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(54) **Grease cap**

(57) According to an aspect of the present invention there is provided a cap for closing an inlet port for introducing lubricant into a power tool, the power tool having an outer casing, the cap comprising, a top portion, a stopper portion, and at least one engaging member config-

ured to engage the inlet port when the cap is displaced to a locked position. The top portion comprises at least one protrusion for cooperating with the outer casing of the power tool to fix the cap in said locked position.

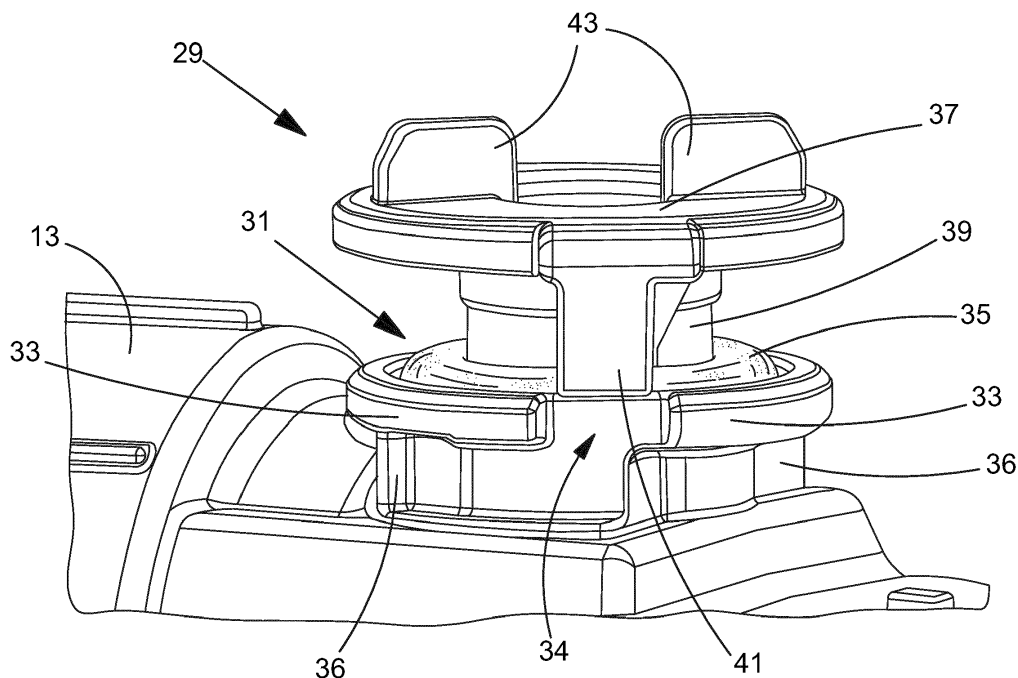


FIG.3

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Description

[0001] The present invention relates to a grease cap; to a power tool incorporating a grease cap; and to a casing for a power tool.

[0002] It is known to provide a power tool, such as a hammer drill, with an inlet for supplying grease to a crank mechanism or the like for lubrication. The inlet is typically provided in a position above the crank mechanism in the housing, and configured to be opened and closed by a cap. Efficiently securing the cap onto the grease supply inlet is essential to avoid any grease leakage from the inlet.

[0003] At least in certain embodiments, the present invention sets out to overcome or at least ameliorate shortcomings associated with known grease cap for power tools. In particular, the present invention sets out to provide an efficient securing of the cap onto the grease supply inlet.

[0004] Aspects of the present invention relate to a grease cap; to a power tool incorporating a grease cap, and to a casing for a power tool.

[0005] According to an aspect of the present invention, there is provided a cap for closing an inlet port for introducing lubricant into a power tool, the power tool having an outer casing, the cap comprising:

a top portion,
a stopper portion, and
at least one engaging member configured to engage the inlet port when the cap is displaced to a locked position. The top portion comprises at least one protrusion for cooperating with the outer casing of the power tool to fix the cap in said locked position. The inlet port can be sealed when the cap is in said locked position. The cap can be configured to be rotated to said locked position and the at least one protrusion can be arranged to cooperate with the outer casing of the power tool to inhibit rotation of the cap and/or axial movement of the cap. The at least one protrusion can be arranged to cooperate with a locking member provided on an interior of the outer casing.

[0006] The top portion can comprise first and second protrusions arranged to form a channel for receiving a locking member provided on said outer casing. The first and second protrusions can be offset to opposite sides of a transverse axis of the top portion of the cap. The first and second protrusions can be arranged in parallel planes. In the assembled power tool, the first and second protrusions can locate on opposite sides of the locking member provided on the outer casing to fix the cap in said locked position.

[0007] Alternatively, the at least one protrusion could be configured to locate in a locking channel defined in the outer casing to fix the cap in said locked position.

[0008] The at least one engaging member can be a locking arm extending from the top portion. The locking

arm can be arranged so as to abut against a stop member of the inlet port when the cap is in said locked position. The cap can thereby be positively displaced to said locked position.

[0009] The or each locking arm can extend parallel to a central axis of the cap. In arrangements in which the cap is rotated to said locked position, the central axis of the cap can be coincident with a rotational axis of the cap. The or each protrusion can be a finger tab for allowing a user to rotate the cap manually about the central axis.

[0010] According to a further aspect of the present invention, there is provided a power tool comprising:

an inner housing having an inlet port for introducing lubricant;
a cap for closing the inlet port, the cap comprising at least one engaging member configured to engage the inlet port when the cap is displaced to a locked position; and
an outer casing for mounting to the inner housing; wherein the cap comprises at least one protrusion for cooperating with the outer casing of the power tool to fix the cap in a locked position. The cap can be installed in said inlet port when the outer casing is not fitted to the inner housing. When the outer casing is disposed on said inner housing, the cap is fixed in said locked position. The power tool can comprise a longitudinal axis and the locking member can be a longitudinal rib extending parallel to the longitudinal axis. The longitudinal axis can be coincident with a rotational axis of a tool holder of the power tool.

[0011] The inlet port may be substantially circular and may comprise at least one circumferential protuberance. The cap can comprise at least one locking arm for engaging said at least one circumferential protuberance when the cap is in said locked position. The inlet port can comprise at least one stop member, the or each locking arm being configured so as to abut against the or each stop member when the cap is in the locked position. A recess or detent can be provided in the inner housing for receiving a portion of the or each engaging member when the cap is in said locked position.

[0012] The cap can be configured to be rotated into said locked position. The at least one protrusion can cooperate with the outer housing to inhibit rotation of said cap and/or axial movement of the cap.

[0013] According to a further aspect of the invention, there is provided a casing for a power tool, the power tool having an inlet port for introducing lubricant and a cap for closing the inlet port, wherein the casing has at least one locking member for fixing the cap in a locked position to seal the inlet port. The or each locking member can be configured to inhibit rotation of the cap and/or axial movement of the cap when the cap is in said locked position. The casing can comprise a longitudinal axis and the or each locking member can be a longitudinal rib ex-

tending parallel to the longitudinal axis. The or each locking member can be configured to be received in a channel formed on a top portion of the cap when the cap is in said locked position. The casing can comprise a locking channel configured to receive at least one protrusion formed on a top portion of the cap to fix the cap in said locked position.

