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(54) **Downhole deployment system for ejecting a tracer and/or taking a fluid sample**

(57) The present invention relates to a downhole deployment system (1) for ejecting a tracer (39) and/or taking a fluid sample of a fluid in a lateral (2) in a well (3). The system comprises a stroking tool (4) comprising a shaft (5), the stroking tool providing a reciprocating movement of the shaft, and a deployment tool (6). The deployment tool comprises a tool body (7), a tool inlet (8), a tool outlet (35), a deployment chamber (9) arranged in the tool body, a piston (10) dividing the deployment chamber into a first deployment chamber part (11) and a second deployment chamber part (12), the first deployment chamber part being in fluid communication with the tool

outlet and the second deployment chamber part being in fluid communication with the tool inlet, and a piston rod (14) connected to the piston and driven by the shaft for moving the piston from a first position to a second position, thereby decreasing the first deployment chamber part and increasing the second deployment chamber part, in order to eject the tracer from the first deployment chamber part or collect the fluid sample through the tool inlet. The present invention furthermore relates to a production optimising method using the downhole deployment system.

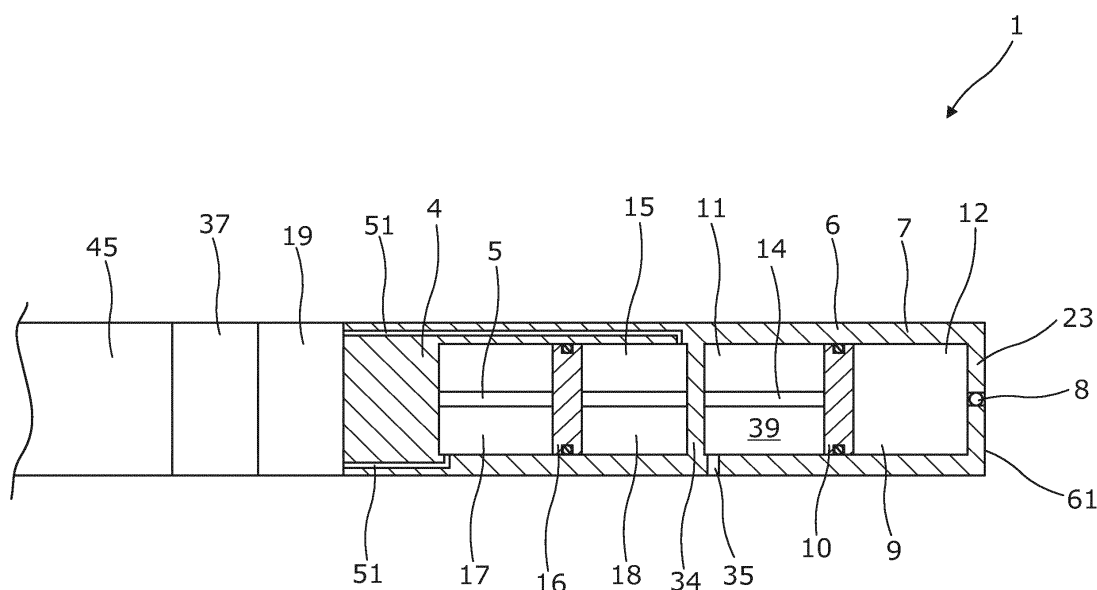


Fig. 2a

Description

Field of the invention

[0001] The present invention relates to a downhole deployment system for ejecting a tracer and/or taking a fluid sample of a fluid in a lateral in a well. The present invention furthermore relates to a production optimising method using the downhole deployment system.

Background art

[0002] A downhole oil or gas well may have a plurality of laterals from which the hydrocarbon-containing fluid flows at different volume rates in order to ensure optimal production. As the hydrocarbon-containing fluid is produced from the well, the pressure and other conditions in the reservoir change, which also changes the volume rates of the hydrocarbon-containing fluid flowing in the well. At the top of the well, the water content of the hydrocarbon-containing fluid produced from the well is measured, however, the water content does not indicate where the water comes from, i.e. which lateral and which production zone in that lateral.

[0003] In addition, the hydrocarbon-containing fluid may have one viscosity in one part of a reservoir and another viscosity in another part of the reservoir. The higher the viscosity, the slower the fluid flow, and if one zone produces fluid having a lower viscosity than a fluid of another zone, this fluid will most likely "by-pass" the fluid having the lower viscosity, and thereby, the zone with the lower viscosity fluid will not produce as much fluid as the zone with the high viscosity fluid. There is therefore a need to know what fluid content is produced from each production zone, and if the zone is producing at all.

Summary of the invention

[0004] It is an object of the present invention to wholly or partly overcome the above disadvantages and drawbacks of the prior art. More specifically, it is an object to provide an improved downhole system being capable of obtaining on whether a production zone is producing as well as what the zone is producing.

[0005] The above objects, together with numerous other objects, advantages and features, which will become evident from the below description, are accomplished by a solution in accordance with the present invention by a downhole deployment system for ejecting a tracer and/or taking a fluid sample of a fluid in a lateral in a well, the system comprising:

- a stroking tool comprising a shaft, the stroking tool providing a reciprocating movement of the shaft, and
- a deployment tool comprising:
 - a tool body,
 - a tool inlet,

- a tool outlet,
- a deployment chamber arranged in the tool body,
- a piston dividing the deployment chamber into a first deployment chamber part and a second deployment chamber part, the first deployment chamber part being in fluid communication with the tool outlet and the second deployment chamber part being in fluid communication with the tool inlet, and
- a piston rod connected to the piston and driven by the shaft for moving the piston from a first position to a second position, thereby decreasing the first deployment chamber part and increasing the second deployment chamber part, in order to eject the tracer from the first deployment chamber part or collect the fluid sample through the tool inlet.

[0006] In an embodiment, the stroking tool may comprise a stoker chamber and a stoker piston surrounding the shaft and dividing the stoker chamber into a first stoker chamber part and a second stoker chamber part, and the stroking tool may further comprise a pump pumping fluid into the first stoker chamber part or the second stoker chamber part for moving the shaft which is connected to the piston rod.

[0007] Furthermore, the shaft and the piston rod may be directly connected so that the shaft or rod penetrates a wall between the second stoker chamber part and the first deployment chamber part of the deployment tool.

[0008] Also, the shaft may be the piston rod.

[0009] The downhole deployment system described above may further comprise a lateral locator having a body part which is connected with the deployment tool, and a guiding part which is movable in relation to the body part for creating an angle between the body part and the guiding part for guiding the deployment system into the lateral.

[0010] In one embodiment, the deployment chamber of the deployment tool may have a chamber wall in which the tool inlet is arranged.

[0011] In another embodiment, the downhole deployment system described above may further comprise a collection chamber tool part comprising at least one collection chamber which is fluidly connected with the second deployment chamber part of the deployment tool through an opening in which a one-way valve is arranged, thereby enabling fluid to be sucked into the second deployment chamber part through a chamber inlet when the piston moves from the first position to the second position, and enabling fluid in the second deployment chamber part to be forced into the collection chamber when the piston moves from the second position to the first position.

[0012] Moreover, the collection chamber may be divided into a first collection chamber part and a second collection chamber part by a movable collection piston, the first collection chamber part being in fluid communication with the second deployment chamber part of the deployment tool.

[0013] Also, the tool inlet may be arranged in a side of the deployment tool or collection chamber tool part.

[0014] In addition, the second collection chamber part may comprise a collection chamber outlet for letting fluid from the second collection chamber part into the well.

[0015] Furthermore, a fluid channel in the collection chamber tool part may fluidly connect the chamber inlet with the tool inlet.

[0016] Also, the collection chamber tool part may be rotatable in relation to the deployment chamber of the tool body.

[0017] Additionally, the pump may be driven by a motor.

[0018] Further, the downhole deployment system may be powered through a wireline.

[0019] Moreover, a tracer may be arranged in the second collection chamber part.

[0020] Furthermore, a tracer may be arranged in the first deployment chamber part of the deployment tool.

[0021] The collection chamber tool part may comprise a plurality of collection chambers.

[0022] Additionally, the collection chamber tool part may be rotatably connected with the tool body in order to fill several collection chambers by aligning the opening of the chamber with an opening of one of the collection chambers.

[0023] Also, the tool body may comprise a motor for rotating the collection chamber tool part in relation to the tool body.

[0024] In an embodiment, a one-way valve may be arranged in the tool inlet and/or chamber inlet for letting fluid into the sampling tool.

[0025] The downhole deployment system described above may further comprise a driving unit for propelling the downhole deployment system forward in the well.

[0026] In addition, the piston rod and the shaft may be connected via a gear arrangement.

[0027] Moreover, the gear arrangement may comprise a worm gear.

[0028] The self-propelling driving unit may have a wireline and thus be a wireline self-propelling driving unit.

[0029] Also, the driving unit may be connected with an elongated tubing string for transporting the fluid in the well, and the driving unit may further comprise a turbine driven by the fluid for driving a generator driven by the turbine and generating electricity for powering the driving unit.

