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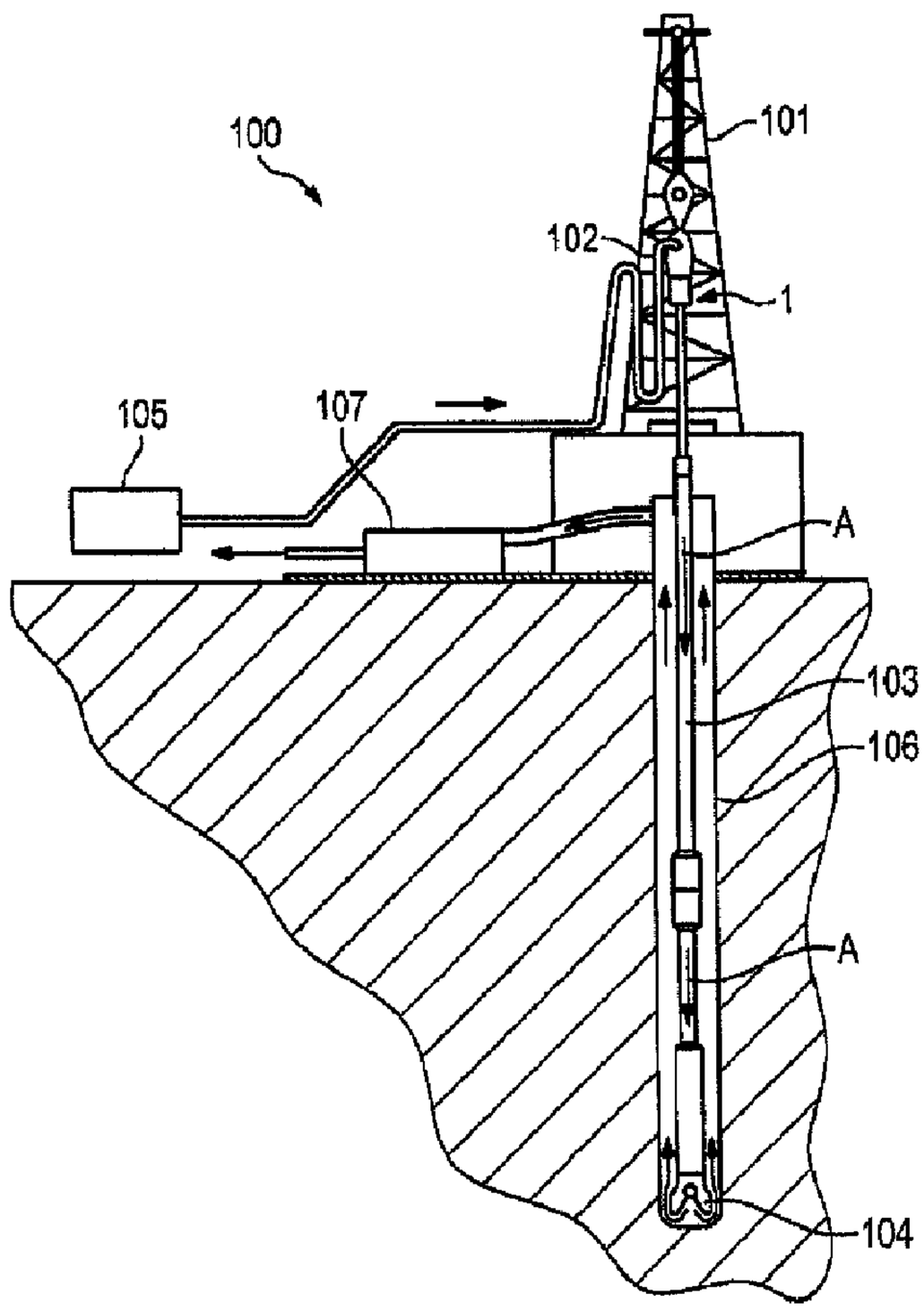
(54) **Titre : DISPOSITIF DE LESSIVAGE DE TREPAN DOTE D'UNE INSERTION D'ECHANGE PRE INSTALLEE**
(54) **Title: DRILL WASH DEVICE WITH PRE-MOUNTED EXCHANGE INSERT**



(57) **Abrégé/Abstract:**
The present invention relates to a drill wash device (100), the drill wash device comprising a stationary washpipe (102), a rotating washpipe (103), a pre-mounted, replaceable exchange insert (1) for connecting the stationary washpipe (102) to the rotating

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(57) **Abrégé(suite)/Abstract(continued):**
washpipe (103), the exchange insert (1) comprising a mechanical seal assembly with a stationary seal ring (20) and a rotating seal ring (21), and a first adapter (108) which is arranged between the stationary washpipe (102) and the exchange insert (1), wherein the first adapter (108) comprises a first adjusting mechanism (116) operative in axial direction for changing an axial length of the first adapter (108), and wherein the exchange insert (1) comprises a second adjusting mechanism (6) operative in axial direction for changing an axial length of the exchange insert (1).

Abstract

The present invention relates to a drill wash device (100), the drill wash device comprising a stationary washpipe (102), a rotating washpipe (103), a pre-mounted, replaceable exchange insert (1) for connecting the stationary washpipe (102) to the rotating washpipe (103), the exchange insert (1) comprising a mechanical seal assembly with a stationary seal ring (20) and a rotating seal ring (21), and a first adapter (108) which is arranged between the stationary washpipe (102) and the exchange insert (1), wherein the first adapter (108) comprises a first adjusting mechanism (116) operative in axial direction for changing an axial length of the first adapter (108), and wherein the exchange insert (1) comprises a second adjusting mechanism (6) operative in axial direction for changing an axial length of the exchange insert (1).

(Fig. 1)

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Drill wash device with pre-mounted exchange insert

Description

The present invention relates to a drill wash device with a pre-mounted exchange insert for connecting a stationary, non-rotating washpipe to a rotating washpipe which is inserted into a drill hole.

For drillings in the earth's crust, particularly for raw materials, so-called washpipe assemblies are used, in which a drill head is arranged at the end of a rotating pipe. A washing or flushing liquid is guided through the pipe from above downwards into the drill hole, the liquid then exiting at the drill head and being returned along the outer circumference of the rotating pipe to the earth's surface. A problematic issue in such drill hole arrangements is a sealing between a stationary washpipe and the rotating washpipe. To prevent any leaks at this sealing between stationary and rotating washpipe particularly under environmental aspects, conservative solutions are used as much as possible. A sealing solution is e.g. a series connection of a plurality of stationary seals, for instance stuffing-box seals or lip seals. In case of failure of one of said stationary seals the subsequent stationary seal will then ensure the sealing function. Due to the great loads arising during drilling the service life of the individual stationary seals is however very short. It is thus necessary to replace the stationary seals after a short period of time. This, however, leads to a standstill of the drilling rig and thus to considerable costs. Since the stationary seals have to be put individually over the pipe parts, the exchange efforts are also very great. Furthermore, EP 1 630 347 B1 discloses a sealing between a rotating and a stationary pipe which uses a mechanical seal. In principle, mechanical seals have the advantage of a longer service life as long as damage to the sliding surfaces can be avoided. To keep the sliding surfaces of said mechanical seal always in contact with one another, if possible, a spring element is provided that during operation applies a constant preload in axial direction to the seal rings. Due to the great loads arising during drilling the mechanical seal must however also be replaced after some time. To this end a nut-screw assembly is then provided for compressing the spring elements in axial direction so as to terminate the preload on the seal rings. It is only then that an exchange of the seal rings is possible. This exchange process is complicated and time-consuming. Furthermore, the seal rings

are removed or mounted again individually, so that there is the risk of damage to the sliding surfaces during mounting. Here, particular attention must be paid that the sealing between rotating and stationary washpipe is arranged in a bell of a drilling tower at a height of several meters and that particularly external influences, such as weather and temperature, cannot have a negative impact on the exchange operation because drilling is performed especially at more and more inhospitable places, e.g. on the high seas and in cold regions of the earth. That is why the exchange must be carried out with utmost care despite possibly very adverse external circumstances so as to avoid damage to the sliding surfaces. This also leads to a long and complicated exchange process.

Furthermore, US 4,557,489 discloses a sealing with seal rings which is pressure-compensated. For this purpose bores are either provided in the seal rings in radial direction, the bores ensuring pressure compensation relative to the outer circumference of the seal rings, or bores are provided in seal ring holders and lead to the outer circumference of the seal rings to provide pressure compensation. In case of damage to the seal, the seal rings must be replaced separately.

It is therefore the object of the present invention to provide a drill wash device with a rotating and a stationary washpipe which while being of a simple and inexpensive construction particularly permits a fast seal-ring exchange.

This object is achieved with a drill wash device comprising the features of claim 1. The sub-claims show preferred developments of the invention.