[0014] Within the scope of this application it is expressly envisaged that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. Features described in connection with one embodiment are applicable to all embodiments, unless such features are incompatible.

[0015] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying Figures, in which:

Figure 1 shows a power tool in accordance with an embodiment of the present invention;

Figure 2 shows a perspective view of an outer casing for a power tool according to an embodiment of the present invention;

Figure 3 shows a perspective view of a grease supply inlet and a grease cap for a power tool according to an embodiment of the present invention, the grease cap being in an unlocked position;

Figure 4 shows a perspective view of the grease cap according to an embodiment of the present invention;

Figure 5 shows a side view of the grease cap shown in Figure 4, according to an embodiment of the present invention;

Figure 6 shows a bottom view of the grease cap shown in Figure 4, according to an embodiment of the present invention;

Figure 7 shows a perspective view of the grease supply inlet and the grease cap shown in Figure 3, the grease cap being in a locked position; and

Figures 8 and 9 show vertical cross sections of the grease supply inlet and the grease cap shown in Figure 3 in transverse and longitudinal directions, the grease cap being in the locked position.

[0016] A grease cap for a power tool in accordance with an embodiment of the present invention will now be described with reference to the accompanying Figures.

[0017] A power tool 1 according to an aspect of the present invention is represented in Figure 1. The represented power tool 1, such as a hammer drill, has a longitudinal axis XX, and an external housing 3 which forms a gripping portion 5 at its rear end. A switch actuator 7 for switching an electric motor (not shown) of the power tool 1 on and off projects into a grip opening 9. The grip opening 9 is defined at its rear end by the gripping portion 5. In the rear lower portion of the external housing 3, a

mains lead (not shown) is provided to connect the power tool 1 to a power source. The power tool 1 comprises at its front part a tool holder 11, in which is inserted a tool (not represented) such as hammer bit, a drill bit or a chisel bit. The power tool 1 comprises an inner housing 13, as shown in Figure 3. The longitudinal axis XX of the power tool 1 is coincident with a central axis of the tool holder 11.

[0018] As shown in Figure 1, the external housing 3 comprises an outer casing 15 which in the present embodiment is moulded from a plastics material. The outer casing 15 is shown in more detail in Figure 2. The outer casing 15 comprises a front section 17 which is profiled to match the shape of an upper portion 19 of the power tool 1. The front section 17 comprises a circular collar 21 that surrounds the front part of the power tool 1. Two securing holes 23 are provided on the sides of the outer casing 15 for securing the outer casing 15 to the internal housing 13. The securing holes 23 align with corresponding holes (not shown) of the internal housing 13 and a securing bolt, or other mechanical fastener, is located in each securing hole 23 to mount the outer casing 15 to the internal housing 13. The outer casing 15 comprises a longitudinal rib 25 extending parallel to the longitudinal axis XX of the power tool 1. The longitudinal rib 25 extends inwardly along an inner surface of the front section 19, from the rear of the front section 19 towards the collar 21. The longitudinal rib 25 comprises a locking region 27 for locking a grease cap 29 in position, as described herein.

[0019] As shown in Figure 3, the internal housing 13 comprises an inlet port 31 for introducing lubricant, for example grease, into the internal housing 13 to lubricate the crank mechanism of the power tool 1. The inlet port 31 is located above the crank mechanism in the internal housing 13. The inlet port 31 has a circular shape, and comprises first and second circumferential protuberances 33 disposed on its outer edge for securing the cap 29 to the inlet port 31. As shown in Figure 3, the first and second protuberances 33 extend circumferentially on opposite sides of the inlet port 31. First and second diametrically opposed openings 34 are formed on the outer surface of the inlet port 31 between the protuberances 33. Furthermore, two stop members 36 are formed on an outer surface of the inlet port 31 to limit rotational movement of the cap 29. A circular seal 35 (for example a deformable O-ring) is disposed inside the inlet port 31, around the internal circumference of the inlet 31. When the cap 29 closes the inlet 31, the seal 35 is disposed between the inlet port 31 and the cap 29, for sealing the internal housing 13. The cap 29 is removably mounted to the inlet port 31 and can be removed to facilitate servicing, for example.

[0020] The cap 29 according to an embodiment of the present invention is shown in Figures 4 to 6. The cap 29 has a central axis AA and a transverse axis BB (represented in Figure 8 as extending perpendicular to the plane of the page) extending radially outwardly from the central axis AA. The cap 29 comprises a circular top por-

tion 37 and a stopper portion 39. The cap 29 also comprises two locking arms 41 extending downwardly from the top portion 37. Each locking arm 41 has an internal projection 42 projecting radially inwardly towards the central axis AA. When the cap 29 closes the inlet port 31, the projections 42 of each locking arm 41 engage an underside of the respective protuberance 33 to prevent the cap 29 being removed, as shown in Figure 7. The diameter of the circular top portion 37 is larger than the diameter of the inlet port 31 so as to cover the inlet 31 when the cap 29 is located in the inlet port 31.

[0021] The cap 29 comprises two finger tabs 43 to allow a user to rotate the cap 29 manually about the central axis AA. The cap 29 is moulded from a plastics material in the present embodiment, but other materials could be used. The finger tabs 43 extend upwardly from the top portion 37 of the cap 29. The finger tabs 43 are arranged in parallel planes and each extends parallel to the transverse axis BB of the cap 29. Specifically, the finger tabs 43 are offset to opposite sides of the transverse axis BB to form a locking channel 44 (shown in Figure 8) therebetween. The locking channel 44 has a longitudinal axis which extends diametrically across the top portion 37 coincident with the transverse axis BB. In alternate arrangements, the longitudinal axis of the locking channel 44 could be arranged parallel to and offset from the transverse axis BB.

[0022] The cap 29 is rotatable relative to the inlet port 31 between an unlocked position and a locked position. In the unlocked position, the locking arms 41 are aligned with the openings 34 so that the cap 29 can be removed from the inlet port 31. The cap 29 can be removed to open the inlet port 31, thereby enabling the user to inject grease into the crank mechanism of the power tool 1. In the locked position, the cap 29 is engaged in the inlet port 31, and the locking arms 41 are engaged with the protuberances 33 formed on the outside of the inlet port 31 to prevent the cap 29 being removed. The cap 29 is rotated into said locked position and the locking arms 41 abut against the stop members 36 to align the cap 29 such that the locking channel 44 extends parallel to the longitudinal axis XX of the power tool 1. In the locked position, the cap 29 is arranged such that the locking region 27 of the longitudinal rib 25 locates in the locking channel 44. The rotation of the cap 29 is thereby inhibited when the outer casing 15 is mounted to the internal housing 13. Thus, once the outer casing 15 is mounted in position, the cap 29 cannot rotate to its unlocked position. Moreover, the outer casing 15 cannot be mounted if the cap 29 is not in its locked position, thereby preventing assembly of the power tool 1 if the cap 29 is not properly located in the inlet port 31.