[0030] Further, the turbine may drive a hollow shaft for driving the generator and for providing fluid to a pump in order to propel the driving unit and the tubing string forward in the well.

[0031] Moreover, the driving unit may further comprise an electrically driven driving section comprising an electrical motor powered by the generator for propelling the driving unit and the production casing forward in the well, the electrically driven driving section being arranged in front of the driving unit, thereby forming a first end.

[0032] Furthermore, the driving unit may be powered

by a battery. The driving unit thus may not have a wireline.

[0033] The present invention also relates to a production optimising method using the downhole deployment system described above, the method comprising the steps of:

- sucking a fluid sample into the deployment tool by moving the shaft of the stroking tool from a first position to a second position,
- forcing the fluid into the chamber, and
- ejecting a tracer into the well opposite a production zone when moving the shaft from the first position to the second position or from the second position to the first position.

Brief description of the drawings

[0034] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawings, which for the purpose of illustration show some non-limiting embodiments and in which

Fig. 1 shows a downhole well in which a downhole deployment system for taking a fluid sample is arranged in one of the laterals in the well, opposite a production zone,

Fig. 2a shows a cross-sectional view of the downhole deployment system,

Fig. 2b shows a cross-sectional view of another downhole deployment system,

Fig. 3a shows a cross-sectional view of yet another downhole deployment system,

Fig. 3a shows a cross-sectional view of yet another downhole deployment system,

Fig. 4 shows a downhole well where a downhole deployment system having a lateral locator is arranged,

Fig. 5 shows a cross-sectional view of the downhole deployment system of Fig. 4,

Fig. 6a shows a cross-sectional view of another downhole deployment system having a lateral locator,

Fig. 6b shows a cross-sectional view of yet another downhole deployment system having a lateral locator,

Fig. 7 shows a cross-sectional view of the downhole deployment system of Fig. 6,

and

Fig. 8 shows a cross-sectional view of yet another downhole deployment system.

[0035] All the figures are highly schematic and not necessarily to scale, and they show only those parts which are necessary in order to elucidate the invention, other parts being omitted or merely suggested.

Detailed description of the invention

[0036] Fig. 1 shows a downhole well 3 having a main bore 50 and laterals 2. A casing string 52 is arranged in the main bore 50 and in the laterals 2 and comprises annular barriers 53 for dividing the well 3 into production zones 101. A downhole deployment system 1 for ejecting a tracer and/or taking a fluid sample is arranged in one of the laterals 2 in the well 3 opposite one of the production zones 101. Hereby, the tracer is injected into the fluid from a specific production zone 101, or a sample of fluid flowing from a specific production zone is collected in a deployment tool 6 of the downhole deployment system 1 and brought to surface for further investigation. In the event that the tracer is ejected from the tool 6, the tracer can be detected at the surface if the well 3 is producing from that production zone 101. The downhole deployment system 1 further comprises a stroking tool 4 for enabling the deployment tool 6 to take the sample. The deployment tool 6 is arranged in front of the stroking tool 4 when the deployment system 1 moves forward in the well 3. Thus, by deployment tool and deployment system are meant a tool and system which are capable of collection a fluid sample from the well and/or eject a fluid e.g. comprising a tracer.

[0037] As shown in Fig. 2a, the deployment tool 6 comprises a tool body 7, a tool inlet 8, a tool outlet 35, a deployment chamber 9 and a piston 10, the piston dividing the chamber into a first deployment chamber part 11 and a second deployment chamber part 12. The deployment chamber 9 of the deployment tool 6 has a chamber wall 23 in which the tool inlet 8 is arranged. The second deployment chamber part 12 is in fluid communication with the tool inlet 8 in order to take in well fluid, e.g. as a fluid sample, and the second deployment chamber part 12 is in fluid communication with the tool outlet 35 for letting fluid out into the well 3, e.g. a tracer 39 opposite a production zone. The stroking tool 4 comprises a shaft 5 and provides a reciprocating movement of the shaft 5 for driving a piston rod 14 connected to the piston 10 of the deployment tool 6 for moving the piston from a first position to a second position, thereby decreasing the first deployment chamber part 11 and increasing the second deployment chamber part 12, in order to eject the tracer 39 and/or collect the fluid sample through the tool inlet 8. In Fig. 2a, the tool inlet 8 is arranged in a front face 61 of the downhole deployment system 1 when the system moves further into the lateral 2, and the second deployment chamber part 12 is arranged in front of the stroking tool 4, thereby forming the front of the deployment tool 6

so that the first deployment chamber part 11 is arranged between the stroking tool 4 and the second deployment chamber part 12.

[0038] If the downhole deployment system 1 of Fig. 2a is used for both ejecting the tracer 39 from the first deployment chamber part 11 and collecting a sample by means of the second deployment chamber part 12, the downhole deployment system 1 may advantageously move forward during the process to ensure that the fluid sample is not mixed with the tracer 39 when the tracer is ejected simultaneously with the collection of the sample. The downhole deployment system 1 may be propelled forward by means of a driving unit 45.

[0039] In Fig. 2b, the tool inlet 8 is arranged in a side face 62 of the tool body 7, and the second deployment chamber part 12 is arranged abutting the stroker chamber 15. The first deployment chamber part 11 is arranged in front of the second deployment chamber part 12, and the tool outlet 35 is arranged in the chamber wall 23, thereby forming the front face 61 of the downhole deployment system 1. If the downhole deployment system 1 of Fig. 2b is used for both ejecting of the tracer from the first deployment chamber part 11 and collecting a sample by means of the second deployment chamber part 12, the downhole deployment system 1 may advantageously be retracted during the process to ensure that the fluid sample is not mixed with the tracer when the tracer is ejected simultaneously with the collection of the sample. The downhole deployment system 1 may be retracted by pulling a wireline 38 connected to the downhole deployment system 1, e.g. for powering the tools.

[0040] In order to move the shaft 5, the stroking tool 4 comprises a stroker chamber 15 and a stroker piston 16 surrounding the shaft and dividing the stroker chamber into a first stroker chamber part 17 and a second stroker chamber part 18. The stroking tool 4 further comprises a pump 19 pumping fluid into the first stroker chamber part 17 or the second stroker chamber part 18 through channels 51 for moving the shaft 5 which is connected to the piston rod 14. The shaft 5 and the piston rod 14 are directly connected and thereby penetrate a wall 34 between the second stroker chamber part 18 and the first deployment chamber part 11 of the deployment tool 6.

[0041] As the pump 19 pumps fluid into the second stroker chamber part 18 through the channels 51, the stroker piston 16 is forced towards the pump and moves the piston 10 of the deployment tool 6 towards the pump 19, which creates a vacuum in the first deployment chamber part 11, and well fluid is thereby sucked into the first deployment chamber part 11. As the piston 10 of the deployment tool 6 moves towards the pump 19, the second deployment chamber part 12 decreases, thereby forcing the fluid in the second deployment chamber part out of a tool outlet 35 and into the well. In this way, a sample of well fluid from a specific production zone is sucked into the deployment chamber 9.

[0042] In Fig. 3a, the deployment tool 6 of the downhole deployment system 1 further comprises a collection

chamber tool part 24 connected with the tool body 7 having the deployment chamber 9. The collection chamber tool part 24 comprises at least one collection chamber 25 which is fluidly connected with the second deployment chamber part 12 of the deployment tool 6 through an opening 26 in which a one-way valve 27 is arranged. This enables fluid to be sucked into the second deployment chamber part 12 through a chamber inlet 28 which is in fluid communication with the tool inlet 8 through a fluid channel 36 when the piston moves from the first position to the second position. As the piston 10 moves from the second position to the first position, the fluid in the second deployment chamber part 12 is forced into the collection chamber 25 and not into the chamber inlet 28, as a one-way valve in the chamber inlet prevents the fluid from flowing back into the fluid channel 36. The collection chamber 25 is divided into a first collection chamber part 31 and a second collection chamber part 32 by a movable collection piston 33. The first collection chamber part 31 is in fluid communication with the second deployment chamber part 12 of the tool body 7, and the second collection chamber part 32 is in fluid communication with the well through a collection chamber outlet 44. As the fluid is forced into the first collection chamber part 31 when the piston 10 moves away from the pump 19, the movable collection piston 33 forces the fluid in the second collection chamber part 32 out of the outlet 44 and into the well 3. When the sample fluid has entered the first collection chamber part 31, the fluid is trapped in the first collection chamber part 31, as the movable collection piston 33 seals towards the collection chamber outlet 44 and the one-way valve 27 prevents the sample fluid from entering the second deployment chamber part 12 again.