The drill wash device according to the invention has the advantage that a seal ring exchange can be performed very rapidly and easily. According to the invention a pre-mounted, replaceable exchange insert is provided for connecting a stationary washpipe to a rotating washpipe, the pre-mounted exchange insert comprising a mechanical seal assembly with a stationary seal ring and a rotating seal ring. A first adapter is provided which is arranged between the stationary washpipe and the pre-mounted exchange insert. The first adapter is fixed to the stationary washpipe and comprises a first adjusting mechanism operative in axial direction. The pre-mounted exchange insert itself

comprises a second adjusting mechanism operative in axial direction for changing an axial length of the exchange insert. Hence, two separate adjusting mechanisms are provided according to the invention, with one of the two adjusting mechanisms being arranged on the stationary washpipe and the other one of the two adjusting mechanisms being integrated into the pre-mounted exchange insert. It is thereby possible to first extend the first adjusting mechanism on the first adapter after insertion of the pre-mounted exchange insert into a region between the stationary and the rotating washpipe, so that the exchange insert is firmly fixed to the first adapter, and then to activate the second adjusting mechanism, so that the pre-mounted exchange insert is connected to the rotating washpipe. Hence, although two adjusting mechanisms have to be provided according to the invention, these can be operated rapidly and easily one after the other, so that a fast exchange of the pre-mounted exchange insert is possible. Moreover, since mechanical seals are used in the pre-mounted exchange insert, a very long service life of the exchange insert can be achieved in comparison with series-connected stuffing boxes. Moreover, the pre-mounted exchange insert can be pre-mounted in a workshop, or the like, so that all secondary sealing elements and possibly existing spring elements can also be replaced. This also leads to a longer service life of the exchange insert.

Preferably, the first adjusting mechanism comprises a first screw connection with an outer ring and an inner ring between which a thread is formed. The axial length between the first adapter and the pre-mounted exchange insert can thereby be adapted by relative rotation of the outer ring with respect to the inner ring of the first adapter.

The outer ring of the first screw connection preferably comprises first tool recesses on an outer circumferential surface which is configured to receive a tool for rotating the outer ring relative to the inner ring. The recesses are preferably bores.

Further preferably, the second adjusting mechanism comprises a second screw connection with an external sleeve with an internal thread, and an internal sleeve with an external thread. Hence, a threaded connection which can be extended by relative rotation between external sleeve and internal sleeve in axial direction is here also

provided between the external sleeve and the internal sleeve. The pitches of the first and second screw connection are here preferably identical, but may also be different.

Further preferably, an axial length of the internal sleeve is greater than an axial length of the external sleeve. Hence, the internal sleeve always protrudes beyond the external sleeve by a predetermined length.

Further preferably, on a portion which is not covered by the external sleeve the internal sleeve is provided on its outer circumference with second tool recesses for receiving a tool for rotating the internal sleeve relative to the external sleeve. The second tool recesses are also preferably bores. Particularly preferably, the second tool recesses have the same geometrical dimensions as the first tool recesses. As a consequence, a mechanic can adjust both the first adjusting mechanism on the first adapter and the second adjusting mechanism on the exchange insert with the same tool.

To enable a torque transmission from the rotating washpipe to the exchange insert, the exchange insert comprises a projection protruding in axial direction of the washpipe, preferably at an end directed towards the rotating washpipe.

Further preferably, the exchange insert further comprises an aligning ring which aligns the protruding projection on the exchange insert for torque transmission from the rotating washpipe in circumferential direction. A reliable mounting and form-fit connection between the projection of the exchange insert and the rotating washpipe can thereby be achieved.

According to a further preferred configuration of the present invention the drill wash device further comprises a second adapter between the rotating washpipe and the exchange insert. Especially the mounting on the rotating washpipe can thereby be simplified significantly.

To even further simplify a mounting operation, a mounting aid is preferably provided which is arranged on the stationary washpipe. The mounting aid supports assembly and

disassembly of the pre-mounted exchange insert in the area between the stationary and the rotating washpipe.

The mounting aid preferably comprises a first and a second guide arm which are arranged on the first adapter. The two guide arms are provided preferably in parallel with each other and further preferably comprise supporting surfaces for supporting the pre-mounted exchange insert. Further preferably, the pre-mounted exchange insert comprises a circumferential groove for a form-fit engagement with the guide arms.

Further preferably, the second adjusting mechanism of the exchange insert comprises an anti-rotation device. The anti-rotation device is preferably a threaded bolt, or the like. The anti-rotation device thereby ensures that a relative position between the external sleeve and the internal sleeve is reliably held during operation. In other words, after adjustment of the axial length of the exchange insert, which is carried out by rotation between external sleeve and internal sleeve, the position is secured by the anti-rotation device. Prior to disassembly the anti-rotation device must of course be released, so that a rotation between external sleeve and internal sleeve is possible again to permit a shortening of the axial length of the exchange insert.

The anti-rotation device is particularly preferably a threaded bolt with a spring-biased locking element, particularly a spring-biased ball, which is arranged on the tip of the threaded bolt. At a start position in which the exchange insert is not axially extended yet, the locking element engages into a first recess on the external sleeve. This defines a basic position of the pre-mounted exchange insert. During preassembly a mechanic can thus easily discern when the pre-mounted position has been reached. Furthermore, a second recess is provided on the external sleeve, in which the locking element locks in place when the exchange insert has reached the axially extended end state, i.e. the end assembly state, during assembly. Hence, there is also an indicator indicating a correct position for the achievement of the end position of the exchange insert in the mounted state. These measures considerably facilitate the assembly which, as has been mentioned, must be carried out partly under extremely difficult conditions because of external influences. Due to the spring-biased locking element, the locking in place during

assembly and the locking out of place during disassembly take place automatically owing to the rotating operation between external sleeve and internal sleeve of the screw connection.

The anti-rotation device is preferably arranged on an arm connected to the internal sleeve, the external sleeve being arranged between the arm and the internal sleeve.

Further preferably, the rotating and the stationary seal ring are each provided with a bandage. The seal rings can thereby withstand high pressure loads.

To avoid damage to the pre-mounted exchange insert during assembly or during transportation of the exchange insert, the exchange insert preferably comprises a transportation lock. The transportation lock comprises at least one spring element to exert a bias or preload on the mechanical seal assembly prior to a final assembly of the exchange insert. The preload is here exerted on the seal rings such that the sliding surfaces of the seal rings reliably abut on one another so as to avoid damage to the sliding surfaces. The transportation lock is here arranged between a connection component to the stationary washpipe and a first seal ring carrier for holding the stationary seal ring. The transportation lock is further configured such that in the end-mounted state of the exchange insert no preload is exerted on the mechanical seal during operation. This is e.g. achieved by providing spring elements which no longer exert a preload in the mounted state of the exchange insert, in which an axial length of the exchange insert has been increased by the second adjusting mechanism. The spring elements can e.g. have a correspondingly short length so that in the end-mounted, axially extended state of the exchange insert no preload is exerted on the seal rings. Thanks to the dead weight of the seal ring and the weight of the first seal ring carrier the stationary seal ring nevertheless reliably lies on the rotating seal ring.

To avoid a situation where the pressure on the seal rings during operation gets excessively strong, the rotating and the stationary seal ring are preferably provided with a respective bevel on the inner circumference. The bevel extends preferably from an

inner circumference of the seal rings up to half a seal ring width. Particularly preferably, the bevels are equally provided on both seal rings.

A preferred embodiment of the invention shall be described hereinafter in detail with reference to the accompanying drawing, in which:

Fig. 1 is a schematic illustration of a drill wash device according to the invention with a pre-mounted exchange insert,

Fig. 2 is a schematic, perspective illustration of an exchange operation of the exchange insert,

Fig. 3 is a schematic partial sectional view of the exchange insert during a first mounting step in which the exchange insert is slid into the drill wash device;

Fig. 4 is a schematic partial sectional view of the exchange insert in which the exchange insert is connected to a stationary washpipe,

Fig. 5 is a schematic partial sectional view of the exchange insert while being connected to a rotating washpipe,

Fig. 6 is a schematic perspective view of an adjusting ring for aligning the exchange insert with respect to the rotating washpipe,

Fig. 7 is a schematic partial sectional view of the exchange insert in the mounted state, and

Fig. 8 is a schematic sectional view of the exchange insert in the mounted state, the stationary and the rotating washpipe being not shown for the sake of clarity.

A drill wash device 100 according to a preferred embodiment of the invention will now be described in detail with reference to Figs. 1 to 8.

As can be seen in Fig. 1, a pre-mounted exchange insert 1 is used in the drill wash device 100. The drill wash device 100 comprises a drilling tower 101 and is configured to introduce a flushing or washing medium from above into a drill hole 106 (arrow A). The drill wash device 100 comprises a stationary washpipe 102 and a rotating washpipe 103 having a free end on which a drill head 104 is arranged. A washing medium is introduced by means of a pump 105 via the stationary washpipe 102 into the rotating washpipe 103 and exits on the drill head 104. The washing medium then flows on the outer circumference of the rotating washpipe 103 back to the surface into a separating device 107. In the separating device 107, rocks, or the like, that have been washed out of the drill hole 106 are separated from the washing medium which can then be recirculated.