[0023] The operation of the grease cap 29 for a power tool 1 according to an embodiment of the present invention will now be described with reference to Figures 3 and 7 to 9. Initially, the grease cap 29 is in the unlocked position, as shown in Figure 3. The inlet port 31 is thereby open and the user can inject grease in the crank mech-

anism of the power tool 1. Once the user has injected the grease, the user locates the grease cap 29 in the inlet port 31. More precisely, the user disposes the stopper portion 39 into the inlet port 31. The locking arms 41 extend in the openings 34 between the protuberances 33, but do not engage the protuberances 33. Then, the grease cap 29 is rotated about the central axis AA out of the unlocked position into the locked position shown in Figures 7 to 9. The projections 42 of the locking arms 41 are now engaged with an underside of the respective protuberance 33. The cap 29 is rotated until the locking arms 41 abut the stop members 36. The finger tabs 43 are thereby oriented parallel to the longitudinal axis XX of the power tool 1. Then, the outer casing 15 is disposed on the upper portion 17 of the power tool 1 so that the locking portion 27 of the longitudinal rib 25 engages the locking channel 44 between the finger tabs 43, and so that the securing holes 23 of the outer casing 15 align with the holes (not shown) of the inner housing 13. The outer casing 15 is then mounted to the inner housing 13 by introducing bolts into the securing holes of the outer casing 15 and the corresponding holes of the inner housing 13. The outer casing 15 is thereby mounted to the inner housing 13 such that the longitudinal rib 25 is located within the locking channel 44 formed between the finger tabs 43 of the grease cap 29. The grease cap 29 is thereby fixed in its locked position such that the inlet port 31 is sealed.

[0024] It will be appreciated that various changes and modifications can be made to the grease cap described herein. For example, alternate locking mechanisms could be provided to secure the outer casing with the grease cap. For example, a locking channel could be formed in the outer casing for cooperating with one or more finger tabs provided on the top portion of the grease cap to inhibit rotation of the grease cap. Two parallel longitudinal ribs could be provided on the outer casing to define the locking channel for engaging the one or more finger tabs when the grease cap is in its locked position. The one or more ribs can be arranged in a single plane for locating in the locking channel. A further alternative locking mechanism would be to form a protrusion, such as a longitudinal rib, on the interior of the outer casing to locate in close proximity to a side of said one or more finger tabs to inhibit rotational movement of the grease cap. A still further alternative would be to form one or more recesses in said outer casing for receiving said one or more finger tabs to inhibit rotation of the grease cap.

[0025] A yet further alternative would be to profile a sidewall of the grease cap to cooperate with the outer casing to inhibit rotation of the grease cap. For example, one or more flats could be formed in the sidewall of the grease cap for cooperating with the outer casing.

Claims

1. A cap for closing an inlet port for introducing lubricant

into a power tool, the power tool having an outer casing, the cap comprising:

- a top portion,
 - a stopper portion, and
 - at least one engaging member configured to engage the inlet port when the cap is displaced to a locked position;
 - wherein the top portion comprises at least one protrusion for cooperating with the outer casing of the power tool to fix the cap in said locked position.
2. A cap as claimed in claim 1, wherein the cap is configured to be rotated to said locked position and the at least one protrusion is arranged to cooperate with the outer casing of the power tool to inhibit rotation of the cap.
 3. A cap as claimed in claim 1 or claim 2, wherein the at least one protrusion is arranged to cooperate with a locking member provided on an interior of the outer casing.
 4. A cap as claimed in any one of claims 1, 2 or 3, wherein the top portion comprises first and second protrusions arranged to form a channel for receiving a locking member provided on said outer casing.
 5. A cap as claimed in claim 4, wherein the first and second protrusions are arranged in parallel planes.
 6. A cap as claimed in any one of claims 1, 2 or 3, wherein the at least one protrusion is configured to locate in a locking channel defined in the outer casing to fix the cap in said locked position.
 7. A cap as claimed in anyone of the preceding claims, wherein said at least one engaging member is a locking arm extending from the top portion, the locking arm being arranged so as to abut against a stop member of the inlet port when the cap is in said locked position.
 8. A cap as claimed in claim 7, wherein the or each locking arm extends parallel to a central axis of the cap.
 9. A cap as claimed in anyone of the preceding claims, wherein the or each protrusion is a finger tab for allowing a user to rotate the cap manually about the central axis.
 10. A power tool comprising:
 - an inner housing having an inlet port for introducing lubricant;
 - a cap for closing the inlet port, the cap compris-

ing at least one engaging member configured to engage the inlet port when the cap is displaced to a locked position; and

an outer casing for mounting to the inner housing;

wherein the cap comprises at least one protrusion for cooperating with the outer casing of the power tool to fix the cap in said locked position.

11. A power tool as claimed in claim 10 comprising a longitudinal axis and wherein the locking member is a longitudinal rib extending parallel to the longitudinal axis.
12. A power tool as claimed in claim 10 or claim 11, wherein the inlet port is substantially circular and comprises at least one circumferential protuberance; and the cap comprising at least one locking arm for engaging said at least one circumferential protuberance when the cap is in said locked position.
13. A power tool as claimed in claim 12, wherein the inlet port comprises at least one stop member, the or each locking arm being arranged so as to abut against the or each stop member when the cap is in said locked position.
14. A power tool as claimed in any one of claims 10 to 13, wherein the cap is configured to be rotated into said locked position; and the at least one protrusion cooperates with the outer housing to inhibit rotation of said cap.
15. A casing for a power tool, the power tool having an inlet port for introducing lubricant and a cap for closing the inlet port, wherein the casing has at least one locking member for fixing the cap in a locked position to seal the inlet port.
16. A casing as claimed in claim 15, wherein the or each locking member is configured to inhibit rotation of the cap when the cap is in said locked position.
17. A casing as claimed in claim 15 or claim 16, comprising a longitudinal axis and wherein the or each locking member is a longitudinal rib extending parallel to the longitudinal axis.
18. A casing as claimed in any one of claims 15 to 17, wherein the or each locking member is configured to be received in a channel formed on a top portion of the cap when the cap is in said locked position.
19. A casing as claimed in any one of claims 15 to 17, comprising a locking channel configured to receive at least one protrusion formed on a top portion of the cap to fix the cap in said locked position.

20. A cap substantially as herein described with reference to the accompanying figures.
21. A power tool substantially as herein described with reference to the accompanying figures.
22. A casing substantially as herein described with reference to the accompanying figures.