[0043] Having the first deployment chamber part 11 filled with well fluid prevents the deployment chamber 9 from collapsing when the tool 4 is subjected to the high pressure several kilometres down the well. The deployment chamber 9 is in this way always filled with fluid and prevented from collapsing. The same applies to the collection chamber 25 since before taking a sample, the piston 33 is forced to abut the inlet 28 by the well fluid which has entered the second collection chamber part 32 and forced the piston 10 into a position where the first collection chamber part 31 is almost non-existing. As the sample is filled into second collection chamber part 32, the well fluid is forced out of the outlet 44, and the collection chamber 25 is thus always filled with fluid and thereby prevented from collapsing. In this way, the chambers 9, 25 are pressure-compensated by the well fluid surrounding the stroking tool 4.

[0044] As shown in Fig. 3b, the first deployment chamber part 11 is fluidly connected with the second collection chamber part 32 which comprises a tracer 39 to be injected into a first production zone as the piston 10 creates a vacuum in the first deployment chamber part 11 and sucks the tracer of the second collection chamber part 32 into the first deployment chamber part 11 and out through the fluid channel 36 and outlet 35. The second

collection chamber part 32 is in fluid communication with the first deployment chamber part 11, and the second collection chamber part 32 comprises the tracer when the deployment system is submerged into the well. The first collection chamber part 31 is in fluid communication with an inlet 64 and thus the well, and the second deployment chamber part 12 is in fluid communication with the well through the tool inlet 8. As the second collection chamber part 32 is emptied of tracer 39, the second collection chamber part 32 decreases as the piston 33 moves along, thereby increasing the first collection chamber part 31 by sucking well fluid into the first collection chamber part 31 through inlet 64.

[0045] In Fig. 4, the downhole deployment system 1 comprises a lateral locator 20 having a body part 21 connected with the deployment tool 6 and a guiding part 22 movable in relation to the body part for creating an angle β between the body part and the guiding part for guiding the deployment system into the lateral 2.

[0046] As shown in Fig. 5, the collection chamber tool part 24 is connected with the body part 21 of the lateral locator 20, and the tool inlet 8 is arranged in the side of the collection chamber tool part 24. The lateral locator 20 comprises a motor 56 in the body part 21 for adjusting the angle β of the guiding part 22 to be at least 15° and thus guide the downhole deployment system 1 into a lateral 2 when the guiding part 22 hits against the wall in the opening of the lateral.

[0047] In Fig. 6a, the collection chamber tool part 24 is rotatable in relation to the deployment chamber 9 of the tool body 7 by means of a motor 43. On the opposite side of the motor, fluid channels 57 extend for providing fluid communication between the tool inlet 8 and the second deployment chamber part 12 and between the second deployment chamber part 12 and the first collection chamber part 31. The downhole deployment system 1 further comprises the tracer 39 which is arranged in the second collection chamber part 32 and/or in the first deployment chamber part 11 of the deployment tool 6. As the fluid sample is taken, the tracer 39 is injected into the well fluid opposite the production zone 101. In this way, a sample of the fluid content flowing from that production zone 101 can be taken, and at the top of the well, the tracer 39 injected into the well fluid in that production zone 101 can be detected. If the tracer 39 is not detected at the top, the production zone 101 is not producing any fluid.

[0048] Furthermore in Fig. 6a, the collection chamber tool part 24 comprises a plurality of collection chambers 25, as can be seen in the cross-sectional view of Fig. 7. When a first collection chamber 25 has been filled with a fluid sample from a first production zone and the tracer in the first collection chamber 25 is ejected, the downhole deployment system 1 shown in Fig. 6 moves to a second production zone, and the motor 43 rotates the collection chamber tool part 24 in relation to the tool body 7. Then, a second collection chamber 25 is arranged in fluid communication with an associated fluid channel 36 and thus

the tool inlet 8. Thus, the fluid channel 36 and a collection chamber 25 arranged opposite the fluid channel 36 in Fig. 7 are in turn brought into fluid communication with one another as the collection chamber tool part 24 is rotated. In this way, a downhole deployment system 1 having seven collection chambers 25 is capable of taking seven samples from seven different production zones.

[0049] Each collection chamber 25 of Fig. 6a may have a chamber opening 42 in which a one-way valve is arranged for closing the collection chamber 25 when it has been filled. The opening 42 is thus aligned with the fluid channels 57 and the opening 26 of the second deployment chamber part 12 when rotating the collection chamber tool part 24 in relation to the tool body 7.

[0050] In Fig. 6b, the collection chamber tool part 24 comprises a plurality of collection chambers 25, as also shown in Fig. 6a. However, in Fig. 6b, a first collection chamber 25 has been filled with a first tracer 39 to be injected into a first production zone as the piston 10 creates a vacuum in the first deployment chamber part 11 and sucks the tracer of the second collection chamber part 32 of first collection chamber 25 into the first deployment chamber part 11 and out through the fluid channel 36 and outlet 35. When the downhole deployment system 1 shown in Fig. 6b moves to a second production zone, the motor 43 rotates the collection chamber tool part 24 in relation to the tool body 7. Then, a second collection chamber 25 comprising a second tracer 39 is arranged in fluid communication with an associated fluid channel 36 and thus the tool outlet 35. Thus, the fluid channel 36 and a collection chamber 25 arranged opposite the fluid channel 36 in Fig. 7 are in turn brought into fluid communication with one another as the collection chamber tool part is rotated. In this way, a downhole deployment system 1 having seven collection chambers 25 is capable of injecting seven different tracers into seven different production zones.

[0051] In Fig. 6b, the second collection chamber part 32 is in fluid communication with the first deployment chamber part 11, and the second collection chamber part 32 comprises the tracer 39 when the deployment system is submerged into the well. The first collection chamber part 31 is in fluid communication with an inlet 63 and thus the well for letting well fluid in as the second collection chamber part 32 is emptied of tracer, and the second deployment chamber part 12 is in fluid communication with the well through the tool inlet 8. The tool inlet 8 functions both as an inlet and an outlet if the stroking tool performs several strokes to empty the second collection chamber part 32.

[0052] Each collection chamber 25 of Fig. 6b may have a chamber opening 42 in which a one-way valve is arranged for preventing tracer fluid in the collection chamber 25 from flowing back when some if not all of the tracer has been sucked into the first deployment chamber 11. The opening 42 is thus aligned with the fluid channels 57 and the opening 26 of the second deployment chamber part 12 when rotating the collection chamber tool part 24

in relation to the tool body 7.

[0053] In order to also be able to enter the horizontal part of the well, e.g. in a lateral, the downhole deployment system 1 further comprises a driving unit 45 for propelling the downhole deployment system forward in the well 3.

[0054] As shown in Fig. 8, the piston rod 14 and the shaft 5 are connected via a gear arrangement 46, allowing for the deployment chamber 9 to be arranged side by side with the motor 43 to rotate the collection chamber tool part 24 in relation to the tool body 7 for fluidly aligning a collection chamber 25 with the second deployment chamber part 12. The gear arrangement 46 may comprise a worm gear.

[0055] The downhole deployment system 1 may further comprise a self-propelling driving unit 45 having two driving sections, i.e. a first driving section and a second driving section. The self-propelling driving unit 45 is connected with an elongated tubing string, such as coiled tubing, a drill pipe, etc., for transporting the fluid to a turbine driven by the fluid for driving a generator driven by the turbine and generating electricity for powering at least one of the driving sections.

[0056] In the event that the first driving unit is a fluid-driven driving section, the fluid in the tubing string is used for driving the pump driving a closed hydraulic system in the first driving section. The pump thus drives hydraulic motors in the wheels of the driving section and projects the arms. The first driving section may also be electrically driven in that the electricity from the generator powers a motor driving the pump and thus the wheels and arms, or the motor drives the pump to drive the arms, and electrical motors in the wheels are powered by the electricity from the generator.

[0057] The second driving section may be an electrically driven driving section and may be powered by the electricity from the generator to drive a pump driving the arms. The motors in the wheels may either be hydraulically driven by the pump or electrically driven by the electricity from the generator.

[0058] Both the first and the second driving sections have a control section (not shown) for controlling the operation of the driving section. In order to provide fluid to the first driving section, the turbine drives a hollow shaft for driving the generator and for providing fluid to the pump in order to propel the driving section.

[0059] The driving unit may also merely be powered by a battery and thus be electrically driven for powering electrical motors in the wheels or for driving a pump driving the wheel arms and hydraulic motors in the wheels.

[0060] The stroking tool 4 may provide several strokes of the shaft 5 in order to move the piston 10 up and down to fill or empty the chamber of the collection chamber tool part 24.

[0061] A stroking tool is a tool providing an axial force. The stroking tool comprises an electrical motor for driving the pump. The pump pumps fluid into a piston housing to move a piston acting therein. The piston is arranged on the shaft. The pump may pump fluid into the piston

housing on one side and simultaneously suck fluid out on the other side of the piston.

[0062] By fluid or well fluid is meant any kind of fluid that may be present in oil or gas wells downhole, such as natural gas, oil, oil mud, crude oil, water, etc. By gas is meant any kind of gas composition present in a well, completion, or open hole, and by oil is meant any kind of oil composition, such as crude oil, an oil-containing fluid, etc. Gas, oil, and water fluids may thus all comprise other elements or substances than gas, oil, and/or water, respectively.