According to the invention a drill wash device 100 with pre-mounted exchange insert 1 is provided, which can be exchanged completely. This is schematically indicated in Fig. 2 by the double-headed arrow B. The pre-mounted exchange insert is here mounted in a space 112 between the stationary washpipe 102 and the rotating washpipe 103. A first adapter 108 is provided at the free end of the stationary washpipe 102, and a second adapter 109 is provided at the opposite free end of the rotating washpipe 103. Furthermore, the first adapter 108 has formed thereon first and second guide arms 110, 111 which allow an easy insertion of the pre-mounted exchange insert 1. To this end two guide elements 10, 11 are provided on the exchange insert 1 on a connection component 5. The guide elements 10, 11 are here lying with their bottom side on the rail-like guide arms 110, 111, so that the weight of the exchange insert 1 after the latter has been slid onto the guide arms 110, 111 is carried by said arms, and the mounting operation is facilitated. The connection component 5 further comprises a circumferential groove 50 for engagement with the guide arms 110, 111.

As is particularly apparent from Figs. 3 and 8, the pre-mounted exchange insert 1 according to the invention comprises a mechanical seal assembly 2 with a stationary

seal ring 20 and a rotating seal ring 26. A sealing gap 26 is formed between the two seal rings. The stationary seal ring 20 is enclosed by a first bandage 22 and the rotating seal ring 21 is enclosed by a second bandage 23.

Furthermore, a first bevel 24 is provided on the stationary seal ring 20 on the inner circumferential side thereof, and a second bevel 25 is provided on the rotating seal ring 21 in mirror-inverted fashion with respect to the sealing gap. The two bevels 24, 25 extend in radial direction of the exchange insert.

The first adapter 108 of the drill wash device 100 comprises a first adjusting mechanism 116 which is operative in axial direction. The first adjusting mechanism 116 comprises a first screw connection 117 with an outer ring 118 and an inner ring 128 between which a thread 129 is provided. Hence, an axial length of the first adapter 108 can be increased or decreased by way of a relative rotation between the outer ring 118 and the inner ring 119.

The exchange insert 1 further comprises a first seal ring carrier 3 which holds the stationary seal ring 20, and a second seal ring carrier 4 which holds the rotating seal ring 21. The first seal ring carrier 3 is configured in two parts, consisting of a first carrier part 31 and a second carrier part 32. Furthermore, a shoulder 33 is provided on the inner circumference of the first seal ring carrier 3.

The second seal ring carrier 4 is also configured in two parts comprising a first carrier part 41 and a second carrier part, which is an adjusting ring 42, and further comprises a plurality of projections 43 extending in axial direction X-X of the exchange insert 1. The projections 43 serve to transmit a torque from the driven rotating washpipe 103 via the second adapter 109 and the second seal ring carrier 4 to the rotating seal ring 21.

Furthermore, the pre-mounted exchange insert 1 comprises a second adjusting mechanism 6 with a second screw connection 60. The second adjusting mechanism 6 comprises an external sleeve 61 with an internal thread 63 and an internal sleeve 62 with an external thread 64. The internal thread 63 and the external thread 64 engage

one another and upon a relative rotation between the external sleeve 61 and the internal sleeve 62 the pre-mounted exchange insert is elongated in axial direction X-X of the second adjusting mechanism 6. Fig. 2 shows a start length L1 of the pre-mounted exchange insert 1 in axial direction. Fig. 8 shows the fully extended axial length L2 which is longer by a length L3 than the start length L1.

The internal sleeve 62 covers the mechanical seal 2 in radial direction and it provides a guide surface 66 for the rotating seal ring 21 on a radial outside of the bandage 23. Furthermore, the internal sleeve 62 also holds the second seal ring carrier 4 via the adjusting ring 42 of the second seal ring carrier 4.

Furthermore, the exchange insert 1 according to the invention comprises a plurality of spring elements 7 which are arranged between the connection component 5 for a connection to the stationary washpipe 102 and the first seal ring carrier 3. Each spring element 7 is arranged around a pin 70 for guiding and positioning the spring elements. The spring elements 7 are arranged in pockets 51 in the connection component 5.

The spring elements 7 ensure that in the state in which the exchange insert is not end-mounted (Figs. 2, 3 and 4) a force F is exerted via the first seal ring carrier 3 on the stationary seal ring 20, so that the stationary seal ring 20 reliably abuts on the rotating seal ring 21 and the sliding surfaces touch each other (cf. Fig. 4). In the end-mounted state which is shown in Figs. 7 and 8, the spring elements 7 do however not exert any spring force on the mechanical seal 2. This is e.g. achieved by way of a corresponding design of a length of the springs 7, so that in the end-mounted state of the exchange insert 1 in the drill wash device 100 a spring distance 71 exists between an end of the spring elements 7 and the connection component 5, as shown in Fig. 8.

Hence, the spring elements 7 form a transportation lock which prior to a final end mounting of the exchange insert 1 exerts a constant preload in axial direction X-X on the mechanical seal.

Furthermore, a sealing element 8 is arranged between the connection component 5 and the first seal ring carrier 3. Furthermore, the exchange insert 1 comprises a first, second, third and fourth secondary sealing element 12, 13, 14, 15. The first secondary sealing element 12 seals between the connection component 5 and the stationary washpipe 102, the second secondary sealing element 13 seals between the first seal ring carrier 3 and the stationary seal ring 20, the third secondary sealing element 14 seals between the rotating seal ring 20 and the second seal ring carrier 4, and the fourth secondary sealing element 15 seals between the second seal ring carrier 4 and the second adapter 109 relative to the rotating washpipe 103.

The adjusting ring 42 of the second seal ring carrier which is rotatable from outside of the pre-mounted exchange insert 1 by means of a tool on openings 9 permits an alignment of the second seal ring carrier 4 in circumferential direction. This is necessary for allowing a torque transmission via the projections 53, which are protruding in axial direction X-X, from the second adapter 109 via the second seal ring carrier 4 to the rotating seal ring 21. This process can be seen in Figs. 5 and 6.

The first and second tool recesses 119 and 65 as well as the openings 9 on the adjusting ring preferably have an identical geometric shape, e.g. a bore, so that they are adjustable by means of the same tool.

The second adapter 109 comprises recesses 44 formed to conform to the projections 43, so that a form-fit connection is possible between the second adapter 109 and the adjusting ring 42.

Furthermore, an anti-rotation device 16 is provided for fixing a relative position of the second adjusting mechanism 6 between the external sleeve 61 and the internal sleeve 62. The anti-rotation device 16 of this embodiment is a threaded bolt which fixes a relative position between the external sleeve 61 and the internal sleeve 62. The threaded bolt comprises a spring-biased ball which in the not yet end-mounted position locks into a first recess 67 on the outer circumference of the external sleeve 61 (Fig. 3). The anti-rotation device is here arranged on an arm 69 which is connected to the

internal sleeve, so that the external sleeve 61 is arranged between the arm 69 and the internal sleeve (cf. Fig. 3 and 4). In the fully end-mounted position (Fig. 7), the ball is locked into a second recess 68 on the external sleeve 61, which serves as an indicator which indicates that the end position of the axially elongated exchange insert is reached. The two recesses 67, 68 are arranged by about a quarter turn between internal sleeve and external sleeve on the circumference of the external sleeve 61. By locking the ball into the recesses 67, 68, a mechanic has - during the respective pre-mounting of the exchange insert - an indicator indicating the correct position of the components internal sleeve and external sleeve relative to each other and also in the end-mounted position by locking into the second recess 68. This permits a reliable mounting also under the most severe environmental conditions.

Since the exchange insert is pre-mounted according to the invention, the exchange insert can be fully pre-mounted without any problems in a workshop. All secondary sealing elements 12, 13, 14, 15 can here also be exchanged in a simple way. The transportation lock by means of the spring elements 7 ensures that during transportation and installation shortly before an end installation position is reached a preload is always exerted on the seal rings 20, 21, so that the sliding surfaces of the seal rings closely abut on one another, and damage to the sliding surfaces can be avoided. According to the invention a complete exchange of the exchange insert with mechanical seal assembly can thereby be provided in a simple and fast way. Hence, during each exchange of the exchange insert new secondary sealing elements can be used, resulting in reduced maintenance and a respectively longer useful life of the exchange insert. In the case of a new exchange insert each of the spring elements 7 can also be replaced, if necessary. Since the spring elements 7 are arranged in the pockets 51, they are very well protected from the pumped medium, so that an exchange of the spring elements 7 is often not required.

The exchange operation will now be described in detail. After the exchange insert to be exchanged has been removed from the drill wash device 100, a new pre-mounted exchange insert 1 is inserted into the drill wash device 100, as outlined in Fig. 2. The new pre-mounted exchange insert 1 is pushed on the circumferential groove 50 and the

guide elements 10, 11 onto the two guide arms 110, 111, so that after a short push path the complete weight of the exchange insert 1 is carried by the guide arms 110, 111. This considerably facilitates an assembly of the exchange insert which is normally carried out at a certain height in the drilling tower 101 and must also be executed under very extreme weather conditions. Now, a mechanic must just push the pre-mounted exchange insert 1 along the guide arms 110, 111 into the assembly position. This inserted position is illustrated in Fig. 3. A first distance 80 is arranged between a face of the connection component 5 and a face of the first adapter 108, which is arranged on the stationary washpipe 102 (cf. Fig. 3).