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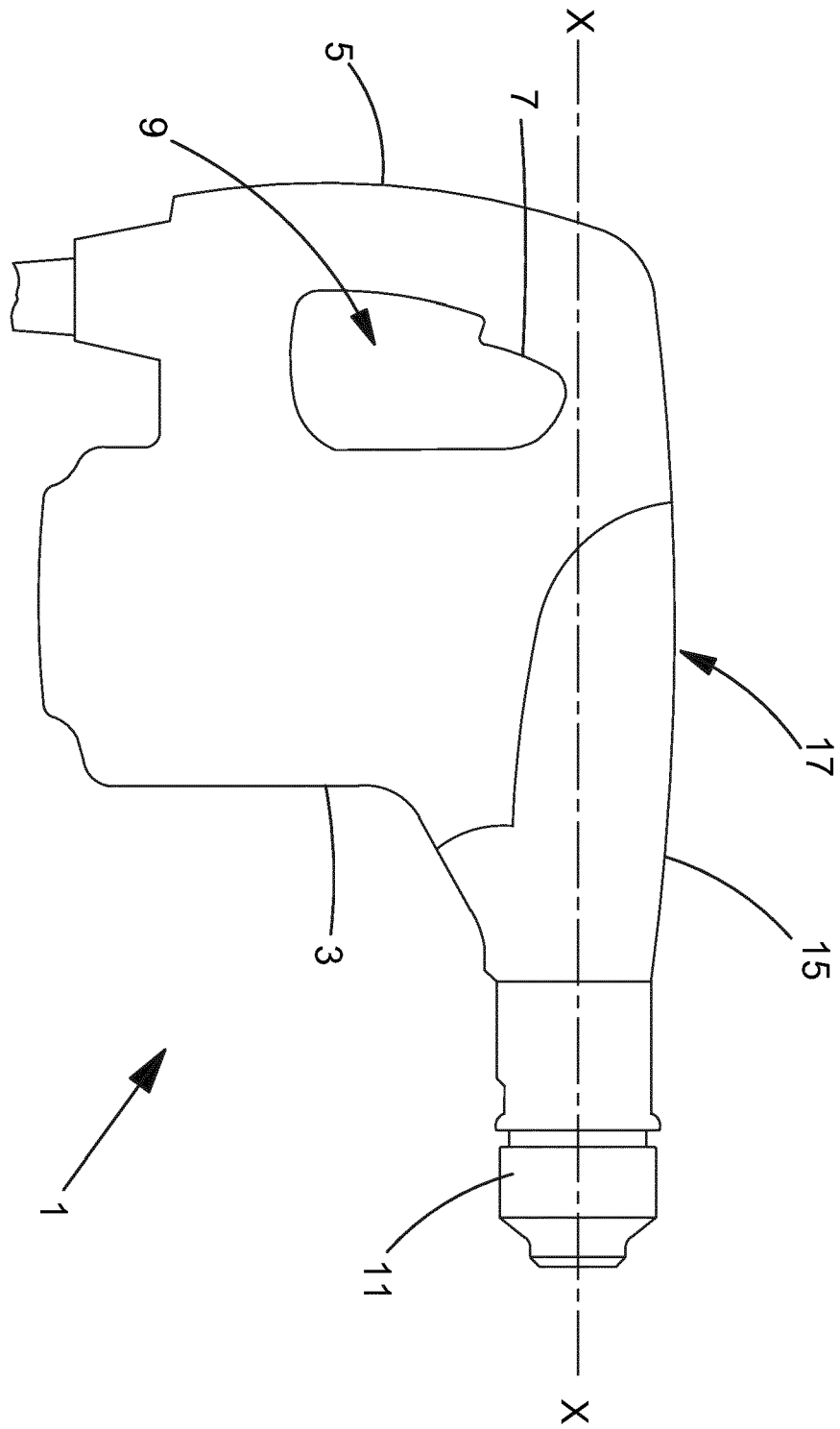