[0063] By a casing is meant any kind of pipe, tubing, tubular, liner, string etc. used downhole in relation to oil or natural gas production.

[0064] In the event that the tool is not submergible all the way into the casing, a downhole tractor can be used to push the tool all the way into position in the well. The downhole tractor may have projectable arms having wheels, wherein the wheels contact the inner surface of the casing for propelling the tractor and the tool forward in the casing. A downhole tractor is any kind of driving tool capable of pushing or pulling tools in a well downhole, such as a Well Tractor®.

[0065] Although the invention has been described in the above in connection with preferred embodiments of the invention, it will be evident for a person skilled in the art that several modifications are conceivable without departing from the invention as defined by the following claims.

Claims

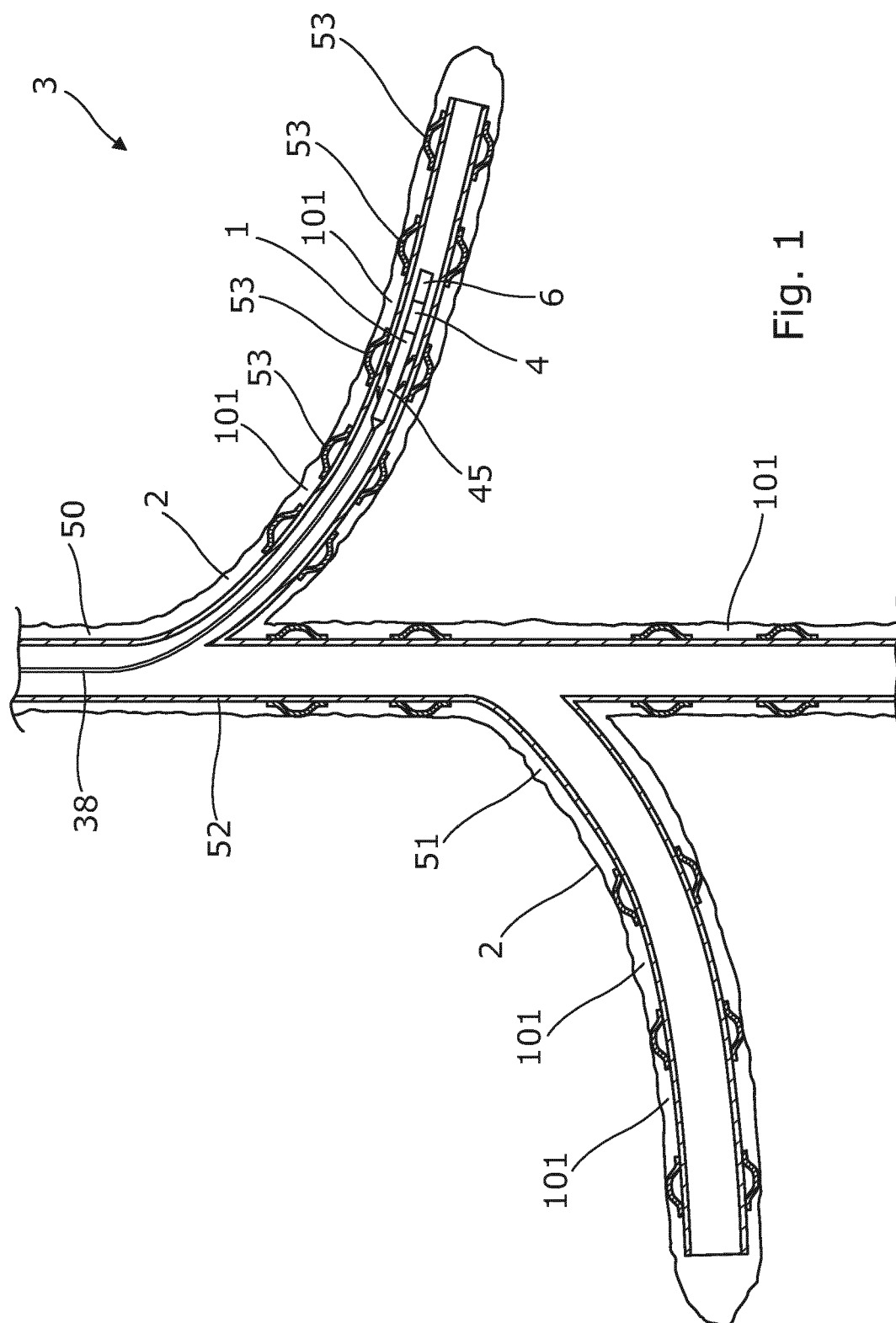
1. A downhole deployment system (1) for ejecting a tracer (39) and/or taking a fluid sample of well fluid in a lateral (2) in a well (3), the system comprising:
 - a stroking tool (4) comprising a shaft (5), the stroking tool providing a reciprocating movement of the shaft, and
 - a deployment tool (6) comprising:
 - a tool body (7),
 - a tool inlet (8),
 - a tool outlet (35),
 - a deployment chamber (9) arranged in the tool body,
 - a piston (10) dividing the deployment chamber into a first deployment chamber part (11) and a second deployment chamber part (12), the first deployment chamber part being in fluid communication with the tool outlet and the second deployment chamber part being in fluid communication with the tool inlet, and
 - a piston rod (14) connected to the piston and driven by the shaft for moving the piston from a first position to a second position, thereby decreasing the first deployment chamber part and increasing the second deployment chamber

part, in order to eject the tracer from the first deployment chamber part or collect the fluid sample through the tool inlet.

2. A downhole deployment system according to claim 1, wherein the stroking tool comprises a stroker chamber (15) and a stroker piston (16) surrounding the shaft and dividing the stroker chamber into a first stroker chamber part (17) and a second stroker chamber part (18), and wherein the stroking tool further comprises a pump (19) pumping fluid into the first stroker chamber part or the second stroker chamber part for moving the shaft which is connected to the piston rod.
3. A downhole deployment system according to claim 1 or 2, further comprising a lateral locator (20) having a body part (21) which is connected with the deployment tool, and a guiding part (22) which is movable in relation to the body part for creating an angle between the body part and the guiding part for guiding the deployment system into the lateral.
4. A downhole deployment system according to any of the preceding claims, wherein the deployment chamber of the deployment tool has a chamber wall (23) in which the tool inlet is arranged.
5. A downhole deployment system according to any of the preceding claims, further comprising a collection chamber tool part (24) comprising at least one collection chamber (25) which is fluidly connected with the second deployment chamber part of the deployment tool through an opening (26) in which a one-way valve (27) is arranged, thereby enabling fluid to be sucked into the second deployment chamber part through a chamber inlet (28) when the piston moves from the first position to the second position, and enabling fluid in the second deployment chamber part to be forced into the collection chamber when the piston moves from the second position to the first position.
6. A downhole deployment system according to any of the preceding claims, further comprising a collection chamber tool part (24) comprising at least one collection chamber (25) which is fluidly connected with the first deployment chamber part of the deployment tool through an opening (26) in which a one-way valve (27) is arranged, thereby preventing a tracer sucked into the first deployment chamber through a collection chamber outlet from flowing back into the collection chamber when the piston moves from the second position to the first position, and enabling the tracer in the first deployment chamber part to be forced out of the collection chamber when the piston moves from the first position to the second position.

7. A downhole deployment system according to claim 5 or 6, wherein the collection chamber is divided into a first collection chamber part (31) and a second collection chamber part (32) by a movable collection piston (33), the first collection chamber part being in fluid communication with the second deployment chamber part of the deployment tool or the second collection chamber part being in fluid communication with the first deployment chamber part of the deployment tool. 5
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8. A downhole deployment system according to any of claims 5-7, wherein a fluid channel (36) in the collection chamber tool part fluidly connects the chamber inlet with the tool inlet or the collection chamber outlet and the tool outlet. 15
9. A downhole deployment system according to any of claims 5-8, wherein the collection chamber tool part is rotatable in relation to the deployment chamber of the tool body. 20
10. A downhole deployment system according to any of the preceding claims, wherein the tracer is arranged in the first deployment chamber part of the deployment tool. 25
11. A downhole deployment system according to any of the preceding claims, wherein the collection chamber tool part comprises a plurality of collection chambers. 30
12. A downhole deployment system according to claim 11, wherein the collection chamber tool part is rotatably connected with the tool body in order to fill several collection chambers by aligning the opening of the chamber with an opening (26) of one of the collection chambers. 35
13. A downhole deployment system according to any of the preceding claims, wherein a one-way valve (27) is arranged in the tool inlet and/or chamber inlet for letting fluid into the deployment tool. 40
14. A downhole deployment system according to any of the preceding claims, further comprising a driving unit (45) for propelling the downhole deployment system forward in the well. 45
15. A production optimising method using the downhole deployment system according to any of the preceding claims, the method comprising the steps of: 50
 - sucking a fluid sample into the deployment tool by moving the shaft of the stroking tool from a first position to a second position, 55
 - forcing the fluid sample into the chamber, and
 - injecting a tracer into the well opposite a pro-

duction zone when moving the shaft from the first position to the second position or from the second position to the first position.



