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D'ETANCHEITE ANNULAIRE FRONTAL

(54) Title: FLUID TRANSMISSION FLAT-FACE COUPLER WITH FRONTAL ANNULAR SEAL

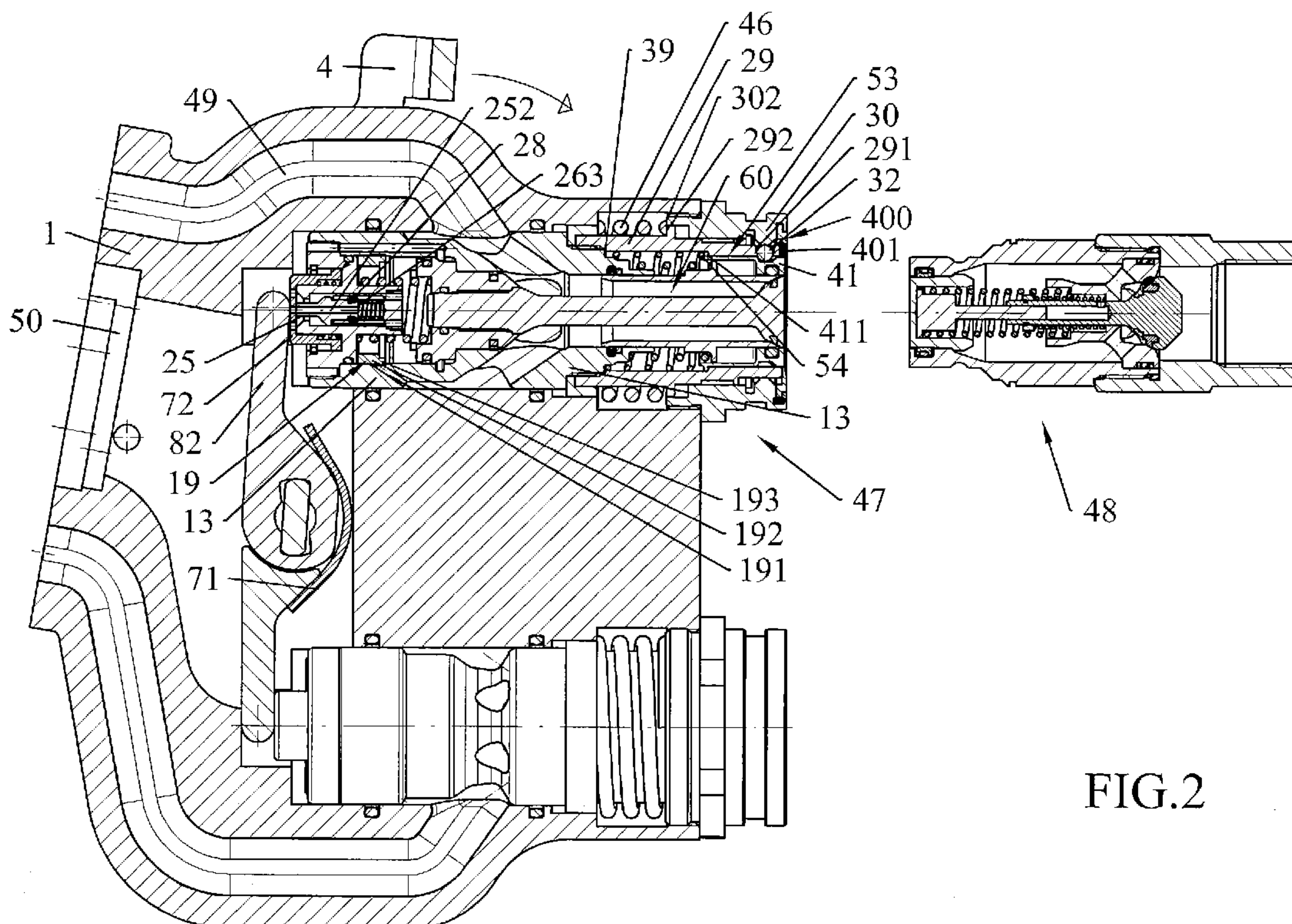


FIG.2

(57) Abrégé/Abstract:

A fluid transmission fitting (100) is described comprising a flat-faced female coupler (47) with a frontal annular seal (400) to protect from the introduction of impurities, when uncoupled, during the step of coupling-uncoupling and when coupled to a flat-faced male coupler (48).