In a next step, this first distance 80 is eliminated in that a length of the first adapter 108 is changed in axial direction X-X of the exchange insert by means of the first adjusting mechanism 116 (Fig. 3). Here, the first adapter 108 comprises an outer ring 118 and an inner ring 128 between which a thread 129 exists, so that the inner ring 128 gets into contact with the connection component 5 by rotating at least one of the rings. This position is shown in Fig. 4. In this embodiment, the outer ring 118 comprises first tool recesses 119 in the form of cylindrical bores to permit a relative rotation between the outer ring 118 and the inner ring 128. A connection is thereby established between the pre-mounted exchange insert 1 and the stationary washpipe 102 via the first adapter 108. Since the connection is static, the first secondary sealing element 12 is adequate for sealing. The axial length L1 of the pre-mounted exchange insert has not been changed yet.

In a next step a connection is now established between the pre-mounted exchange insert 1 and the rotating washpipe 103. To this end the second adjusting mechanism 6 is operated in that the internal sleeve 62 is rotated relative to the external sleeve 61. The internal sleeve 62 also comprises a portion which is exposed to the outside and in which plural second tool recesses 65 are provided for the attachment of a tool. The internal sleeve 62 is here rotated relative to the external sleeve 61 until the position shown in Fig. 5 is reached. In this position a final connection has not been established yet between the pre-mounted exchange insert 1 and the second adapter 109 on the rotating washpipe 103, but an alignment of the torque transmitting mechanism must still be

carried out between the second adapter 109 and the second seal ring carrier 4. To this end the adjusting ring 42 is rotated in circumferential direction, which is also made possible by way of a tool which can be attached from the outside to the adjusting ring 42. The alignment is of such a type that the projections 43 of the second seal ring carrier 4 are arranged over the corresponding recesses 44 of the second adapter 109, as shown in Fig. 6.

After the alignment has been made, the internal sleeve 62 of the adjusting mechanism 6 is further rotated relative to the external sleeve 61, so that a further elongation of the exchange insert 1 is carried out in axial direction X-X until the connecting end position, which is shown in Figs. 7 and 8, is reached (axial length L2).

Fig. 8 also shows the pre-mounted exchange insert in the connecting end position without showing the first and second adapter 108, 109 of the stationary and rotating washpipe for reasons of clarity.

Owing to the axial elongation of the exchange insert 1 the spring elements 7 can relax completely, so that the spring distance 71 plotted in Fig. 8 exists between the free end of the spring element 7 and the connection component 5. During operation the pressure on the seal rings is then built up via the shoulder 33. The spring elements may also be designed such that there is no spring distance from the connection component 5, but that a spring force is no longer exerted between connection component 5 and first seal ring carrier 4.

The spring elements 7 are here arranged in correspondingly formed pockets 51 in the connection component 5.

As a last step, the anti-rotation device 16 is then activated for fixing a relative position between the external sleeve 61 and the internal sleeve 62 of the adjusting mechanism 6. Here, the ball of the anti-rotation device locks in place in the second recess 68. Hence, the mechanic possesses an indicator which indicates that the exchange insert has been

extended to the correct axial length L2. Subsequently, the drill wash device 100 is again ready for use.

During operation a pressure is then exerted via the shoulder 33 at the first seal ring carrier 3 on the seal rings, so that a reliable sealing is possible at the sealing gap 26. In the end-mounted position, the exchange insert 1 thereby has an axial length which is extended by length L3, starting from the axial length L1 (Fig. 2) to the axial length L2 (Fig. 8).

Owing to the inventive idea of providing a drill wash device 100 with a first and second adjusting mechanism 116, 6, which respectively permit an elongation in axial direction, it is possible to provide a fast and reliable exchange of a mechanical seal. The mechanical seal is here integrated into a pre-mounted replaceable exchange insert 1. Upon exchange of the mechanical seals the complete exchange insert 1 is replaced. This can prevent the risk of damage to the seal rings 20, 21 in case of replacement. When the first and second adjusting mechanisms comprise a respective screw connection, a particularly fast and simple exchange is made possible by way of a relative rotation between the two components forming the screw connection. The relative rotation is here carried out by means of the same tool. A handling with individual seal rings at the drilling tower is not required. The pitches of the two screw connections of the adjusting mechanisms are here particularly preferably provided in the same way. Furthermore, it should be noted that the tool receiving means on the adjusting ring 42 is also configured in the same way as on the first and second adjusting mechanism. Thus, only one single tool is needed for the complete assembly of the replaceable exchange insert 1. The exchange can here be carried out by only one mechanic.

List of reference numerals

1	exchange insert
2	mechanical seal assembly
3	first seal ring carrier
4	second seal ring carrier
5	connection component
6	second adjusting mechanism
7	spring element
8	sealing element
9	opening
10, 11	guide elements
12-15	secondary sealing elements
16	anti-rotation device
17	preloaded locking element
20	stationary seal ring
21	rotating seal ring
22	first bandage
23	second bandage
24	first bevel
25	second bevel
26	sealing gap
31	first carrier part
32	second carrier part
33	shoulder
41	first carrier part
42	adjusting ring
43	projection
44	recess
50	circumferential groove
51	pocket

60	second screw connection
61	external sleeve
62	internal sleeve
63	internal thread
64	external thread
65	second tool recess
66	guide surface
67	first recess
68	second recess
69	arm
70	pin for positioning
71	spring distance
80	first distance
100	drill wash device
101	drilling tower
102	stationary washpipe
103	rotating washpipe
104	drill head
105	pump
106	drill hole
107	separating device
108	first adapter
109	second adapter
110	first guide arm
111	second guide arm
112	space
116	first adjusting mechanism
117	first screw connection
118	outer ring
119	first tool recess
128	inner ring
129	thread

Claims

1. A drill wash device (100), comprising
   - a stationary washpipe (102),
   - a rotating washpipe (103),
   - a pre-mounted, replaceable exchange insert (1) for connecting the stationary washpipe (102) to the rotating washpipe (103), the exchange insert (1) comprising a mechanical seal assembly with a stationary seal ring (20) and a rotating seal ring (21), and
   - a first adapter (108) which is arranged between the stationary washpipe (102) and the exchange insert (1),
   - wherein the first adapter (108) comprises a first adjusting mechanism (116) operative in axial direction for changing an axial length of the first adapter (108), and
   - wherein the exchange insert (1) comprises a second adjusting mechanism (6) operative in axial direction for changing an axial length of the exchange insert (1).

2. The drill wash device according to claim 1, characterized in that the first adjusting mechanism (116) comprises a first screw connection (117) with an outer ring (118) with an internal thread, and an inner ring (128) with an external thread.

3. The drill wash device according to claim 2, characterized in that the outer ring (118) of the first screw connection comprises first tool recesses (119) on an outer circumferential surface which are configured to receive a tool for rotating the outer ring (118) relative to the inner ring (128).

4. The drill wash device according to any one of claims 1 to 3, characterized in that the second adjusting mechanism (6) comprises a second screw connection (60) with an external sleeve (61) with an internal thread and an internal sleeve (62) with an external thread.

5. The drill wash device according to claim 4, characterized in that an axial length of the internal sleeve (62) is greater than an axial length of the external sleeve (61).

6. The drill wash device according to claim 4 or 5, characterized in that second tool recesses (65) are provided on the internal sleeve (62) on a portion not covered by the external sleeve (61), for receiving a tool for rotating the internal sleeve (62) relative to the external sleeve (61).

7. The drill wash device according to any one of claims 3 to 6, characterized in that a geometric shape of the first tool recesses (11) and a geometric shape of the second tool recesses (65) are identical.

8. The drill wash device according to any one of claims 1 to 7, characterized in that at an end directed towards the rotating washpipe (103) the pre-mounted exchange insert (1) comprises a projection (43) protruding in axial direction (X-X) for torque transmission from the rotating washpipe (103) to the exchange insert (1).

9. The drill wash device according to claim 8, characterized in that the exchange insert (1) further comprises an aligning ring (42) for aligning the protruding projection (43) in circumferential direction.

10. The drill wash device according to any one of claims 1 to 9, further comprising a second adapter (109) between the rotating washpipe (103) and the exchange insert (1).

11. The drill wash device according to any one of claims 1 to 10, further comprising a mounting aid which is arranged on the stationary washpipe

(102) to support assembly and disassembly of the pre-mounted exchange insert (1).

12. The drill wash device according to claim 11, characterized in that the mounting aid comprises a first guide arm (110) and a second guide arm (111) which are arranged on the first adapter (108).

13. The drill wash device according to claim 12, characterized in that the pre-mounted exchange insert (1) comprises a circumferential groove (50) for engagement with the guide arms (110, 111).

14. The drill wash device according to any one of claims 1 to 13, characterized in that the second adjusting mechanism (6) comprises an anti-rotation device (16) to fix a relative position between the external sleeve (61) and the internal sleeve (62).