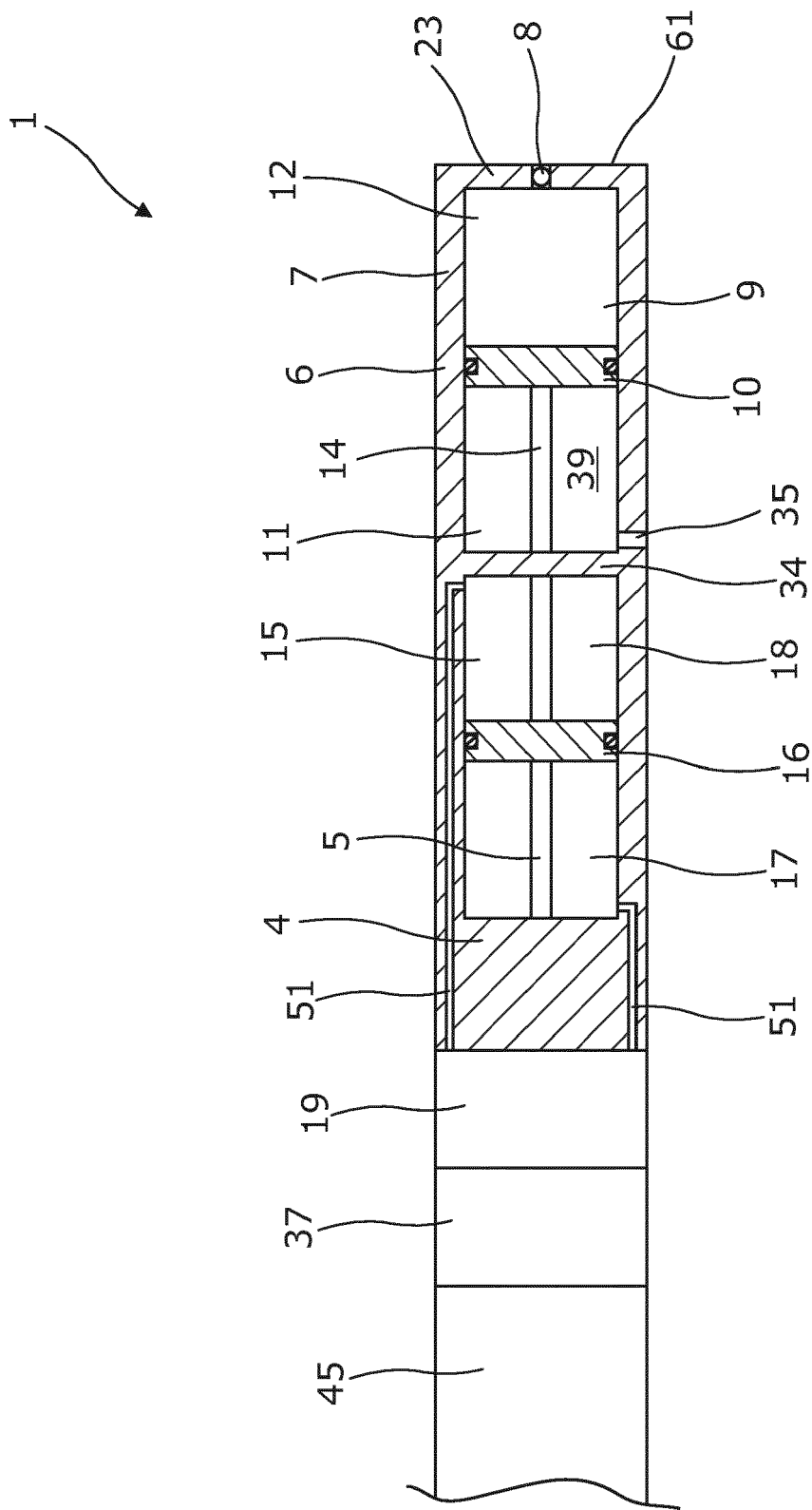


Fig. 2a

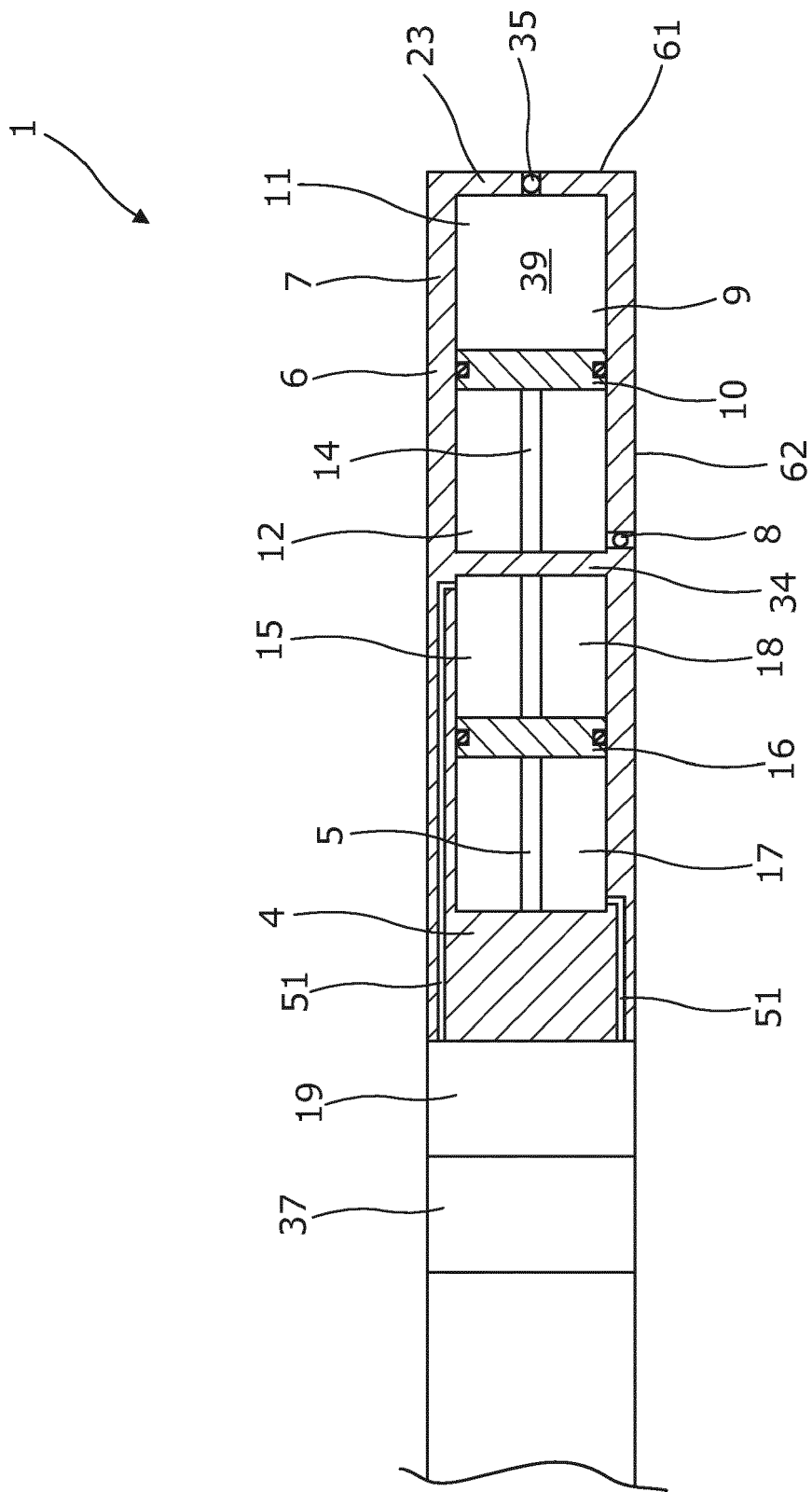


