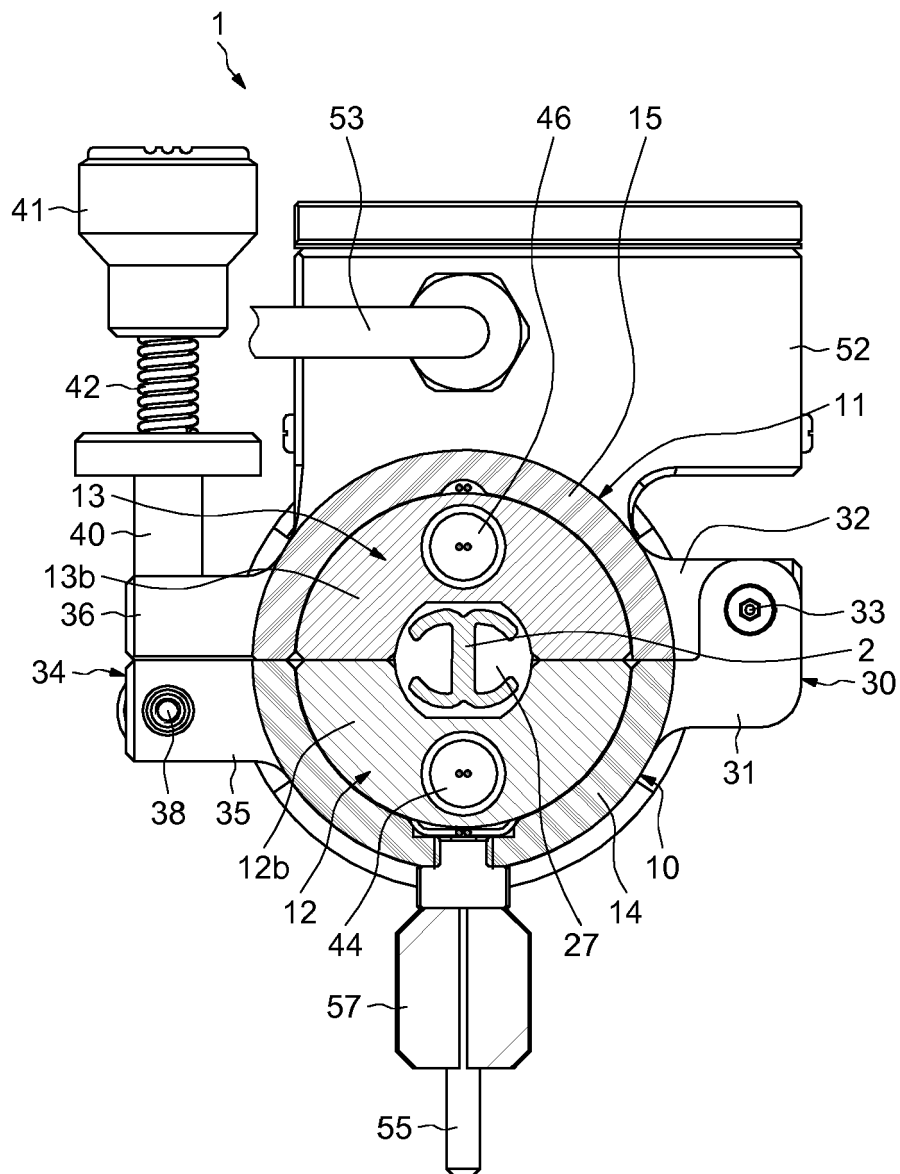


FIG.5