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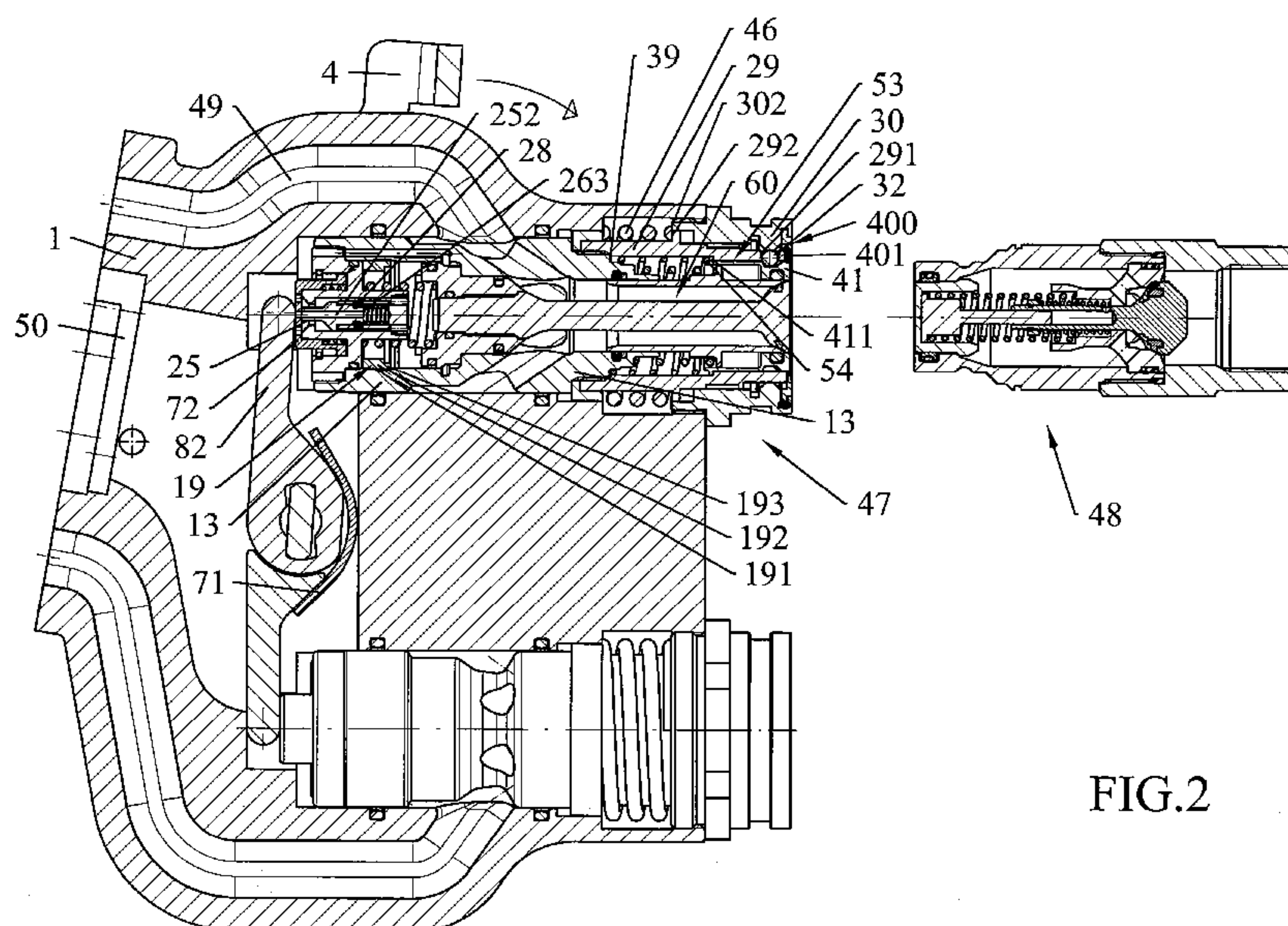


FIG.2

(57) Abstract: A fluid transmission fitting (100) is described comprising a flat-faced female coupler (47) with a frontal annular seal (400) to protect from the introduction of impurities, when uncoupled, during the step of coupling-uncoupling and when coupled to a flat-faced male coupler (48).

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“Fluid transmission flat-face coupler with frontal annular seal”.

* * * *

DESCRIPTION

5 The present invention relates to a fluid transmission flat-face coupler with frontal annular seal.

Fittings which may be rapidly coupled to one another to connect a fluid feed, by means of rigid pipes or flexible hoses, are frequently required for fluid transmission for example in operating machines and hydraulic equipment.

10 The known quick coupling fittings usually consist of two couplings, named male and female, which are fastened to respective pipes to be joined and which can be coupled together by screwing or by snapping.

15 The aforesaid male and female couplers are formed by fixed parts and axially sliding parts, which at rest are arranged in a closing position of a fluid passage gap and during the coupling between two members are displaced by engaging with corresponding parts of the other member to an opening position of said passage gap.

20 The currently marketed fluid transmission solutions show that the coupling between the male coupler and the female coupler is not always very easy with effort increasing incrementally as the residual pressure present in the circuit increases.

25 Italian patent application MI2012A001254 by the present Applicant concerns a fluid transmission coupling connectable with constant effort provided with a pressure compensation and relief system which is complex and not very cost-effective. Said known fitting further comprises a central locking system which is mechanically cumbersome and ineffective in some situations of accidental actuating by the user.