Fig. 2b

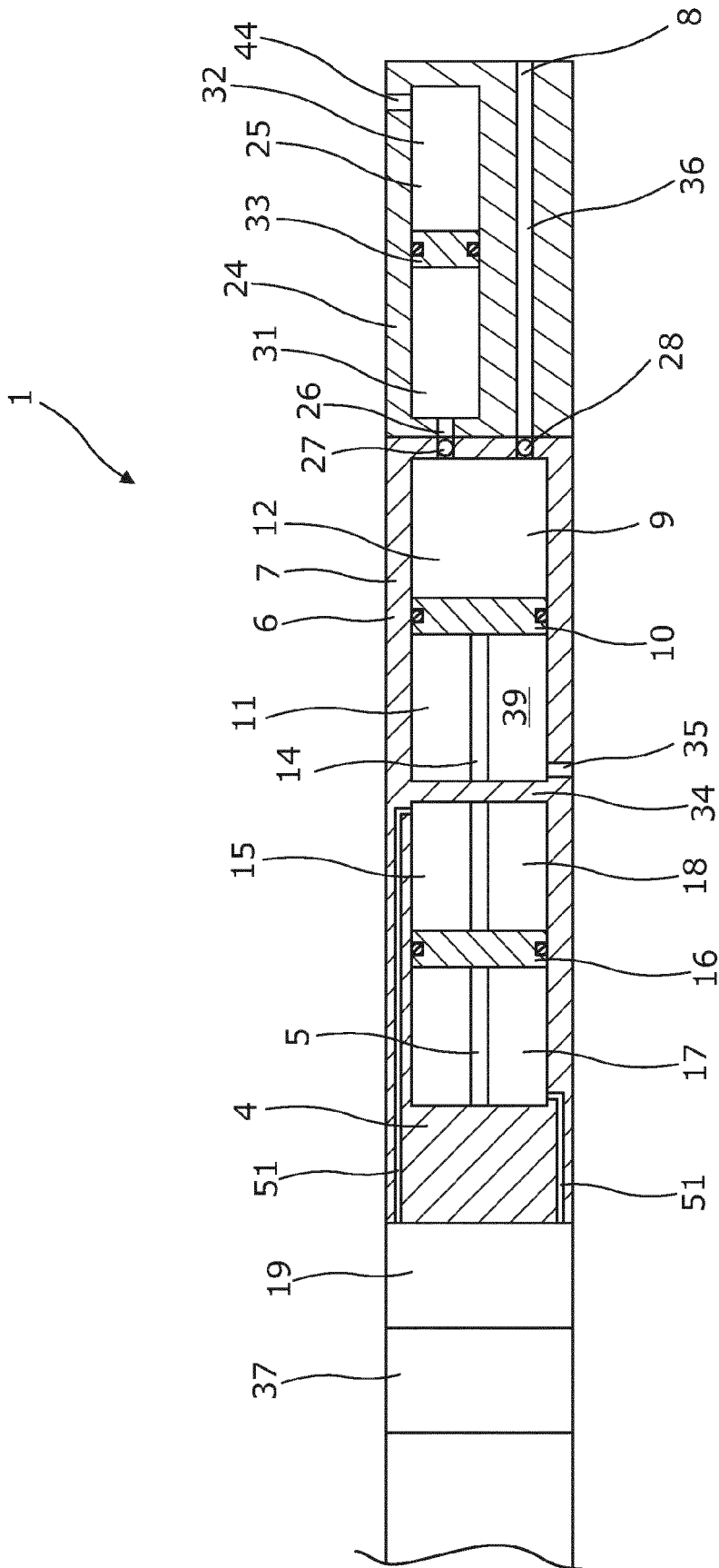
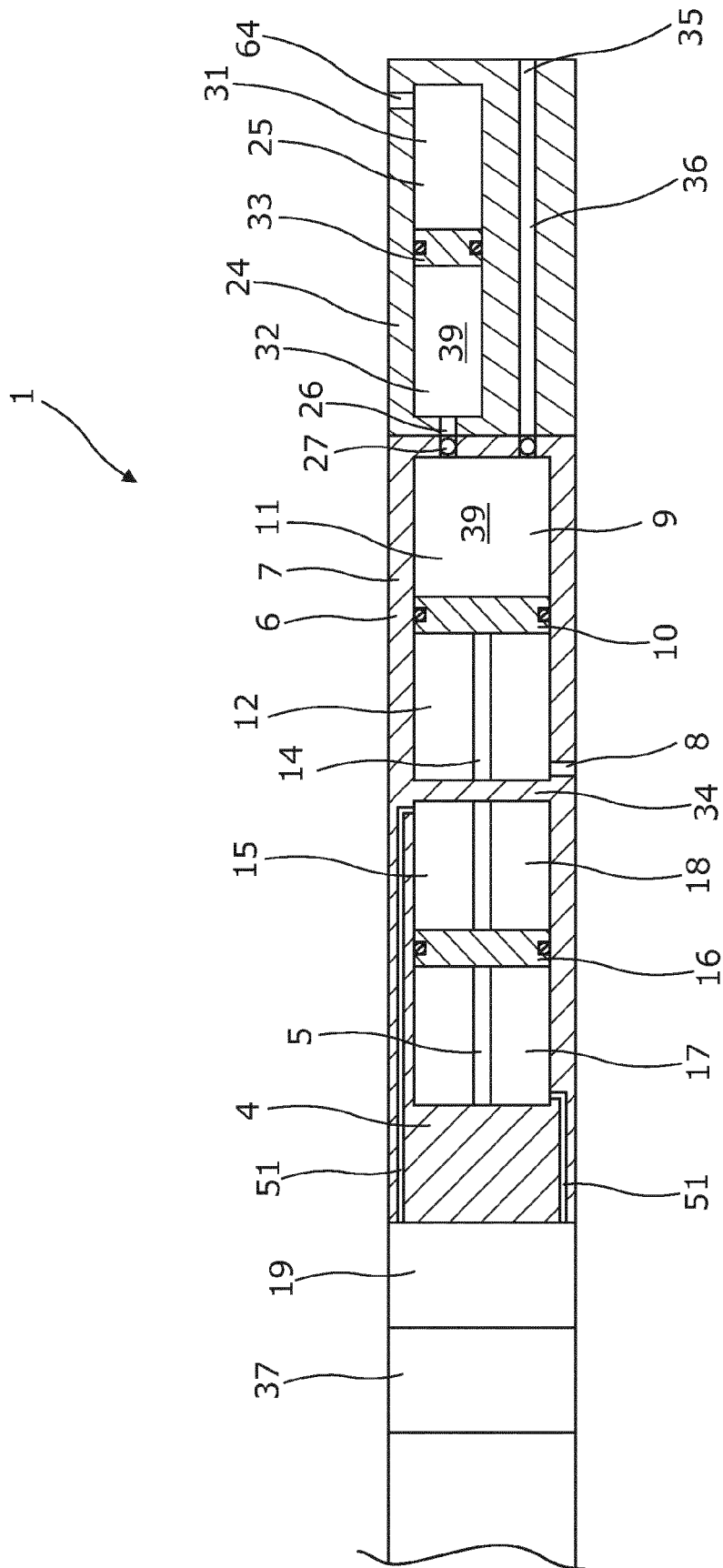