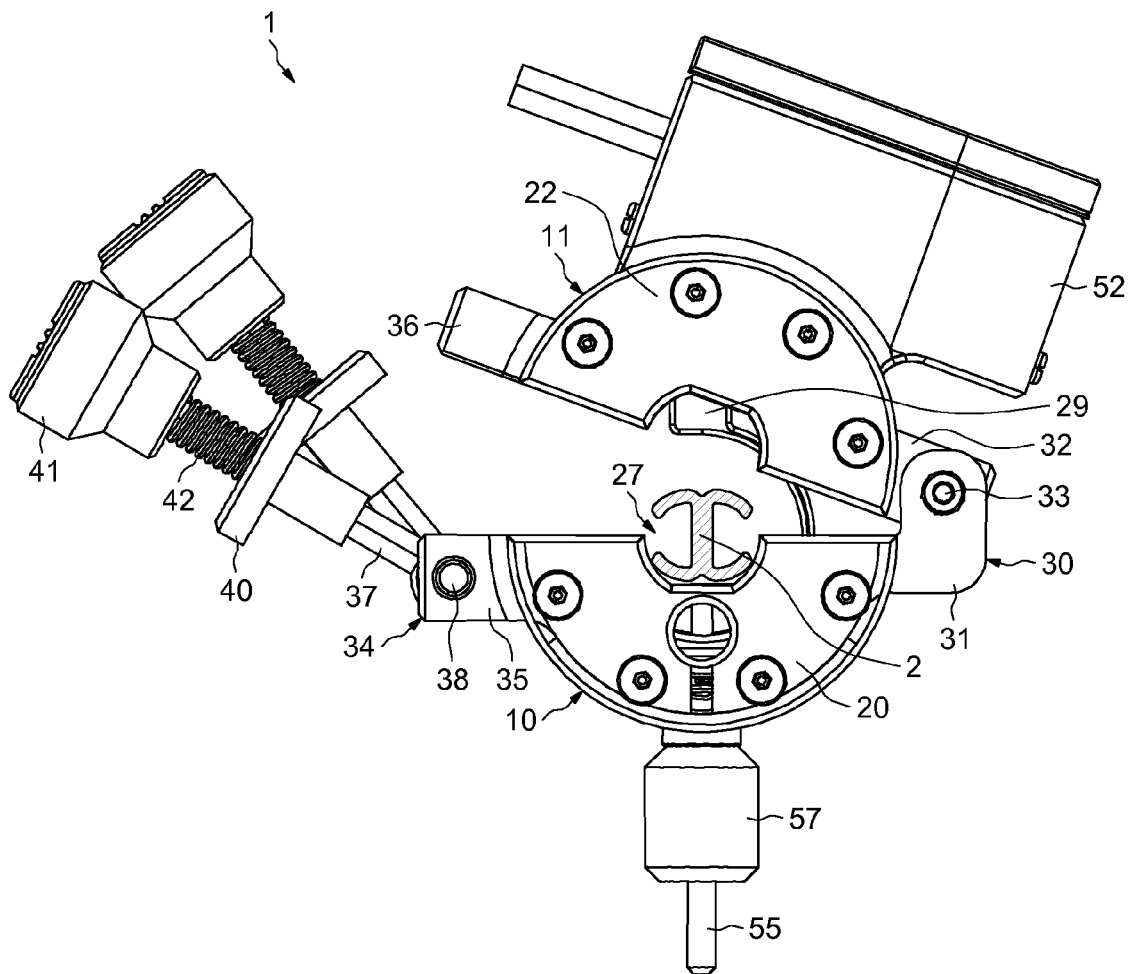
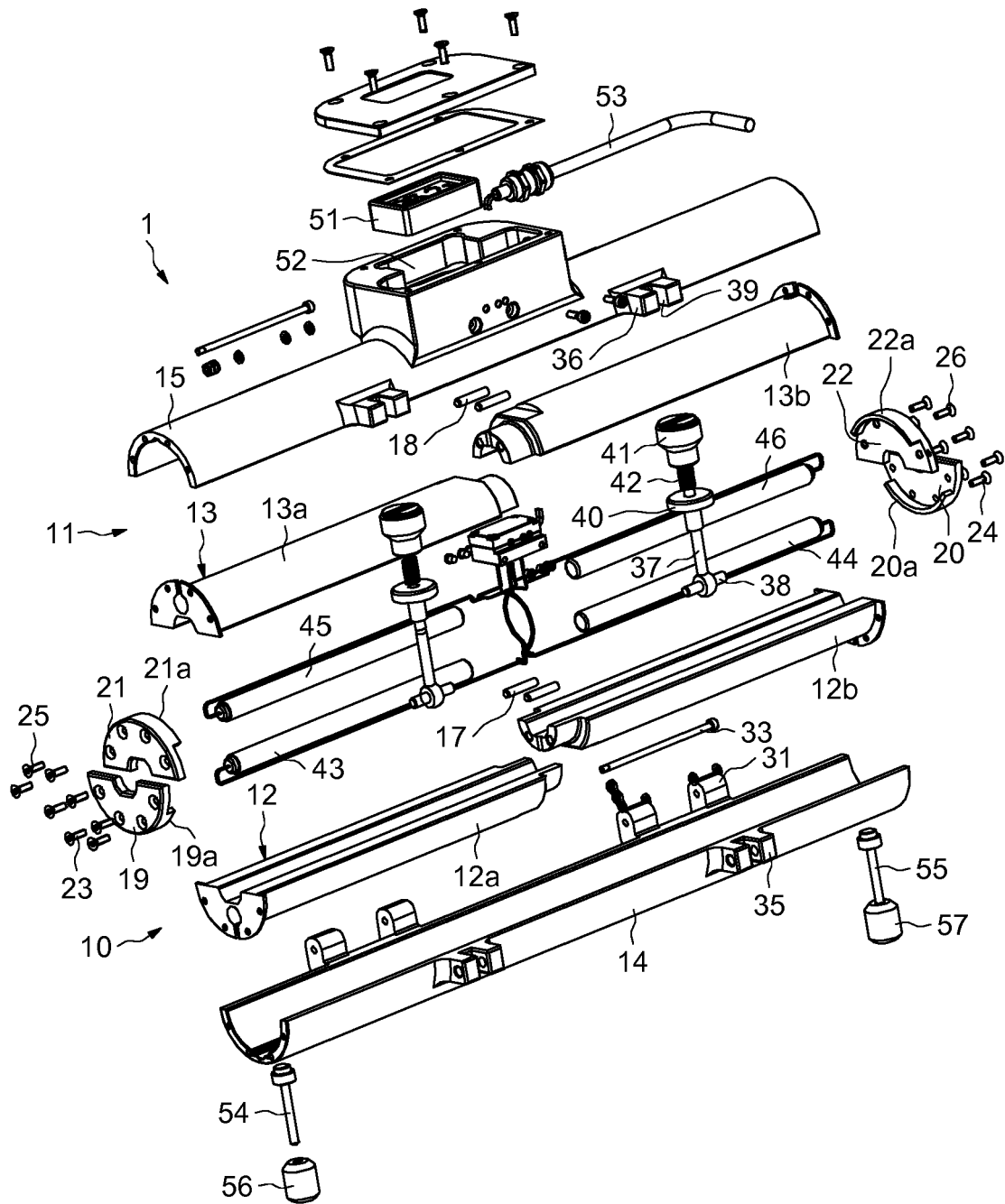