15. The drill wash device according to claim 14, characterized in that the anti-rotation device (16) comprises a threaded bolt with a locking element (17) which is spring-loaded on a tip of the threaded bolt and which in a pre-mounted position locks into a first recess (67) on the external sleeve (61) and in an end-mounted position locks into a second recess (68) on the external sleeve (61).

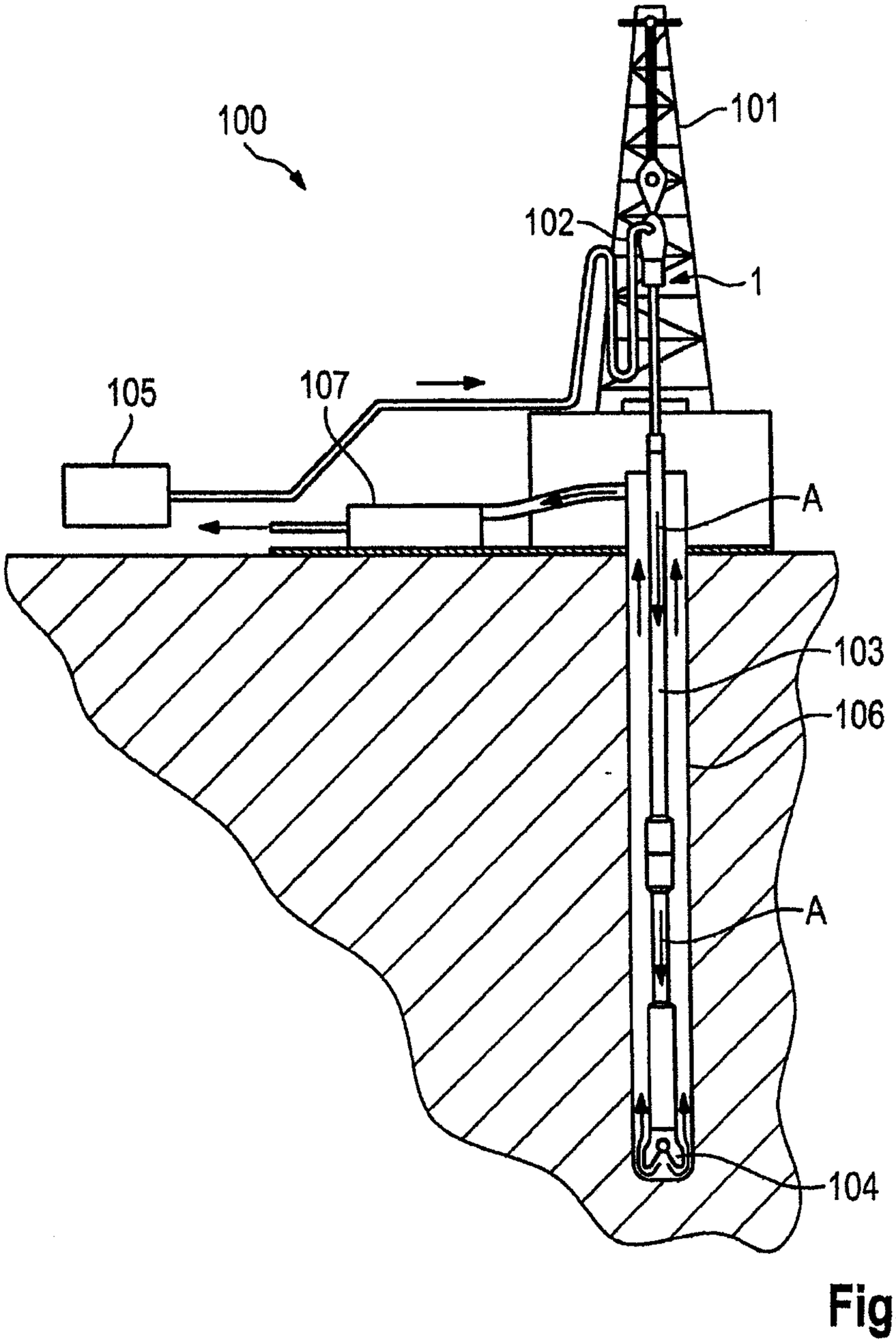


Fig. 1

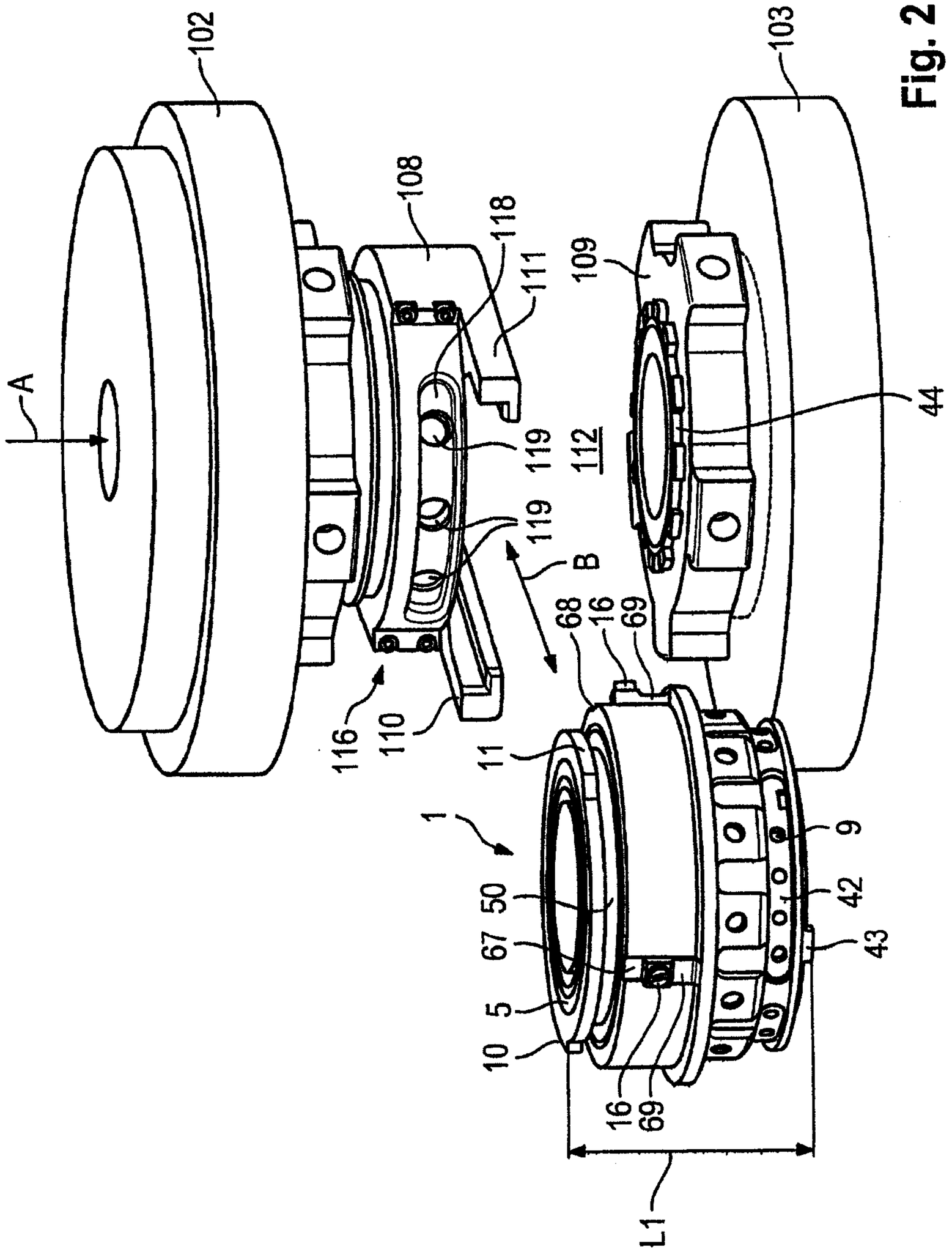
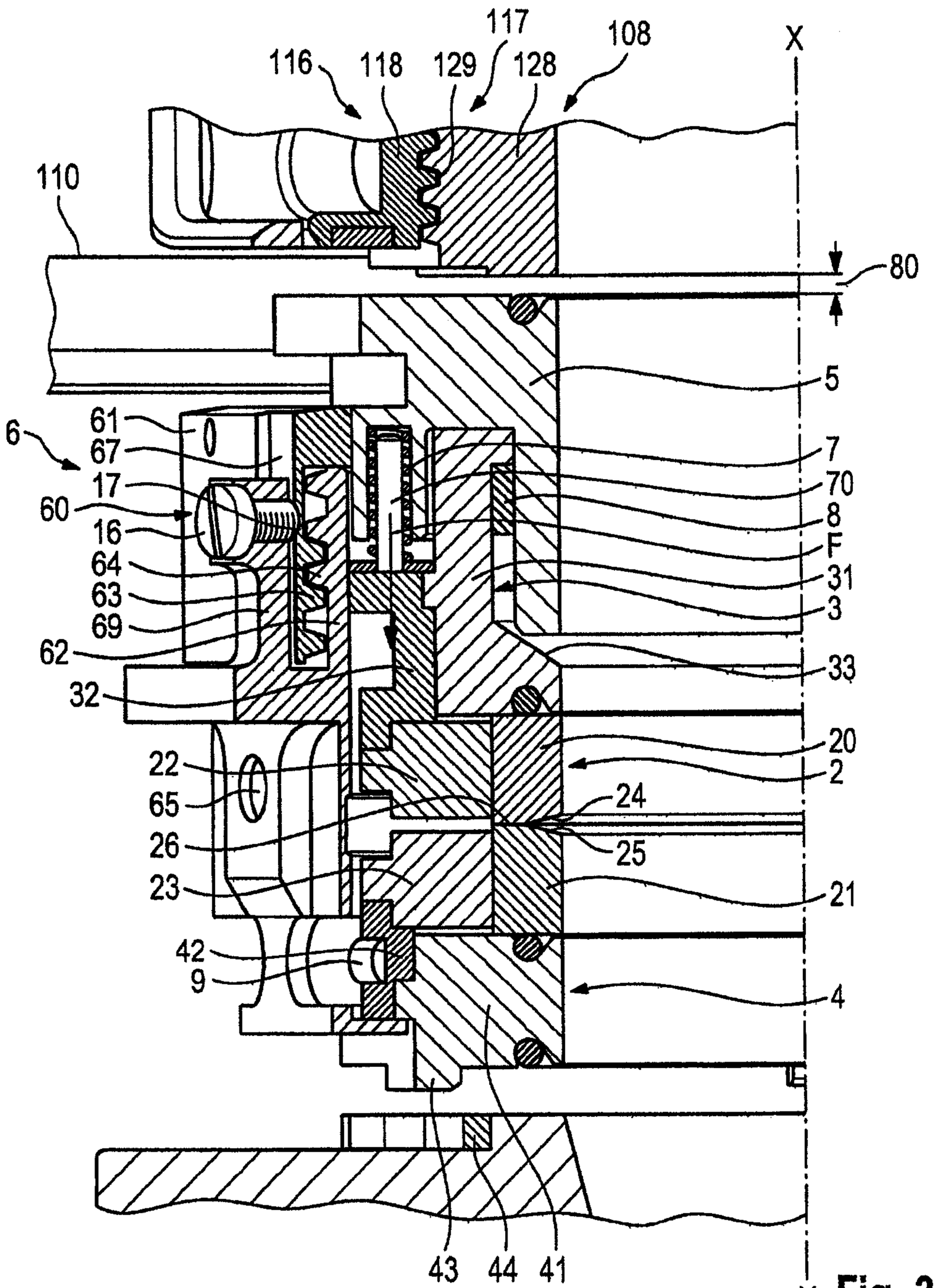