Fig. 3a



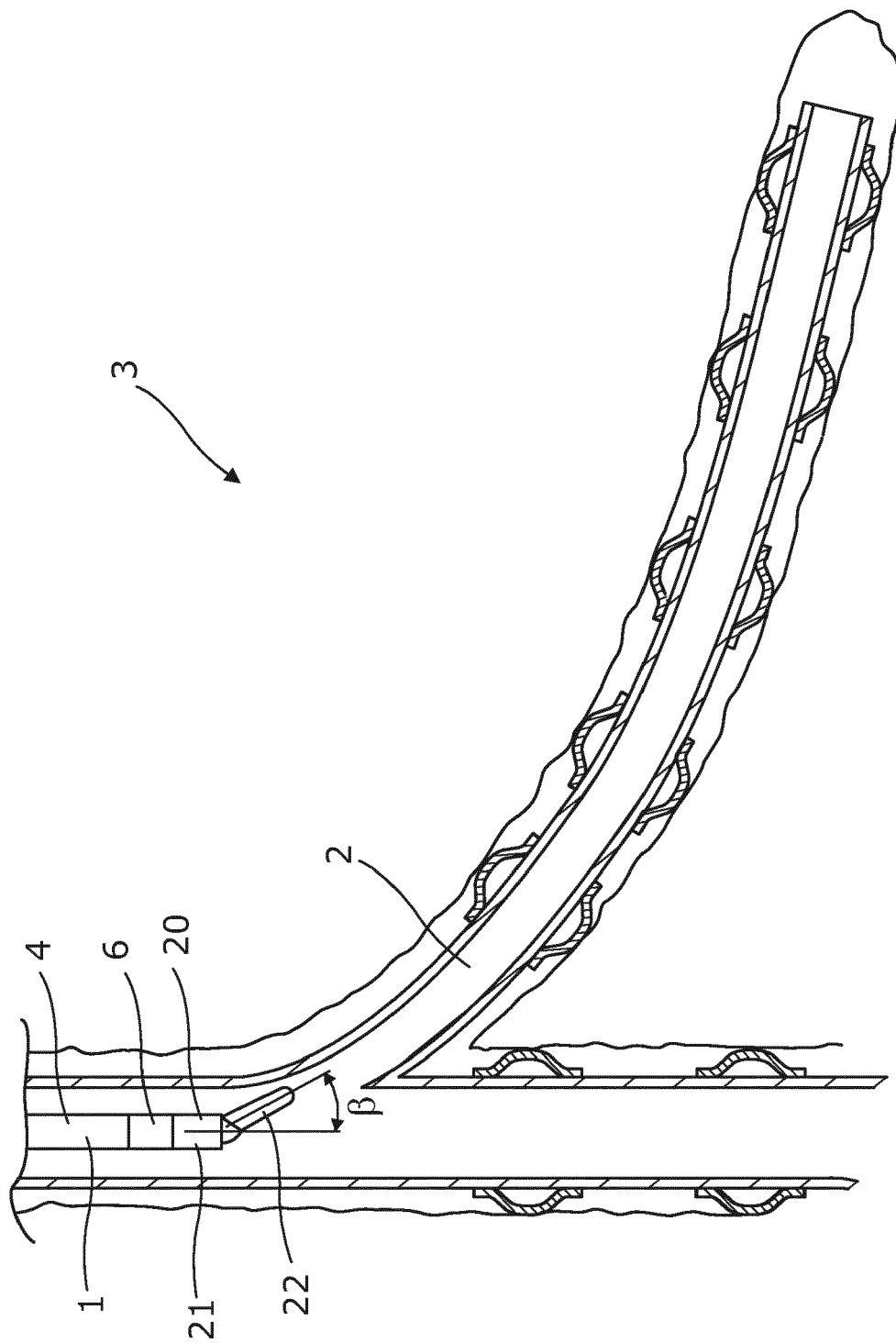


Fig. 4

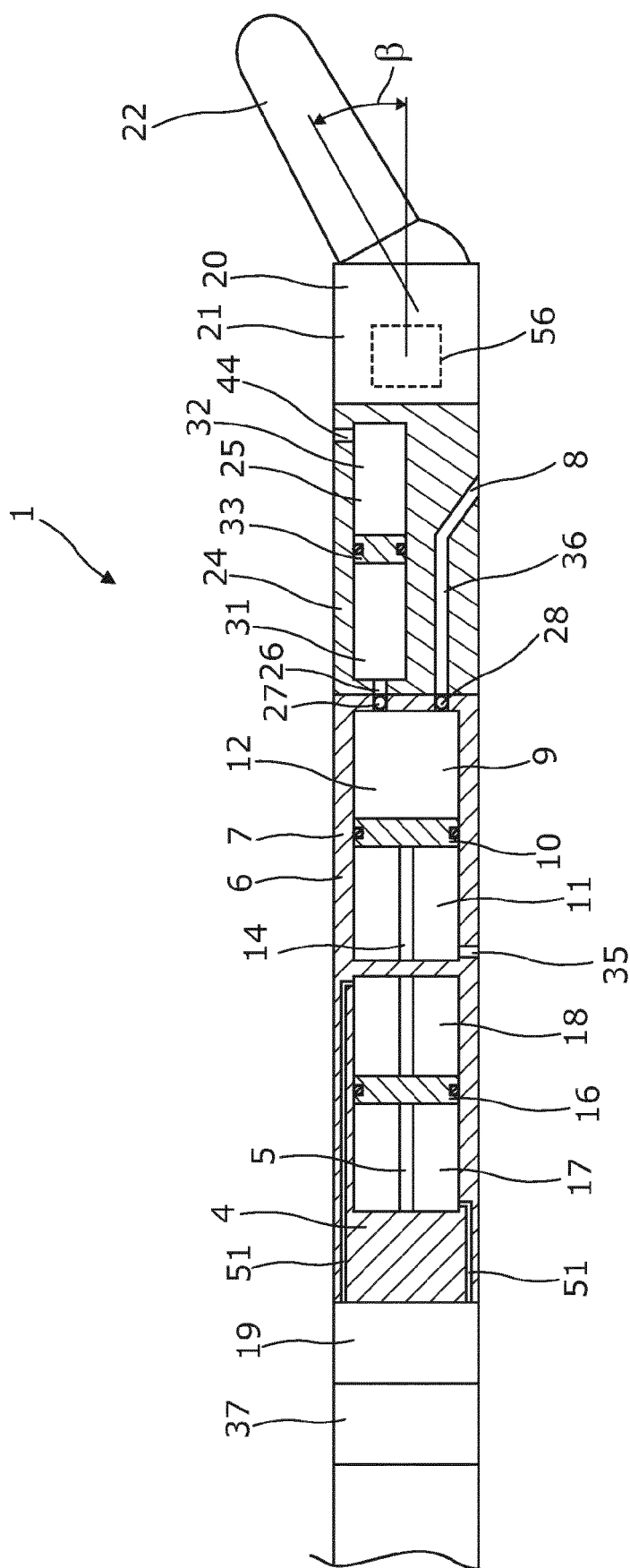


Fig. 5

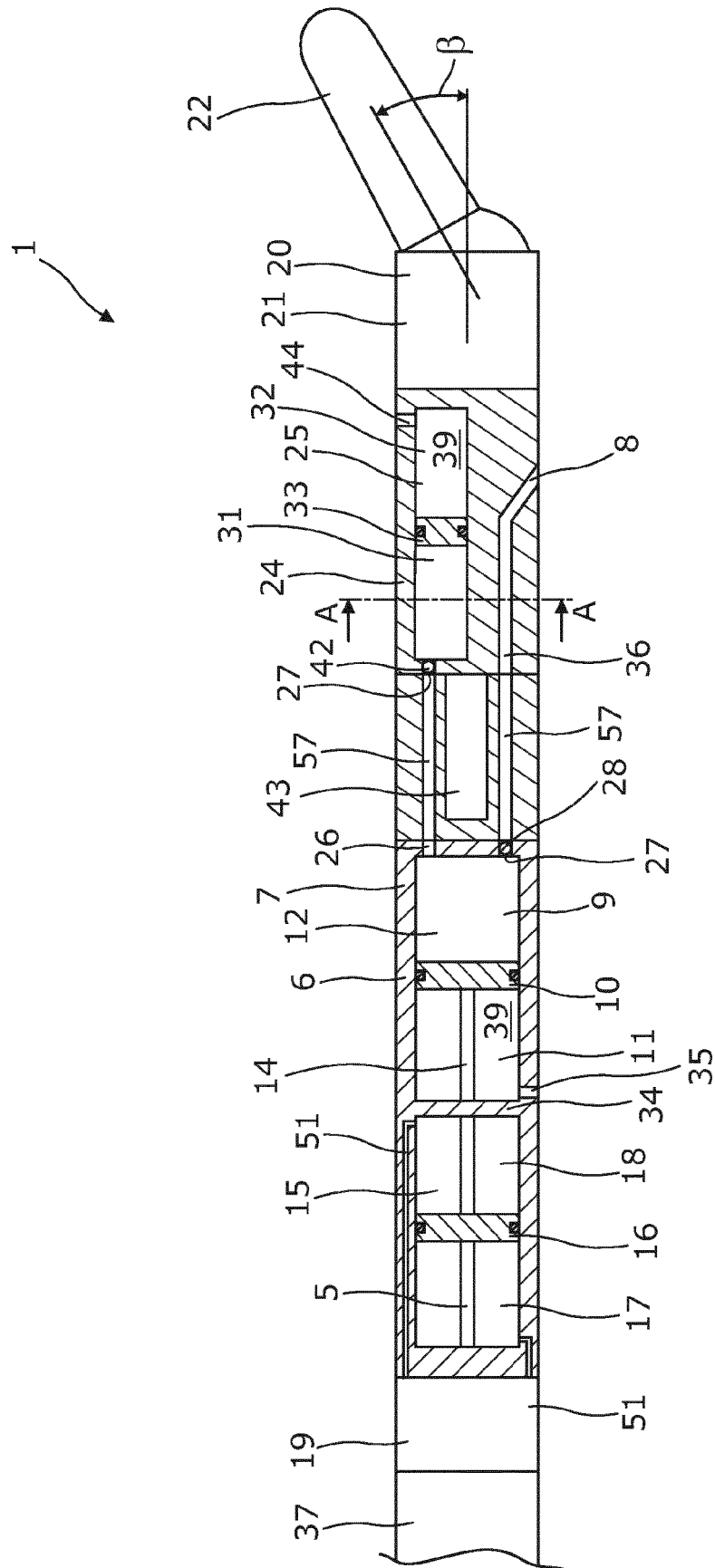


Fig. 6a

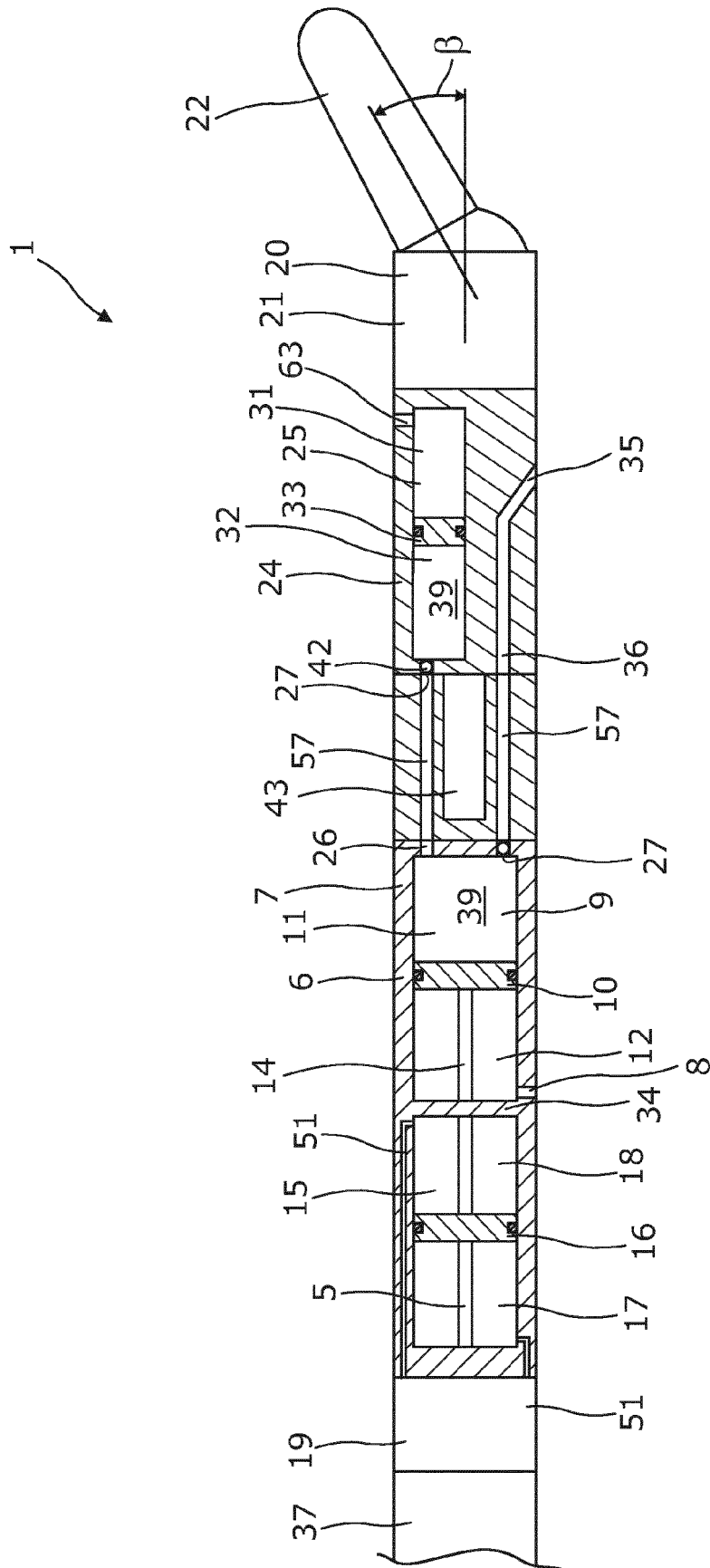


Fig. 6b

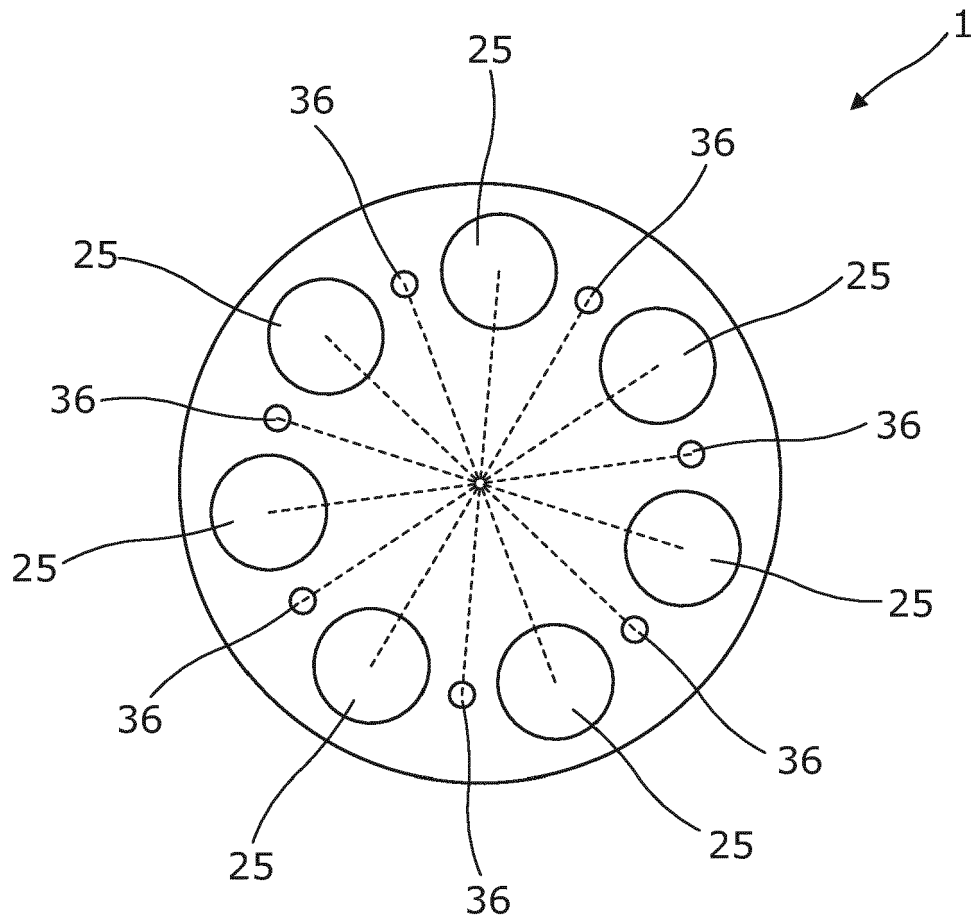