30 US-4540021 describes a fluid transmission fitting with a female coupler, which includes a frontal seal, which prevents the introduction of impurities only when coupled to a male coupler and during the step of

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coupling or uncoupling of the male coupler. A closing plug is provided to prevent the introduction of impurities into the uncoupled female coupler.

5 US-3407847 describes a fluid transmission fitting with a female coupler, which includes a frontal seal, which prevents the introduction of impurities only when coupled to a male coupler and during the step of coupling or uncoupling of the male coupler. Said frontal seal does not cover the wide frontal opening of the female coupler when the female coupler is uncoupled, the impurities thus being disadvantageously able to enter.

10 It is the object of the present invention to make a pipe fitting, in which the effort required for the coupling operation is minimum and independent from the residual pressure present in the circuit.

It is a further object of the present invention to make the fitting mechanically simpler and allow a suitable hydraulic control to guarantee user safety also in the event of accidental actuation.

15 It is a yet further object to prevent the introduction of impurities into the female coupler both if it is uncoupled from the male coupler and if it is coupled to the male coupler and during the step of coupling or uncoupling with or from the male coupler.

20 According to the present invention, such objects are reached by means of a fluid transmission flat face fitting as described in claim 1.

The features of the present invention will be more apparent from the following detailed description of a non-limitative example thereof shown in the accompanying drawings, in which:

25 figure 1 shows a section view taken along line I-I in figure 26 of a fluid transmission fitting with uncoupled male and female coupler with a frontal seal according to a first embodiment;

figure 2 shows a section view similar to the one in figure 1 of the fluid transmission fitting with male coupler and female coupler uncoupled in a step of relieving the residual pressure;

30 figure 3 shows a section view similar to the one in figure 1 of the

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fitting in a first step of coupling between male coupler and female coupler,
with contact between the male coupler and the female coupler;

figures 4 and 5 show section views similar to the one in figure 1 of
the fitting in a second and third step of coupling between male coupler and
5 female coupler, with displacement of the inner part of the male coupler in
the female coupler;

figure 6 shows a section view similar to the one in figure 1 of the
fitting in a fourth step of coupling between male coupler and female coupler,
with displacement of the inner part of the female coupler in the block with a
10 detail enlarged in circle N and opening of the rear pressure relief;

figure 7 shows a section view similar to the one in figure 1 of the
fitting in a second step of coupling between male coupler and female
coupler, with radial displacement of the balls in the female coupler in the
fixing ring nut housing and consequent insertion of the male coupler;

15 figure 8 shows a similar view to the one in figure 1 of the fitting in a
sixth step of coupling between male coupler and female coupler, with
positioning of the male coupler at the fixing balls, with an enlarged detail in
circle Q;

figure 9 shows a similar view to the one in figure 1 of the fitting in a
20 seventh step of coupling between male coupler and female coupler, with
displacement of the outer assembly with locking balls to the locking position
of the male coupler;

figure 10 shows a section view similar to the one in figure 1 of the
fitting in a eighth step of coupling between male coupler and female coupler,
25 with opening of the male valve by effect of the hydraulic thrust caused by
the feeding of the circuit;

figure 11 shows a section view similar to the one in figure 1 of the
fitting in a first step of uncoupling between male coupler and female
coupler, with pressure relief;

30 figure 12 shows a section view similar to the one in figure 1 of the

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fitting in a second step of uncoupling between male coupler and female coupler, with closing of the male valve;

5 figure 13 shows a section view similar to the one in figure 1 of the fitting in a third step of uncoupling between male coupler and female coupler, with displacement of the inner parts until the fixing balls are released, with a detail enlarged in circle S;

figure 14 shows a section view similar to the one in figure 1 of the fitting in a fourth step of uncoupling between male coupler and female coupler, with radial displacement of the fixing balls;

10 figure 15 shows a section view similar to the one in figure 1 of the fitting, with male coupler and female coupler uncoupled;

figure 16 shows an enlarged detail in a circle W of the cam in resting position in figure 1;

15 figure 17 shows a section view taken along line XVII-XVII in figure 16;

figure 18 shows an enlarged detail in a circle U of the cam in a first position rotated as shown in figure 2;

figure 19 shows a section view taken along line XIX-XIX in figure 18;

20 figure 20 shows an enlarged detail in a circle Z of the cam in a second rotated position in figure 13;

figure 21 shows a section view taken along line XXI-XXI in figure 20;

25 figure 22 shows an enlarged detail in a circle V of the cam in a third position rotated in opposite sense as shown in figure 27;

figure 23 shows a section view taken along line XXIII-XXIII in figure 22;

30 figure 24 shows a section view similar to the one in figure 1, of a female coupler with a radial seal, shown enlarged in circle B in accordance with a further embodiment;

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figure 25 shows a section view similar to the one in figure 1, of a female coupler with a radial seal, shown enlarged in circle C in accordance with a yet further embodiment;

5 figure 26 shows a front view of the fitting according to the present invention;

figure 27 shows a section view similar to the one in figure 1 of the fitting in a step of relieving of the residual pressure before the coupling between male coupler and female coupler of the lower hydraulic line;

10 figure 28 shows a section view similar to the one in figure 1 with a second embodiment of a frontal seal shown partially enlarged in circle E mounted on the uncoupled female coupler;

figure 29 shows an enlarged view from the right of the uncoupled female coupler in figure 28;

15 figure 30 shows a section view of the frontal seal in accordance with a first embodiment comprised in the fitting in figure 1;

figure 31 shows a section view of the frontal seal in accordance with a second embodiment comprised in the fitting in figure 28.