102
103
108
118
111
109
A
119
112
44
119
B
68
16
69
116
110
11
1
9
50
42
67
43
5
10
16
69
L1

Fig. 2


117
108
X
116
118
129
128
110
80
5
61
6
67
7
17
70
60
8
16
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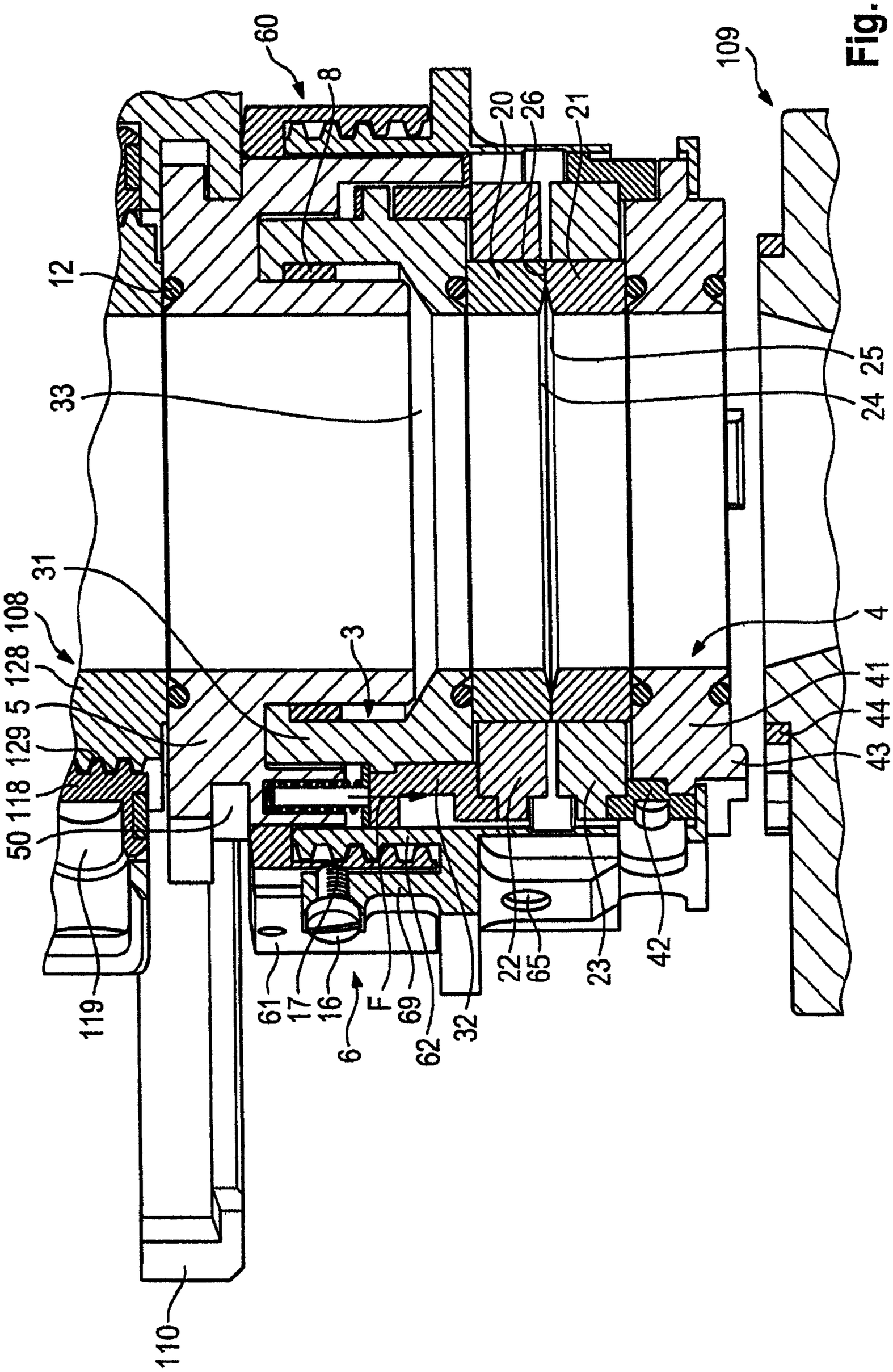
64
31
63
3
69
62
33
32
20
22
2
65
24
26
25
23
21
42
9
4
43
44
41
X