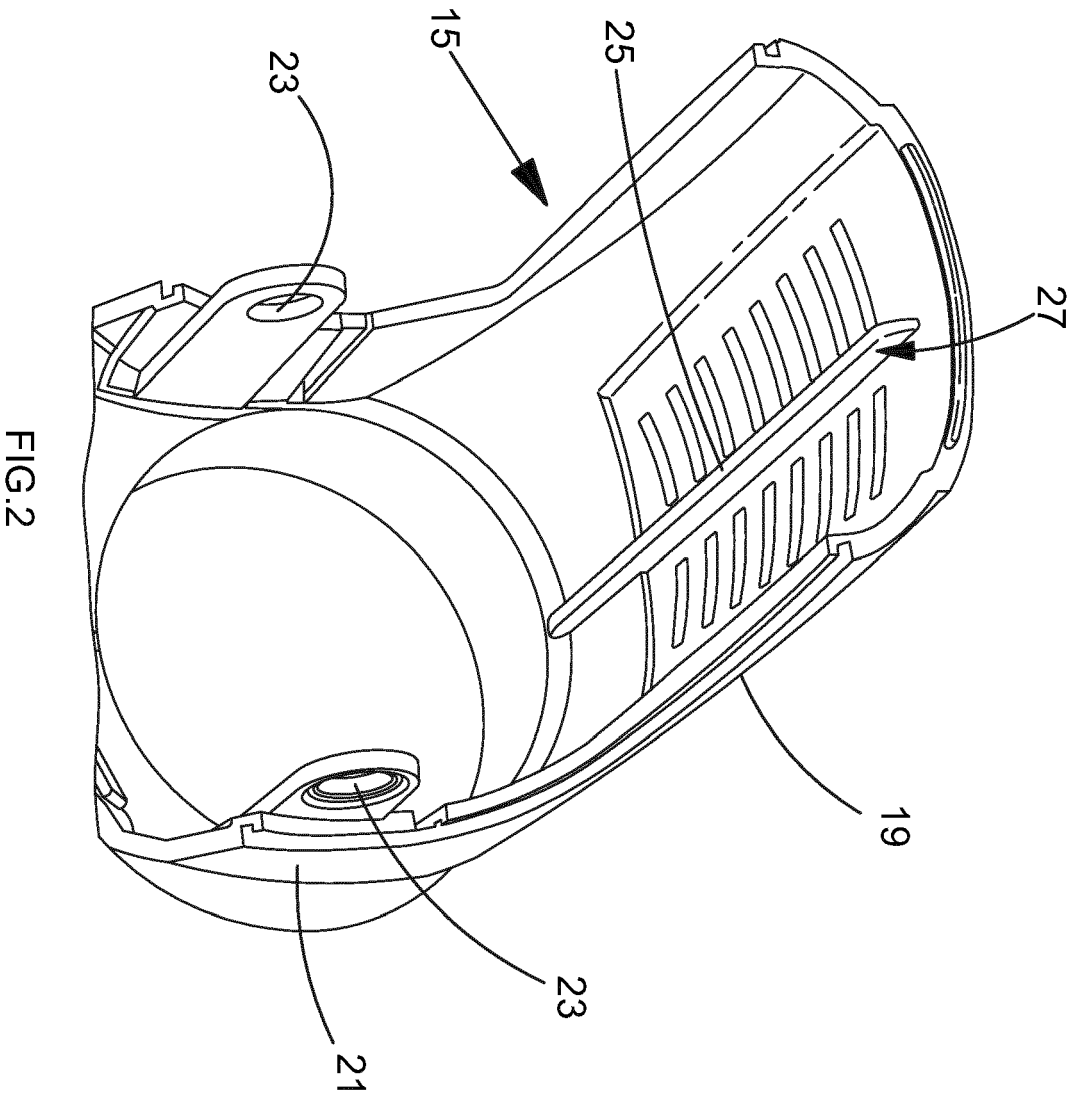
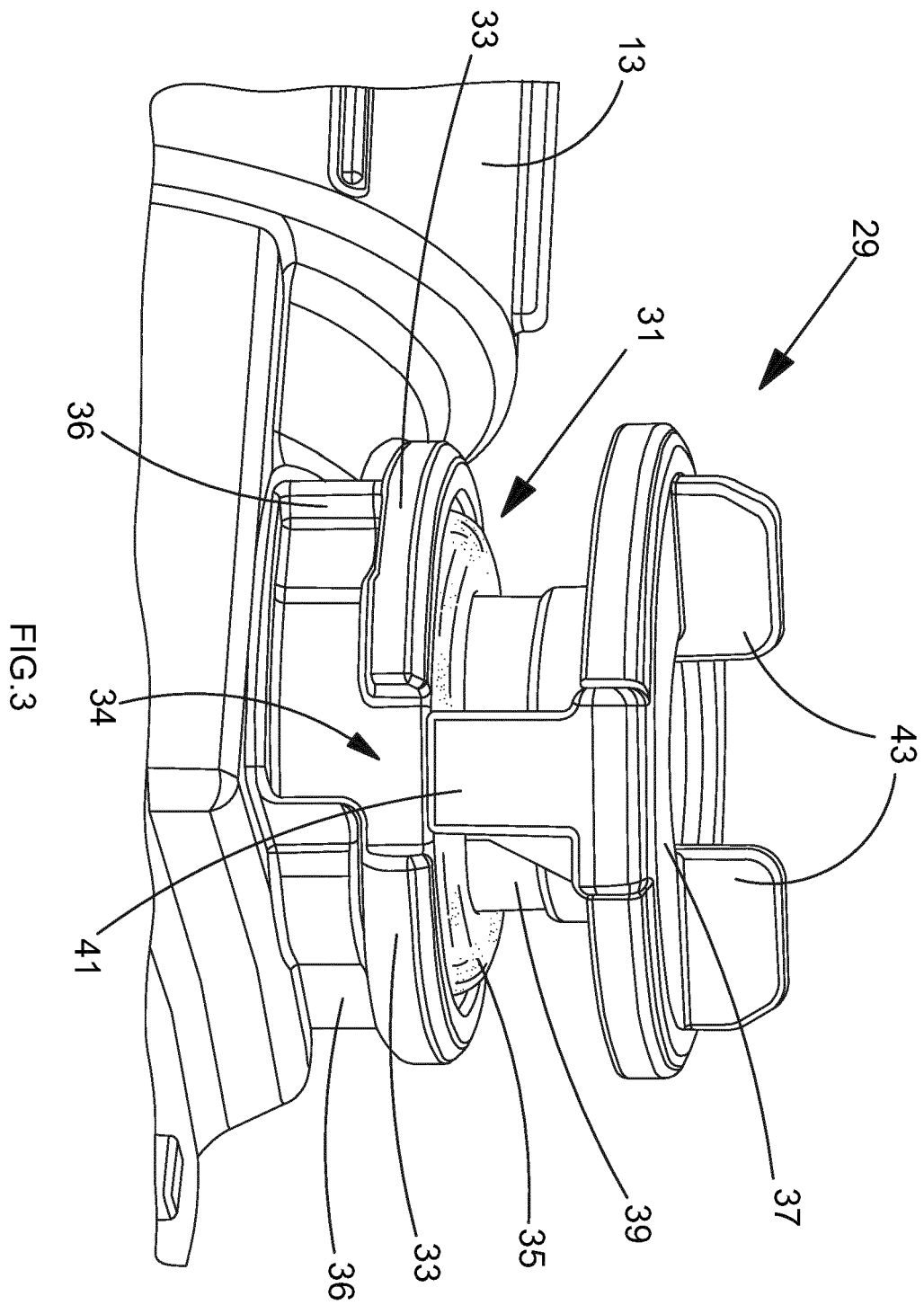