20 Figure 1 shows a coupling fitting 100 comprising a flat-faced female coupler 47 inserted in a hydraulic feeding block 1 and a flat-faced male coupler 48 which can be coupled to said female coupler 47.

The block 1, which feeds the fluid, comprises at least one hydraulic line 49 and a draining line 50, both interfacing with one or more female couplers 47.

25 In the description of the operation, reference will be made to only one male-female line (the one shown on the top in the drawings), but the considerations are applicable to all lines of a same fitting. It is worth noting that in the drawings the male-female coupler in the lower line is not shown in section but only as a view, the section being identical to that of the upper line.

30 The block 1 further comprises a lever 4 integral with a cam 7 adapted

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to relieve the pressure from a chamber 54 inside the female coupler 47, and adapted to uncouple the male coupler 48 from the female coupler 47.

5 The cam 7 consists of two parts, an upper one 82, which acts on the coupling of the upper hydraulic line, and a lower one 83, which acts on the coupling of the lower hydraulic line (figure 1).

10 The cams 82, 83 each have a disc-shaped attachment portion 821, 831 (figures 16-23, in which the lower cam 83 is not shown in section for better comprehension of the operation described below) assembled on a central shaft 5 with a substantially rectangular section and rounded short sides 501 (figure 16) so as to allow the rotation of said shaft 5 in loops 822, 832 of said attachment portions 821, 831. The rotation of the central shaft 5 is transmitted by applying stress to the lever 4, which moves the attachment portion 821 of the upper cam 82 clockwise, but being free in the second loop 832 it does not move the attachment portion 831 of the lower cam 83, and moves the attachment portion 831 of the lower cam 83 anticlockwise but by being free in the loop 822 it does not move the attachment portion 821 of the upper cam 82.

20 The shape of said loops 822, 832 is substantially complementary to the shape of the central shaft 5, but their width is greater to allow a rotation clearance such to be able to move one cam 82 while maintaining the other 83 stationary, as will be more apparent below.

The cams 82, 83 are held in position by means of a spring 71, for example a C spring, but two compression springs may be provided. The central shaft 5 is integral with the lever 4, in turn.

25 The female coupler 47 comprises a pressure relief valve 51 which puts said chamber 54 into communication with the draining line 50 (figure 1).

30 Said valve 51 comprises a valve body 23, which forms a housing for a sliding shutter 25, stressed by a spring 26, which reacts against a protrusion of the shutter 25 and a stop 27. Sealing is ensured by the contact

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between a conical surface 251 of the shutter 25 and an edge 231 of the valve body 23 (figure 1).

5 A cup 72 sliding in axial direction and pushed by said upper cam 82 against the opposite thrust of a spring 84 acts on said shutter 25. The upper cam 82 is always in contact with the cup 72, which is pushed by the spring 84 against the cam 82 in releasing position of the shutter 25. Said cup 72 is thus moveable between an engaging position and a releasing position with the shutter 25.

10 The shutter 25 has therein a hole 252 (figure 2) for venting the air and a hydraulic thrust section reduced to the minimum. Such a hydraulic thrust section is determined by the interface diameter between the conical surface 251 of the shutter 25 and the valve body 23, and by the diameter of slightly smaller size of a rear part 263 of the shutter 25 on which a seal 28 acts. The described configuration of the shutter 25 - valve body 23 coupling
15 allows to minimize the actuation force of the shutter 25 itself in presence of residual pressure present inside the chamber 54.

The female coupler 47 further comprises an inner assembly 60 axially sliding inside an outer assembly 53 of the female coupler 47 itself, and a seal 19 adapted to generate a pressure difference between the
20 hydraulic line 49 and the chamber 54.

Said seal 19 is adapted to close a calibrated communication pipe 191 between the chamber 54 and the hydraulic line 49 contained in an inner body 13 (figure 2).

25 Said seal 19 is ring-shaped, determines a radial type sealing, i.e. orthogonal to the axis of the fitting 100, and comprises a non-deformable portion 192 and a deformable portion 193.

Said pipe 191 is external to the chamber 54 and the pressurized fluid flow inside it insists radially outwards from the inside of the chamber 54 at the outer surface of the seal 19.

30 When a given nominal pressure is reached, the deformable portion

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193 bends towards the inside of the chamber 54 thus determining the introduction of pressurized fluid into the chamber 54 of the hydraulic line 49. When the pressure returns under said nominal pressure, the deformable portion 193 returns to its initial position thus obstructing the passage of fluid.