FIG.6





EUROPEAN SEARCH REPORT

Application Number
EP 15 30 6137

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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	EP 0 487 257 A1 (BREVILLE R & D PTY LTD [AU]) 27 May 1992 (1992-05-27) * column 2, line 45 - column 3, line 47; figures 1,2 *	1-8	INV. B25B27/00
X	EP 1 400 193 A1 (SEB SA [FR]) 24 March 2004 (2004-03-24) * paragraph [0008] - paragraph [0050] *	1-8	
A	WO 2011/050837 A1 (SKF AB [SE]; TANKE JESKO-HENNING [FR]; OVIZE PASCAL [FR]; GRUBER ANDRE) 5 May 2011 (2011-05-05) * abstract; figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A61J B25B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 January 2016	Examiner Pothmann, Johannes
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			

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0487257	A1	27-05-1992	AU	627997 B2	03-09-1992
			AU	8550191 A	11-06-1992
			CA	2053170 A1	20-05-1992
			DE	69102977 D1	25-08-1994
			DE	69102977 T2	16-03-1995
			EP	0487257 A1	27-05-1992
			US	5138938 A	18-08-1992

EP 1400193	A1	24-03-2004	DE	60300875 D1	28-07-2005
			DE	60300875 T2	11-05-2006
			DE	60309735 T2	13-09-2007
			EP	1400193 A1	24-03-2004
			EP	1557120 A1	27-07-2005
			FR	2844694 A1	26-03-2004

WO 2011050837	A1	05-05-2011	EP	2494195 A1	05-09-2012
			ES	2524073 T3	04-12-2014
			WO	2011050837 A1	05-05-2011