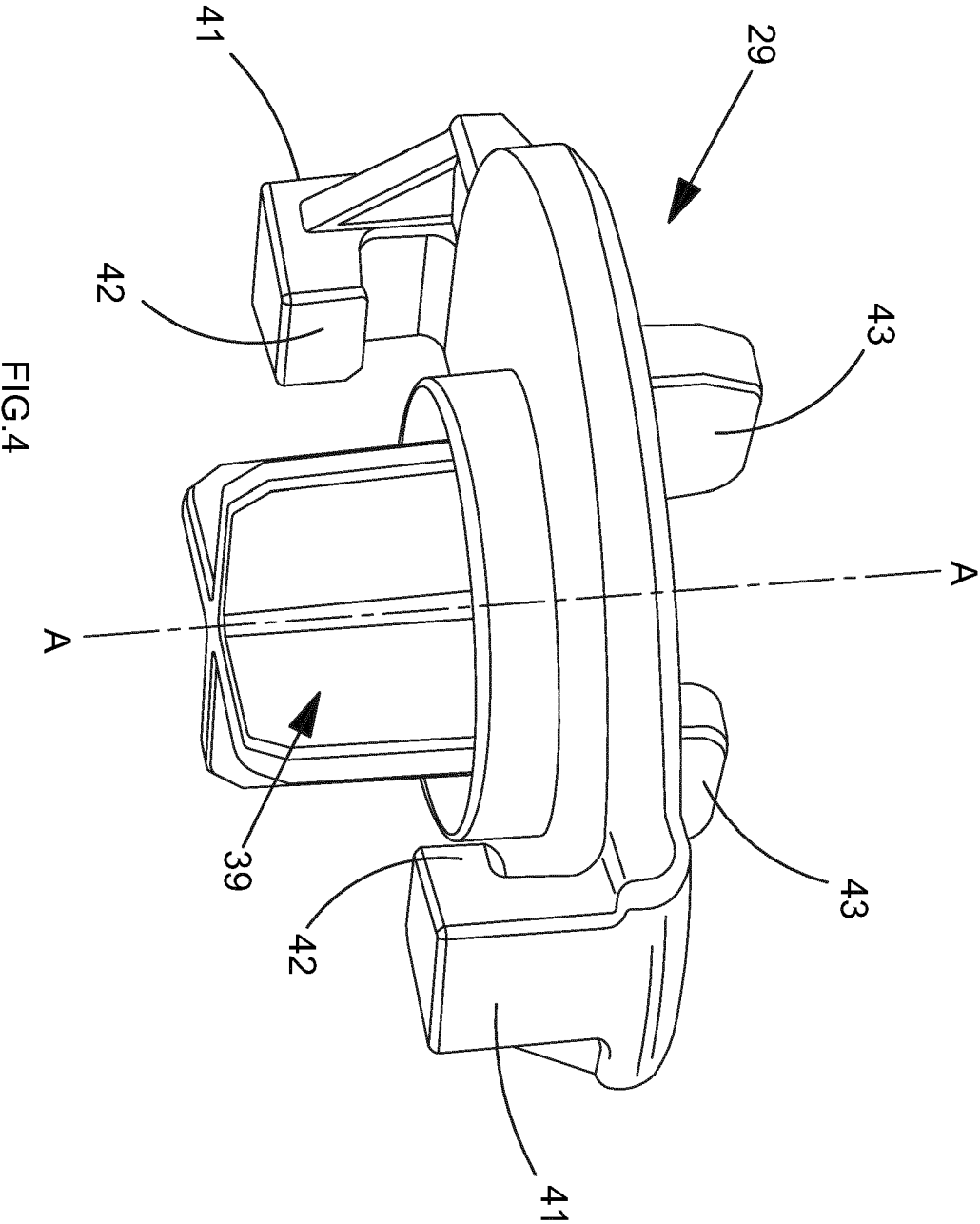
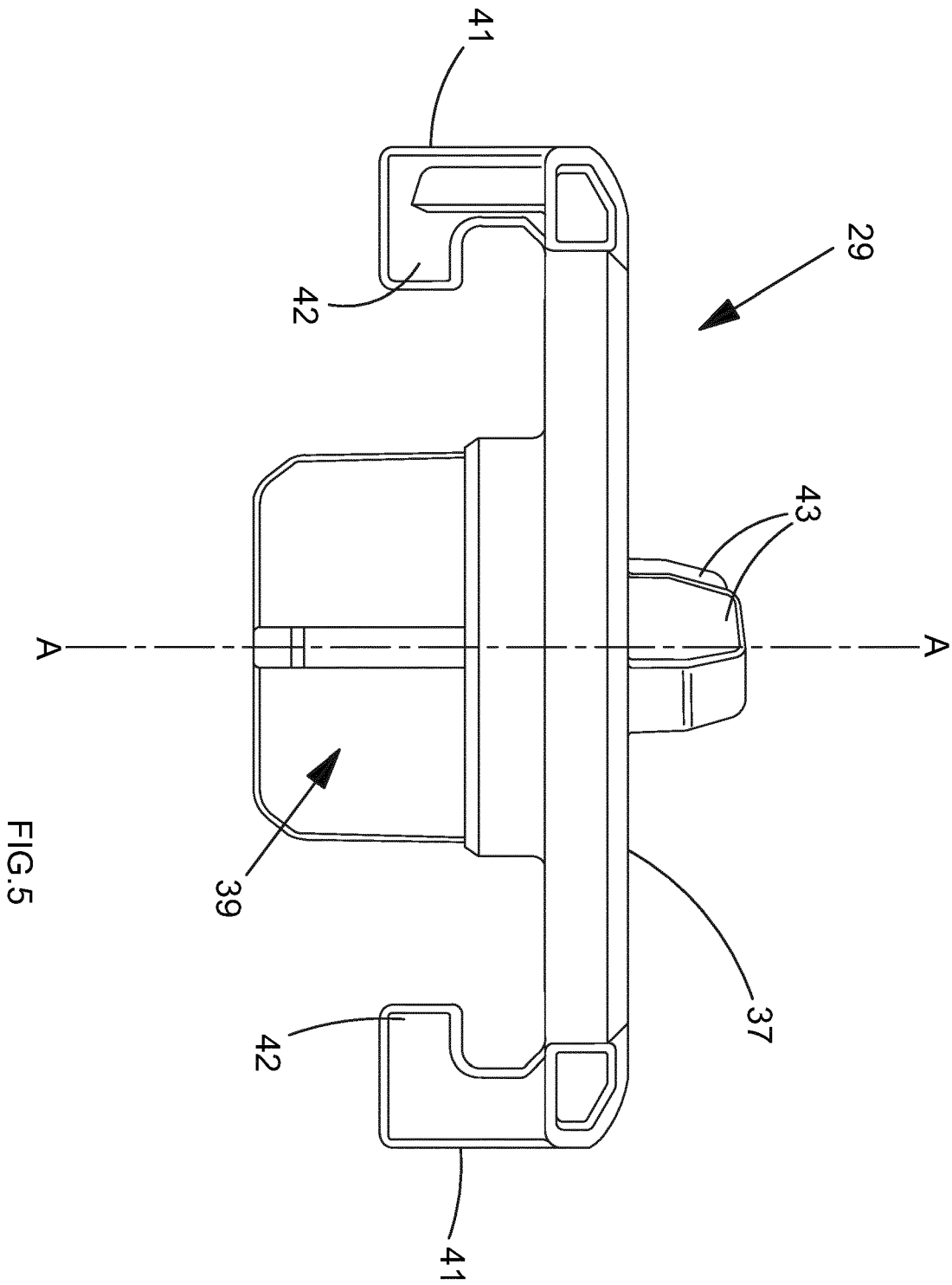