Said seal 19 can be used with identical operating principle also in case of non-flat-faced male-female couplers.

The female coupler 47 has flat faces in resting position (figure 1).

The inner assembly 60 comprises a bottom 35 and a stem 44 with a flat face 441 facing towards the outside of the female coupler 47, integral with each other, and a sealing bush 43 which define a gap 65 (figure 3). The sealing of the gap 65 is ensured by a seal 42 housed in a seat at the end of the stem 44 which is in contact with the sealing bush 43 pushed by the spring 33 which reacts between inner body 13 and an appropriate protrusion 431 of the sealing bush 43 itself (figure 3).

The outer assembly 53 (figure 2) comprises a ring nut holder 29, a ring nut 30 and at least one locking ball 32 arranged inside a housing 291 of the ring nut holder 29.

The housing 304 (figure 3) comprises a deformable elastic member 305 for pushing the balls 32, as will be more apparent below (figure 7).

A spring 46 (figure 2), by reacting against appropriate protrusions 292, 302, against the ring nut 30, the ring nut holder 29 and the block 1, constrains the outer assembly 53 in a central resting position which guarantees the locking of the male coupler 48 after the coupling.

Equally, a cup 41 (figure 2) axially slides in the ring nut holder 29. A spring 54 reacts against a protrusion 411 of the cup 41 and stop shoulder 39 arranged in the inner body 13, also opposing in the case the sliding of the cup 41 in the ring nut holder 29 in coupling position.

The cup 41 further displays a housing 412 adapted to house the balls 32 when the female coupler 47 is uncoupled and a seal 45 which preloads on

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the diameter of the sealing bush 43 thus limiting the introduction of impurities between the two components (figure 6).

5 Near the cup 41 (figure 2), facing the male coupler 48, there is a frontal annular seal 400 with a deformable portion 401 which limits the introduction of impurities with the coupler uncoupled, coupled and in the steps of coupling/uncoupling, as will more apparent below.

In case of coupling with the male coupler 48, the bottom 35 slides within the inner body 13 and is stressed by a spring 38 which reacts against the valve body 23 (figure 13).

10 The bottom 35 has two seals 14 and 17 (figure 9) on the side of the hydraulic line 49 and on that of the chamber 54, respectively. The zone comprised between the two seals 14, 17 is in contact with the draining line 50 by means of the pipe 56.

15 The male coupler 48 is shown, in turn, in figure 1 and comprises a male body 448 onto the rear of which a fitting 140 with an inner pipe 61 is associated for connecting to a user (not shown), e.g. hydraulic equipment. Such a male coupler 48 may include one or more valves therein. The present description refers to a male coupler with two inner valves.

20 A first valve 101 (figure 1) is present at the interface with the female coupler 47 and comprises a front closing piston 8 provided with a guide rod 2 for a spring 3. The sealing between the male body 448 and the piston 8 is guaranteed by a seal 51 housed in an annular seal of the body near a front end of the male body 448. By engaging with the seal 51, the piston 8 frontally seals a cavity 63 when the male coupler 48 is uncoupled from the
25 female coupler 47.

A second valve 102 is present in the central part of the male coupler 48 and comprises a valve body 11 crossed by a plurality of holes 62. The valves 101 and 102, together with the male body 448, define a cavity 63 with no residual pressure. The sealing of the valve 102 is ensured by the
30 seals 90 and by the seal 120 placed on the shutter 18 which runs inside the

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valve body 11.

Residual pressure may be present in one or more of the hydraulic lines 49 in operation. By moving the lever 4 (figure 2) rightwards, the upper cam 82 is actuated which puts the hydraulic line 49 into connection with the draining line 50 by touching the shutter 25 by means of the cup 72 and allows to relieve the internal residual pressure (figure 2).

During such a function, the seal 19 is radially deformed at the deformable portion 193 allowing the passage of fluid through the pipe 191.

During this step, the lower cam 83 does not move because the shaft 5 by rotating rightwards meets a side of the loop 822 of the upper cam 82 feeding it, while the loop 832 of the attachment portion 831 is sufficiently wide to make the shaft 5 rotate without touching any of its sides (figures 18-19).

The force applied by the lever 4 must be such to overcome the resistance of the spring 71, which in all cases holds the lower cam 83 in position.

Having relieved the residual pressure inside the line 49, the system is ready for coupling.

The first coupling step (figure 4) consists in pushing the male coupler 48 into the female coupler 47 by applying pressure on the flat face 441 of the stem 44. In absence of residual pressure in the pipe 61, the load of the springs 38 of the female coupler and of the springs 9, 16 of the male coupler is equivalent, so that the sealing bush 43 of the female coupler and the valves 101, 102 of the male coupler open. In case of pressure in the pipe 61, there is no residual pressure in the chamber 63 comprised between the valves 101 and 102 of the male coupler 48, the residual pressure being retained upstream of the valve 102 at the pipe 61. By approaching the male coupler 48 to the female coupler 47, the piston 8 comes into contact with the stem 44, which is integral with the bottom 35, the seal 37, and the sealing bush 43, which form the inner assembly 60.