Fig. 7

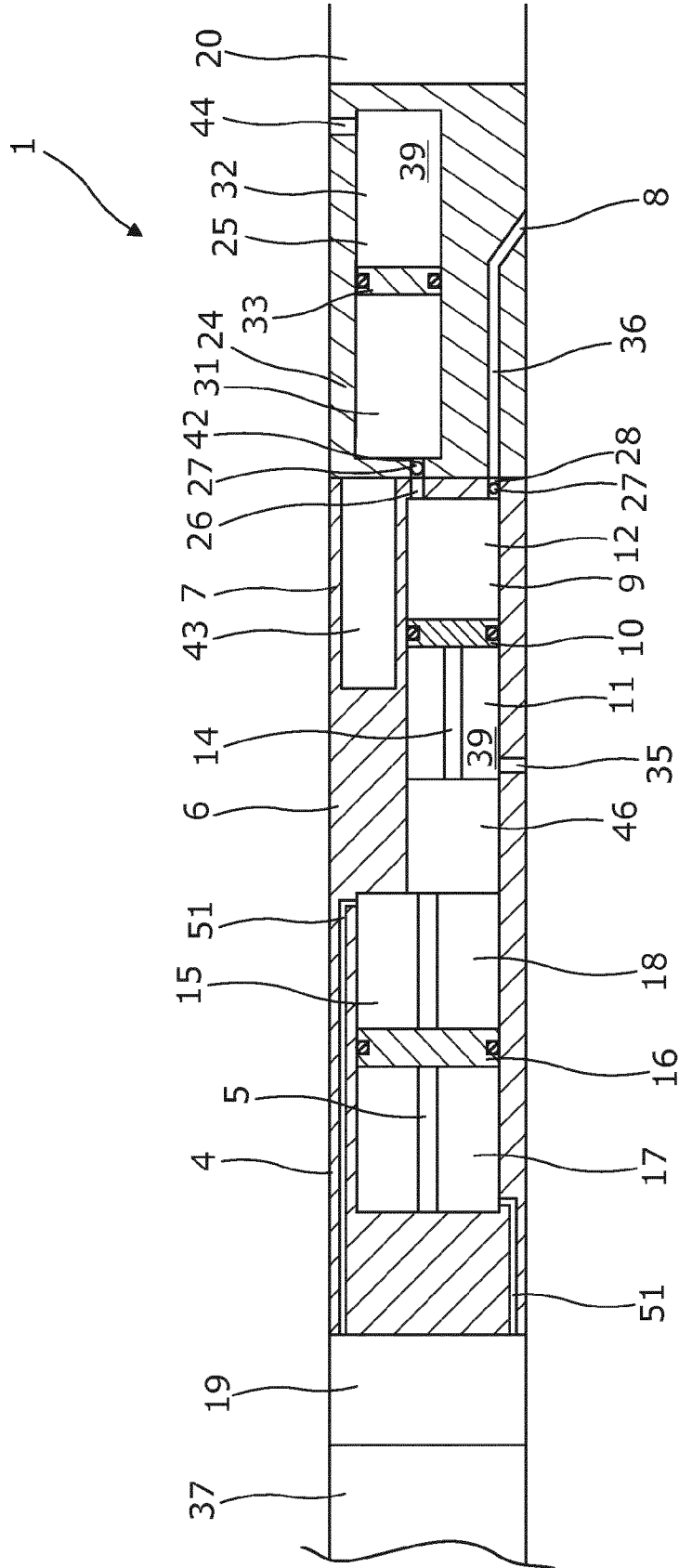


Fig. 8



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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 May 2014	Examiner Dantinne, Patrick
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