FIG.1









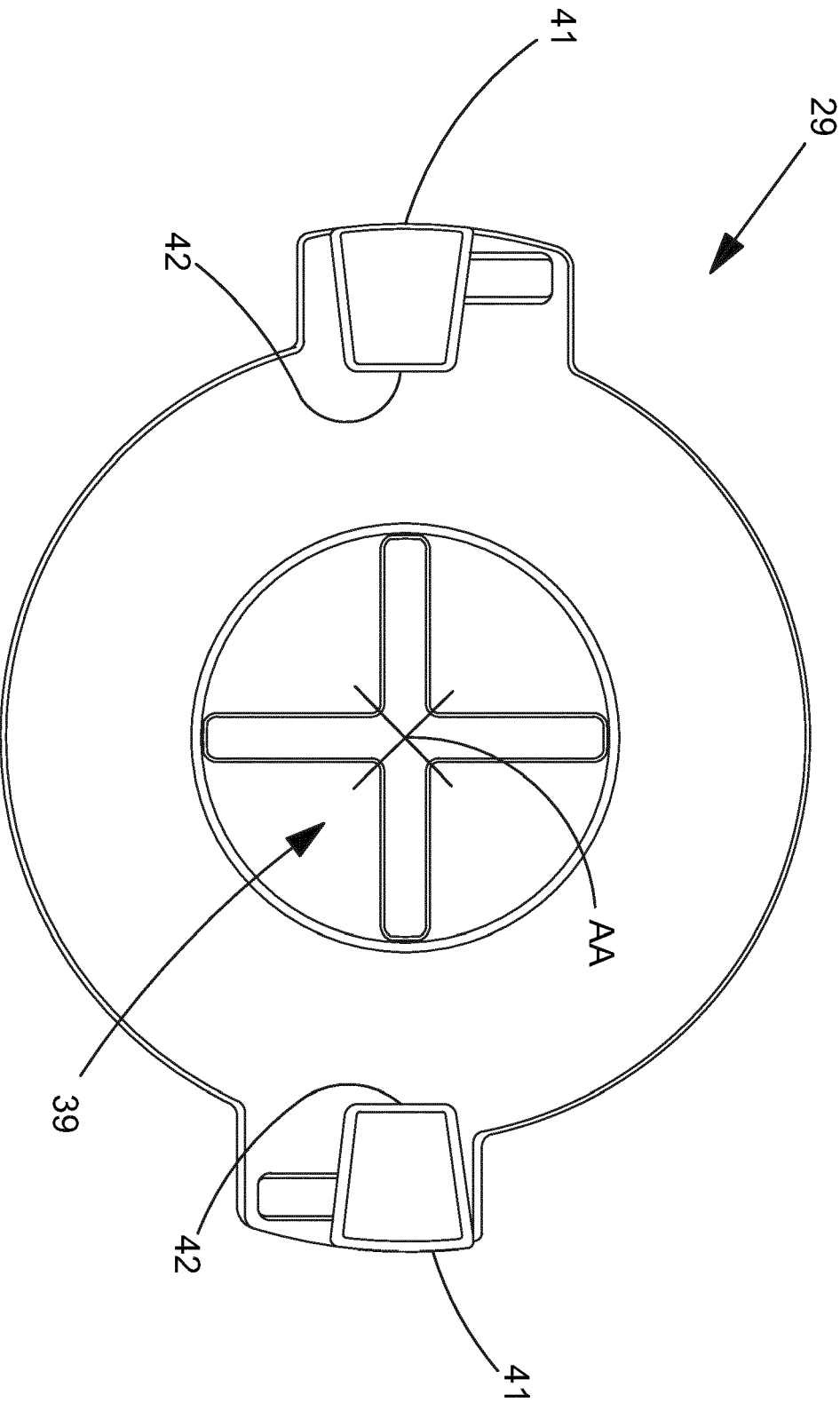


FIG. 6

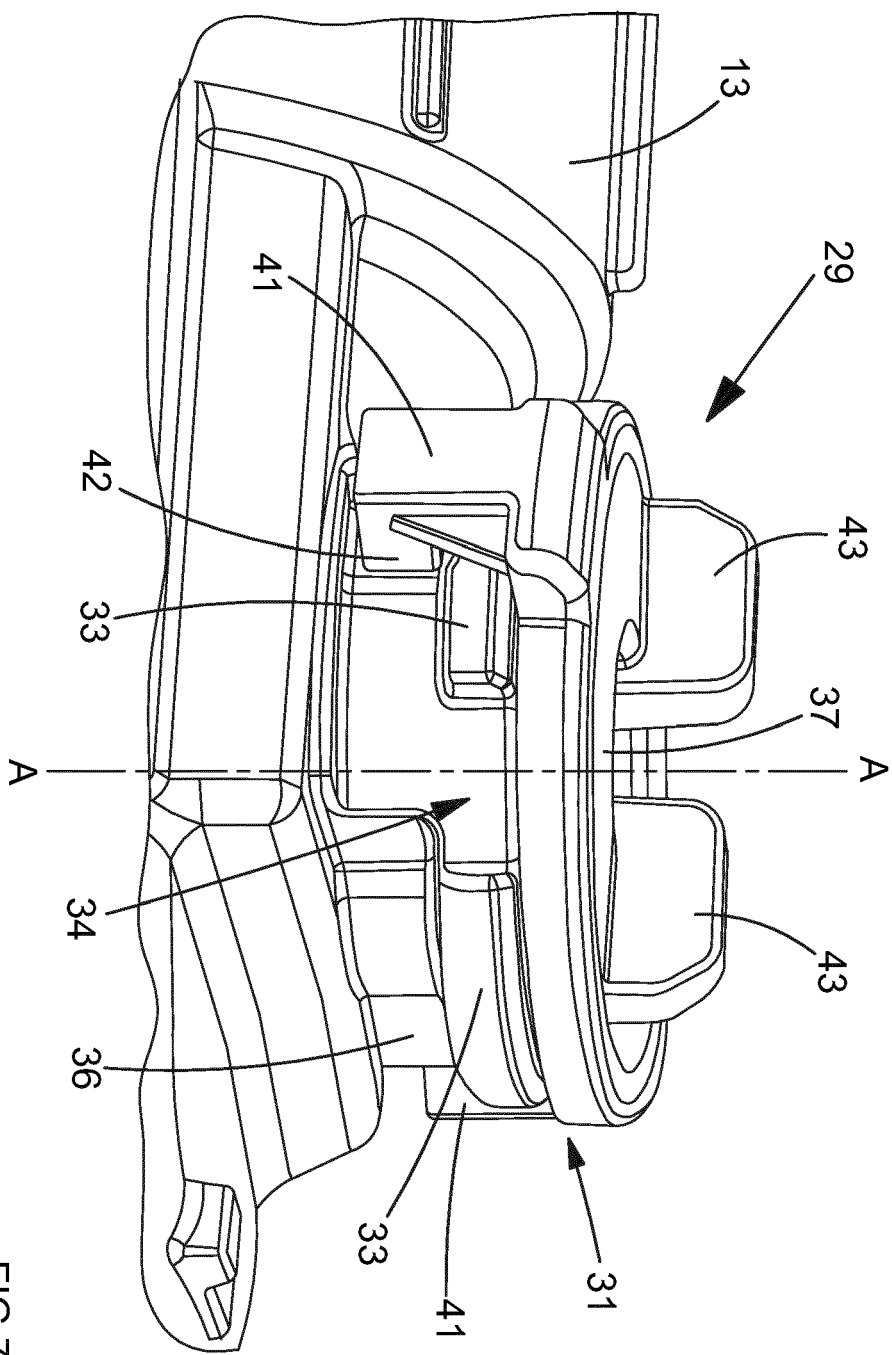


FIG. 7

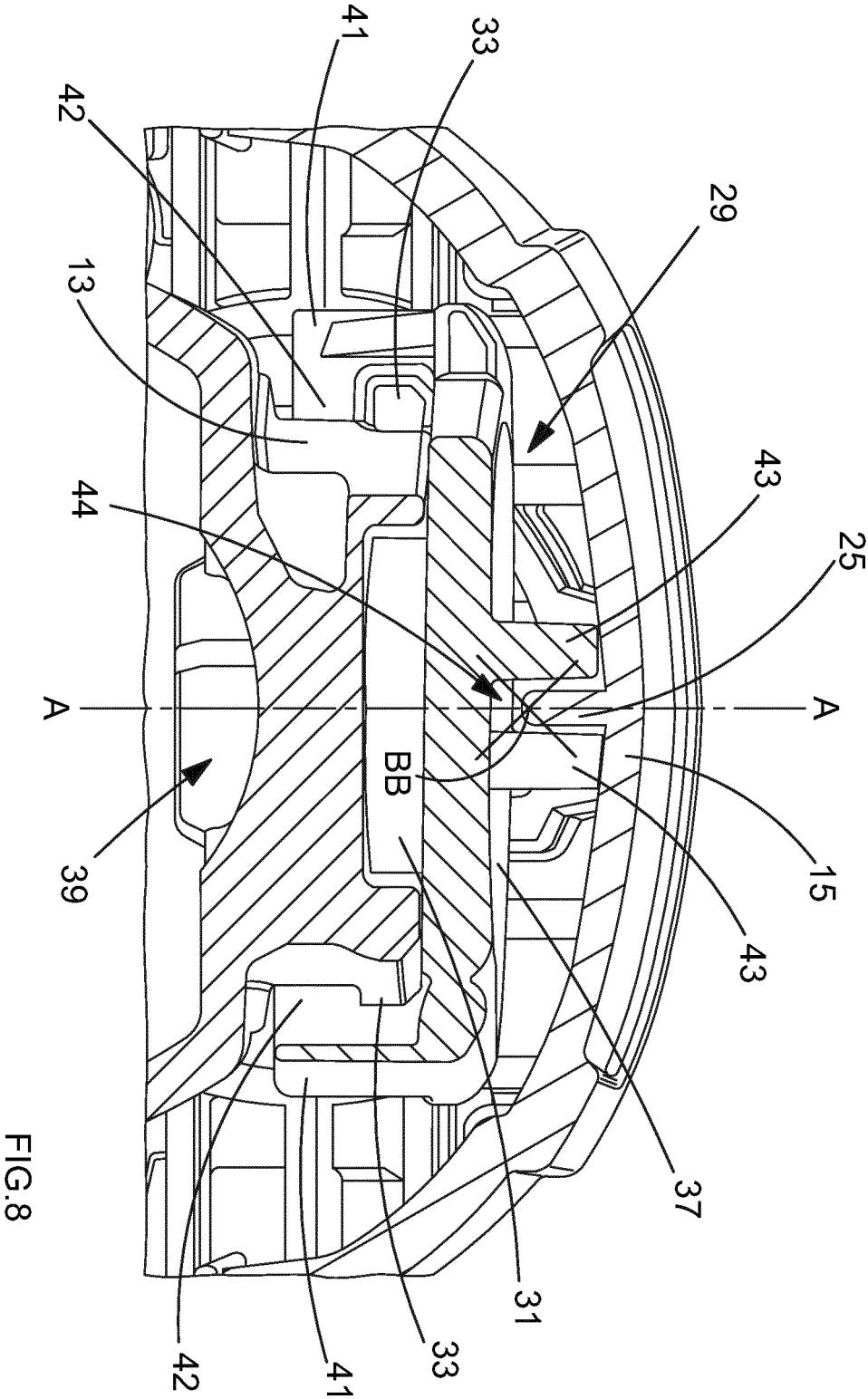


FIG. 8

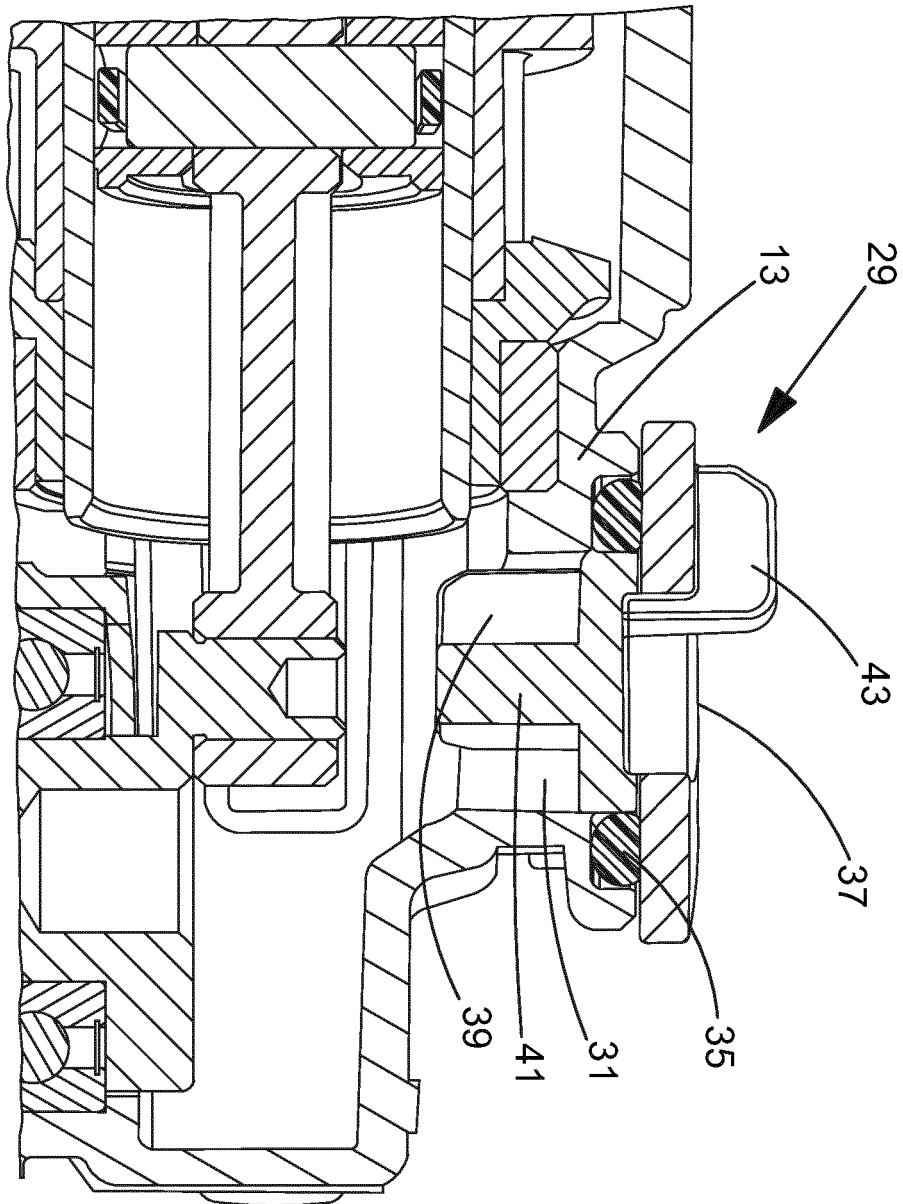


FIG.9



EUROPEAN SEARCH REPORT

Application Number
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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 2 433 755 A1 (MAKITA CORP [JP]) 28 March 2012 (2012-03-28) * paragraphs [0021] - [0025], [0041] - [0044]; figures *	1-22	INV. B25F5/02
X	EP 2 281 662 A2 (MAKITA CORP [JP]) 9 February 2011 (2011-02-09) * paragraphs [0023] - [0046]; figures *	10,11, 14-17, 20-22	
A	US 6 123 212 A (RUSSELL MARK N [US] ET AL) 26 September 2000 (2000-09-26) * columns 2-6; figures *	1-22	
A	EP 0 133 520 A2 (BERG JACOB KG [DE]) 27 February 1985 (1985-02-27) * abstract; figures *	1-22	
A	US 2 897 919 A (DELLNER RAYMOND P) 4 August 1959 (1959-08-04) * the whole document *	1-22	
			TECHNICAL FIELDS SEARCHED (IPC)
			B25F B27B B25D B65D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 May 2015	Examiner David, Radu
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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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26-05-2015

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 2433755	A1	28-03-2012	CN	102458776 A		16-05-2012