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The seal 37 ensures the sealing between the end part of the stem 44 and the bottom 35.

The male body 448 makes the cup 41 (figure 4-5) retract by pushing the male coupler 48 into the female coupler 47.

5 By continuing the thrust of the male coupler towards the female coupler, the cup 41 comes into contact with the balls 32, which, in turn, are in contact with the ring nut holder 19, and thus the entire outer assembly 53 is displaced towards the inside of the female coupler 47 (figure 6).

10 At this point, with the upper cam 82 abutting onto the block 1 and continuing the retraction of the valve body 23, the shutter 25 encounters the cup 72 and relieves the pressure generated in the chamber 54 (figure 6).

15 By relieving the pressure in the chamber 54, the entire inner assembly 60 can retract because it is pushed by the piston 8, which is in contact with the rod 2 and locked on the valve 18, which cannot open due to presence of rear pressure (figure 8).

During the insertion of the male coupler 48 in the female coupler 47 (figures 7-8), the locking balls 32 exit from the seat 412 of the cup 41 and are in contact with a deformable element 305.

20 The deformable member 305 is deformed by turning clockwise pushed radially by the ball 32 exiting from the seat 412. When the male body 448 is in position such to face the housing 49 of the ball 32, the deformable member 305 pushes the ball 32 within the housing 49 (figures 8-9).

25 In this position, the spring 46 returns the assembly consisting of the outer assembly 53 and the male coupler 48 to the coupled balanced position by working on the shoulder 292 of the lock ring holder 29 (figure 9). In case of absence of pressure in the pipe 61, as mentioned above, the inner assembly 60 is not moved and held in position by the spring 38, thus the sealing bush 43 and the shutter 18 are retracted and in this case the circuit is
30 open and the coupler is coupled as shown in figure 10.

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Before the coupling, the frontal annular seal 400 preloads between ring nut 30, ring nut holder 29 and cup 41 (figures 1 and 2) thus closing any gap which could permit the introduction of impurities into the female coupler 47 also when it is uncoupled from the male coupler 48 together with the flat face 441 of the stem 44.

During the coupling, the deformable portion 401 of the annular seal 400 preloads the outer diameter of the male body 448, thus cleaning any impurities present on such a diameter and preventing carrying them into the female coupler (circle N in figure 6). After coupling, the annular seal 400 preloads the ring nut 30, ring nut holder 29 and outer diameter of the male body 448 (figure 9), thus preventing the introduction of impurities between these components.

During coupling, the deformable coupling 401 rotates clockwise (i.e. is pushed towards the inside of the female coupler 47), during uncoupling the deformable portion 401 rotates counterclockwise (is pushed outwards by sliding on the male coupling 48).

The manual mechanical coupling operation is complete at this point (figure 9); the male coupler 48 is mechanically coupled to the female coupler 47, but by virtue of the fact that the inner assembly 60 was moved towards the inside of the female coupler 47, the valve 102 which retains the residual pressure in the pipe 61 of the male coupler 48 is still not open. Thus, the effort required for the coupling operation is independent from the residual pressure present inside the male coupler 48 because it does not work on the valves which retain the residual pressure.

The valve 102 (figure 10) is opened by displacing the inner assembly 60 of the female coupler 47 towards the inside of the male coupler 48 with hydraulic actuation by sending a pressure impulse of the hydraulic line 49.

The hydraulic actuation is achieved by virtue of the deformable portion 193 of the seal 19, which could permit the introduction of fluid from the hydraulic line 49 into the chamber 54 and the consequent thrust on the

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sealing surface of the bottom 35 which moves the inner assembly 60 towards the male coupler 48. The sealing bush 43 is held in contact with the cup 41, which, in turn, is blocked by the male body 448, and thus the sealing bush 43 opens by overcoming the force of the spring 33.

5 By continuing its movement towards the male coupler 48, the inner assembly 60 pushes the piston 8 and the rod 2 which comes into contact with the shutter 18, which opens the valve 102, thus releasing the residual pressure and fully opening the passage for the flow of fluid.

10 The male coupler could also have another valve inside the valve 102 with the purpose of reducing the hydraulic thrust section.

The inner assembly 60 stops when the bottom 35 abuts on the shoulder 36 of the inner body 13 (figure 10). In this position, the chamber 54 remains full of oil and pressurized, and no longer allows the movement of the inner assembly 60 except for a movement of the shutter 25 because the seal 19 does not allow the return of fluid towards the hydraulic line 49.