Fig. 3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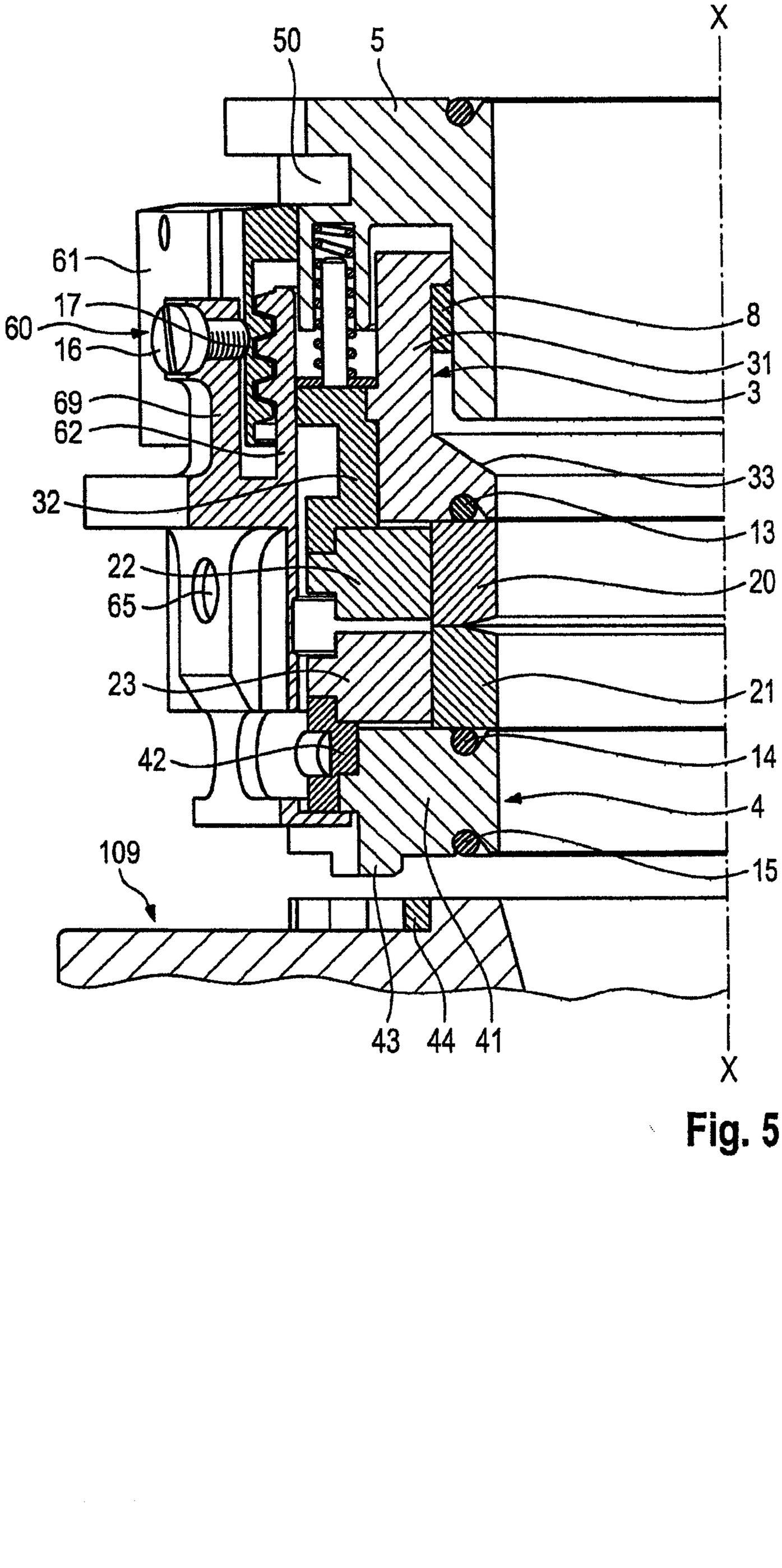
8
20
26
21
109
12
25
24
33
31
108
128
5
129
118
50
3
4
41
44
43
119
61
17
16
F
69
62
32
22
65
23
42
6
110

Fig. 4


X
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5
61
17
60
16
69
62
32
22
65
23
42
109
8
31
3
33
13
20
21
14
4
15
43
44
41
X

Fig. 5

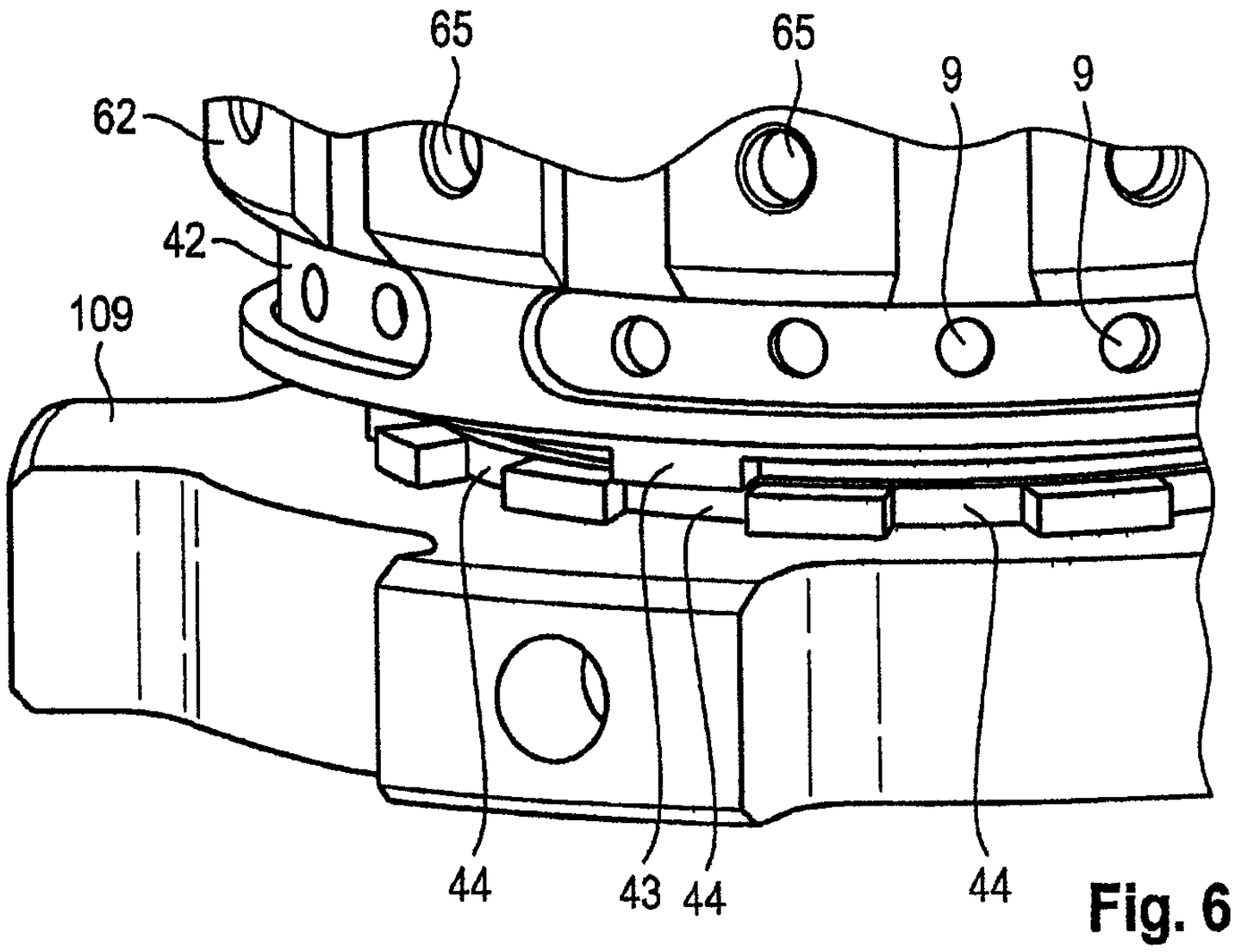
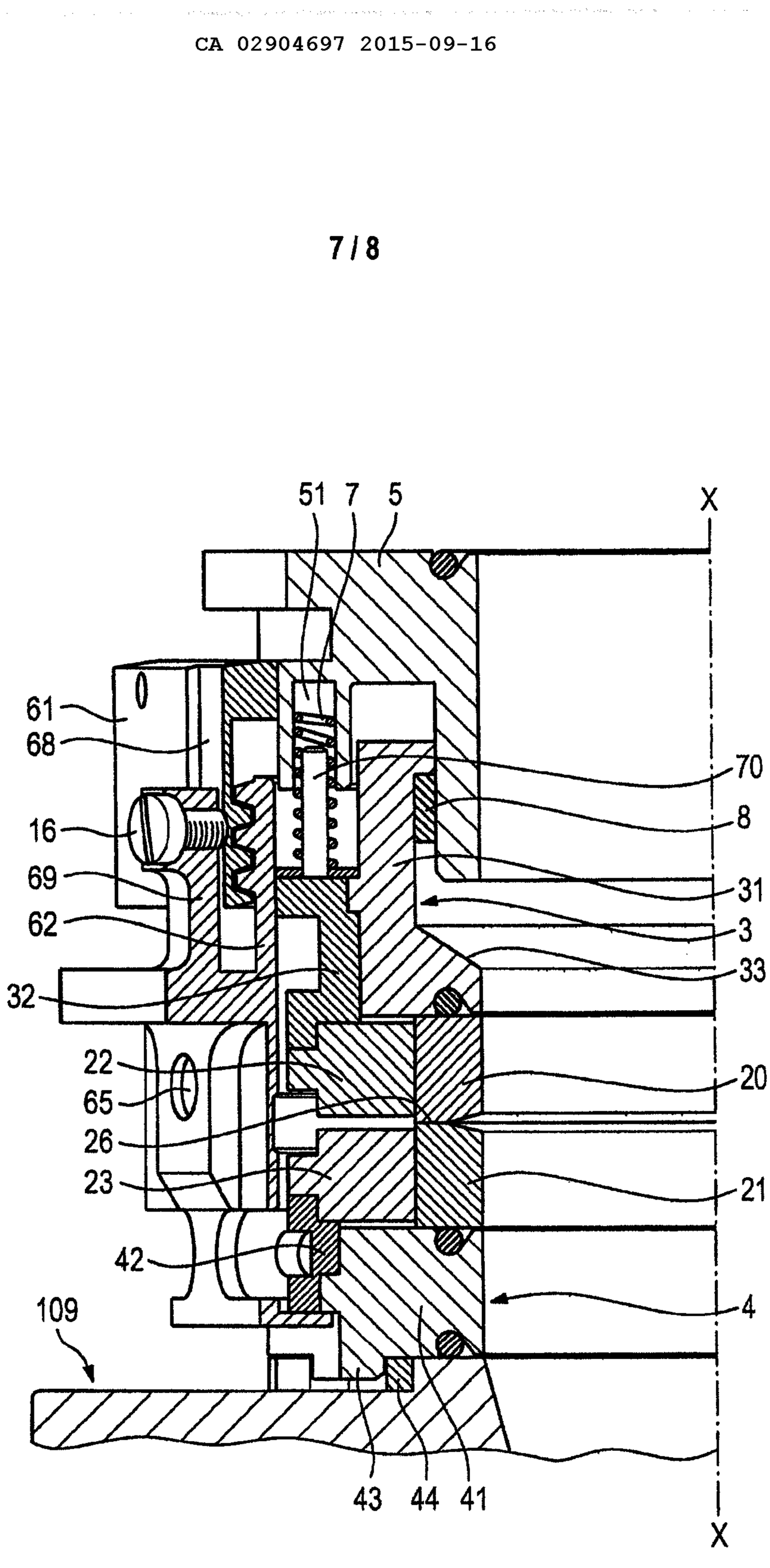