			EP	2433755 A1		28-03-2012
			JP	5486214 B2		07-05-2014
			JP	2010269394 A		02-12-2010
			RU	2011151828 A		27-06-2013
			US	2012061393 A1		15-03-2012
			WO	2010134394 A1		25-11-2010

EP 2281662	A2	09-02-2011	CN	101992455 A		30-03-2011
			EP	2281662 A2		09-02-2011
			JP	5560004 B2		23-07-2014
			JP	2011031363 A		17-02-2011
			RU	2010132848 A		10-02-2012
			US	2011030983 A1		10-02-2011

US 6123212	A	26-09-2000	AR	040619 A1		13-04-2005
			AU	761701 B2		05-06-2003
			AU	7883500 A		26-03-2001
			BR	0012967 A		30-04-2002
			CA	2379574 A1		08-03-2001
			CN	1367751 A		04-09-2002
			CO	5280106 A1		30-05-2003
			DE	60021731 D1		08-09-2005
			DE	60021731 T2		20-04-2006
			EP	1206396 A1		22-05-2002
			ES	2246899 T3		01-03-2006
			GC	0000139 A		29-06-2005
			HU	0202455 A2		28-11-2002
			JP	4017393 B2		05-12-2007
			JP	2003508310 A		04-03-2003
			MX	PA02001135 A		31-10-2002
			PL	353353 A1		17-11-2003
			TW	585821 B		01-05-2004
			US	6123212 A		26-09-2000
			WO	0115988 A1		08-03-2001
			ZA	200200277 A		25-06-2003

EP 0133520	A2	27-02-1985	DE	3328953 A1		21-02-1985
			EP	0133520 A2		27-02-1985
			JP	S60110652 A		17-06-1985
			US	4533062 A		06-08-1985

US 2897919	A	04-08-1959	NONE			

EPO FORM P0459

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