15 The uncoupling between male coupler 48 and female coupler 47 starts by acting on the lever 4 (figure 11) which moves the upper cam 82, according to the same methods as the initial relieving described above shown in figures 2, 18 and 19, which acts on the shutter 25 by means of the cup 72 putting the hydraulic line 49 into communication with the draining line 50, thus discharging the pressure inside them. In case of pressure and possible flow in the hydraulic line 49 (e.g. caused by a load applied upstream of the male coupler), by actuating the shutter 25 there is a drop of pressure in the chamber 54, while the presence of the seal 19 and of the calibrated pipe 191 causes a higher pressure in the hydraulic line 49, which acts on the seal 14 causing a thrust on the inner assembly 60, which overcomes the spring 38 and thus moves the inner assembly 60 itself, the piston 8 and the shutter 18 which close (figure 12).

25 Continuing the movement, the upper cam 82 pushes the cup 72 to act on the valve body 23, which in turn moves the whole formed by female
30

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coupler 47 and male coupler 48 outwards the locking balls 32 with the recess 303 on the fixing ring nut 30. In such a position, the locking balls 32 exit from the recess 49 in the male body 448 and release it letting it out (figures 13-14).

5 It is worth noting that the loop 832 of the lower cam 83 is sufficiently wide to allow a double movement of the upper cam 82 at the end of the second movement, the shaft 5 nearly abutting onto a side of said loop 832 (figures 20-21).

10 The unrestrained male coupler 48 is uncoupled by effect of the thrust of the inner springs. Having released the balls 32, the spring 46 returns the female coupler 47 to the resting position by working on the ring 34 (figures 15 and 1).

15 It is worth noting that during the steps of uncoupling, the deformable portion 401 of the seal 400 rotates outwards stressed and distanced by the male coupler. The final return of the outer assembly 53 returns the seal 400 to the initial position in figure 1 for elastic return.

 After having released the lever 4, the system is ready for a new connection.

20 The female coupler 47 coupled by means of the locking balls 32 is fed outwards when coupled, if the male coupler 48 is pulled. When the locking balls 32 reach the recess 303 of the ring nut 30, the male coupler 48 is uncoupled (accidental uncoupling, "breakaway" function).

25 The engagement of the lower line is similar to that of the upper line it being worth noting that the lever 4 moves leftwards in opposite direction (figure 27): the interaction between the shaft 5 and the attachment portion 831 of the lower cam 83 is similar to that described above for the attachment portion 821 of the upper cam 82, in which the loop 822 allows the rotation of the attachment portion 831 of the lower cam 83 without moving the upper cam 82.

30 Figures 24-25 show female couplers 47 with seals 19 according to

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two further embodiments.

The seal 19 in figure 24 is not placed directly on the mouth of the pipe 191, there being provided an annular gap 194 obtained on the valve body 23 which allows to limit the wear of the seal 19 itself, which again includes a non-deformable portion 192 and a deformable portion 193.

Said gap 194 allows to direct the pressurized flow exiting from the mouth of the pipe 191 firstly towards the non-deformable portion 192, then onto the deformable portion 193, on both sides of said mouth of the pipe 191.

Said deformable portion 193 has a reduced thickness with respect to the non-deformable portion 192, which is further reduced by moving away from the non-deformable portion 192. When there is pressure in the chamber 54, the deformable portion 193 presses on a conical surface 232 of the valve body 23. When there is no pressure in the chamber 54, the pressurized fluid in the hydraulic line 49 bends the deformable portion 193 inwards starting from the most distant part from the non-deformable portion 192.

The seal 19 in figure 25 instead includes the non-deformable portion 192 made of more rigid material directly on the mouth of the pipe 191.

Said non-deformable portion 192 has an L-shaped section and is adapted to direct the pressurized fluid coming from the pipe 191 towards the deformable portion 193 which does not face the mouth of the pipe 191 directly. As apparent in the enlargement shown in circle C, the L is rotated by 90° clockwise to form an annular gap 194 also in this case: the short part of the L closes an end of the mouth of the pipe 191, while the longer part of the L of the pipe 191, directs the pressurized fluid towards the deformable portion 193 of the seal 19.

Consequently, the wear of the seal 19 is limited also in this second embodiment which indeed derives from the direct interaction between the mouth of the pipe 191 and the deformable portion 193 of the seal 192, which is excluded in this manner.

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5 Figures 28-31 show a frontal annular seal 500 in accordance with a second embodiment comprising again a deformable position 501, which respect to said first embodiment 400 includes a resting surface 502 for the ring nut holder 29, which ends on the cup 41, also inclined when the seal 500 is disassembled (compare figures 30 and 31).

As shown in circle E in figure 28, the surface 502 frontally preloads on the ring nut holder 29, while on the cup 41 the preload is circumferential, an edge 503 of the seal 500 being concerned.

10 It is worth noting that the resting surface 402 of the first seal 400 is in line (vertical) with the flat face 441 of the stem 44, while the resting surface 502 of the second seal 500 is inclined with the seal 500 both mounted (figure 28) and disassembled from the female coupler 47 (figure 31).

15 This determines a greater preload on the ring nut holder 29 and on the cup 41, thus preventing the even accidental lifting of the deformable portion 501, for example if the operator, before coupling, attempts to remove the residual dirt from the flat face 441 of the rod 44 manually.