Fig. 6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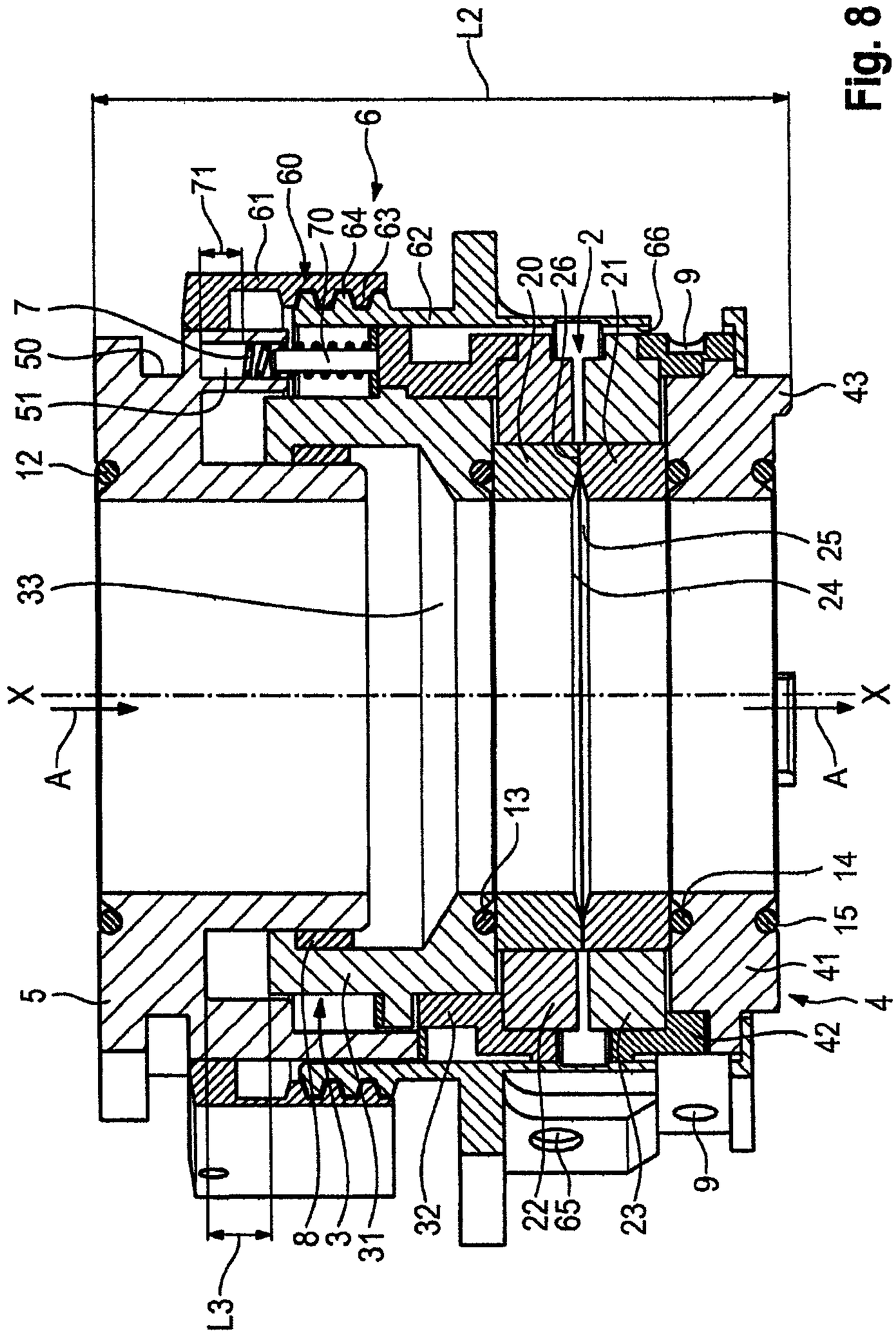
7
5
X
61
68
16
69
62
32
22
65
26
23
42
109
70
8
31
3
33
20
21
4
43
44
41
X

Fig. 7


L2
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71
61
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70
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63
62
20
26
2
21
66
9
7
50
51
12
43
33
25
24
X
A
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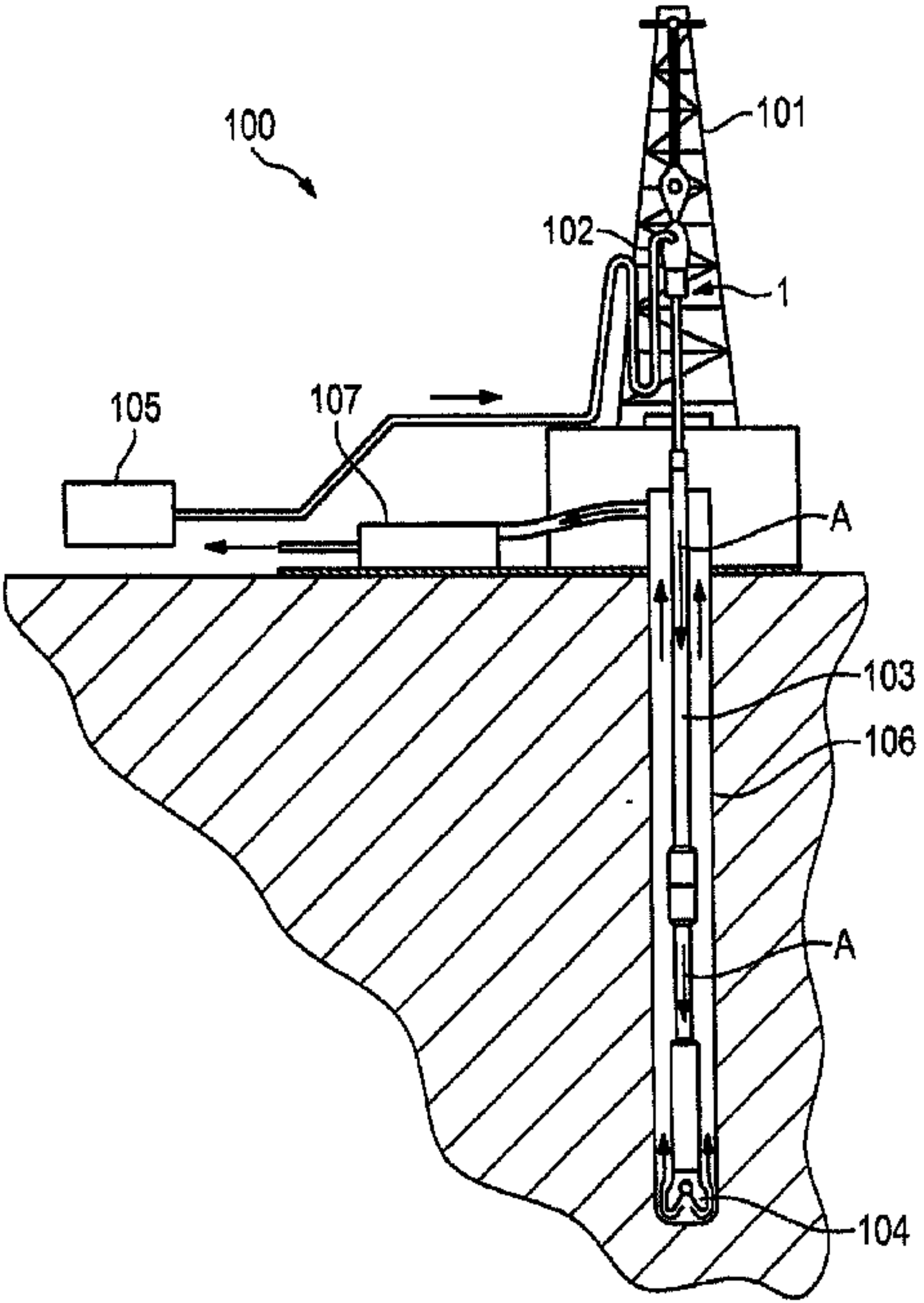
14
15
41
4
42
5
0
8
3
31
32
22
65
23
9
L3

Fig. 8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105
107
A
103
106
A
104