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CLAIMS

1. A fluid transmission fitting (100) comprising a flat-faced female coupler (47) inserted in a hydraulic feeding block (1) belonging to the fitting (100), and a male coupler (48), which can be coupled to said female coupler (47),
- 5 said block (1) including at least one hydraulic line (49) and a draining line (50), and a lever (4) integral with a cam (7) adapted to relieve the pressure from a chamber (54) inside each female coupler (47) and adapted to uncouple the male coupler (48) from the female coupler (47),
- 10 said female coupler (47) comprising a pressure relief valve (51) which puts said chamber (54) into communication with the draining line (50),
- characterized in that
- the female coupler (47) further comprises an inner assembly (60)
- 15 axially sliding within the outer assembly (53) of the female coupler (47) itself,
- said inner assembly (60) comprising a bottom (35) and a stem (44) with a flat face (441) facing towards the outside of the female coupler (47), integral with each other, and a sealing bush (43) which define a gap (65),
- 20 said outer assembly (53) comprising a ring nut holder (29), a ring nut (30) and at least one locking ball (32) arranged inside a housing (291) of the ring nut holder (29),
- said female connector (47) further comprising a frontal annular seal (400, 500) supported by said ring nut (30) facing the male coupler (48) with
- 25 a deformable portion (401, 501) which prevents the introduction of impurities into the female coupler (47) if it is uncoupled from the male coupler (48) or if it is coupled to the male coupler (48), and in the steps of coupling/uncoupling,
- and the deformable portion (401, 501) rotating clockwise towards the
- 30 inside of the female coupler (47) during coupling, the deformable portion

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(401, 501) rotating counter-clockwise towards the outside of the female coupler (47) and sliding on the male coupler (48) during uncoupling,

5 in case of female coupler (47) uncoupled from the male coupler (48), the frontal annular seal (400, 500) preloading ring nut (30), ring nut holder (29) and cup (41), thus closing any gap which could permit the introduction of impurities into the female coupler (47) together with the flat face (441) of the stem (44).

10 2. A fitting (100) according to claim 1, characterized in that the deformable portion (501) of the frontal annular seal (500) includes a resting surface (502) for the ring nut holder (29) and a resting edge (503) for the cup (41), said surface (502) being inclined with respect to the first face (441) of the stem (40) when the seal (500) is mounted on the female coupler (47) uncoupled from the male coupler (48), said surface (502) frontally preloading the ring nut holder (29), while the preload on the cup (41) is circumferential, being concerned the edge (503) of the seal (500).

15 3. A fitting (100) according to claim 1 or 2, characterized in that said cup (41) includes a further seal (45) which preloads the diameter of the sealing bush (43) thereby limiting the introduction of impurities between these components.

20 4. A fitting (100) according to any one of the preceding claims, characterized in that a housing (304) of the ring nut (30) comprises a deformable member (305) adapted to push the locking ball (32) radially towards the housing (49) of the male body (4).

25 5. A fluid transmission fitting (100) comprising a flat-faced female coupler (47) inserted in a hydraulic feeding block (1) belonging to the fitting (100), and a male coupler (48), which can be coupled to said female coupler (47),

30 said block (1) including at least one hydraulic line (49) and a draining line (50), and a lever (4) integral with a cam (7) adapted to relieve the pressure from a chamber (54) inside each female coupler (47) and

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adapted to uncouple the male coupler (48) from the female coupler (47),

said female coupler (47) comprising a pressure relief valve (51) which puts said chamber (54) into communication with the draining line (50),

5 characterized in that

the female coupler (47) further comprises an inner assembly (60) axially sliding within the outer assembly (53) of the female coupler (47) itself,

10 said inner assembly (60) comprising a bottom (35) and a stem (44) with a flat face (441) facing towards the outside of the female coupler (47), integral with each other, and a sealing bush (43) which define a gap (65),

said outer assembly (53) comprising a ring nut holder (29), a ring nut (30) and at least one locking ball (32) arranged inside a housing (291) of the ring nut holder (29),

15 said cup (41) being axially sliding within the ring nut holder (29) and including a housing (412) for said locking ball (32).

20 6. A fitting (100) according to claim 5, characterized in that said female coupling (47) further comprises a frontal annular seal (400, 500) supported by said ring nut (30) facing the male coupler (48) with a deformable portion (401, 501) that prevents the introduction of impurities in the female coupler (47) if uncoupled from the male coupler (48), if coupled to the male coupler (48), and during the steps of coupling/uncoupling,

25 and the deformable portion (401, 501) rotating clockwise towards the inside of the female coupler (47) during coupling, the deformable portion (401, 501) rotating counter-clockwise towards the outside of the female coupler (47) and sliding on the male coupler (48) during uncoupling,

30 in case of female coupler (47) uncoupled from the male coupler (48), the frontal annular seal (400, 500) preloading ring nut (30), ring nut holder (29) and cup (41), thus closing any gap which could permit the introduction of impurities into the female coupler (47) together with the flat face (441) of

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the stem (44).

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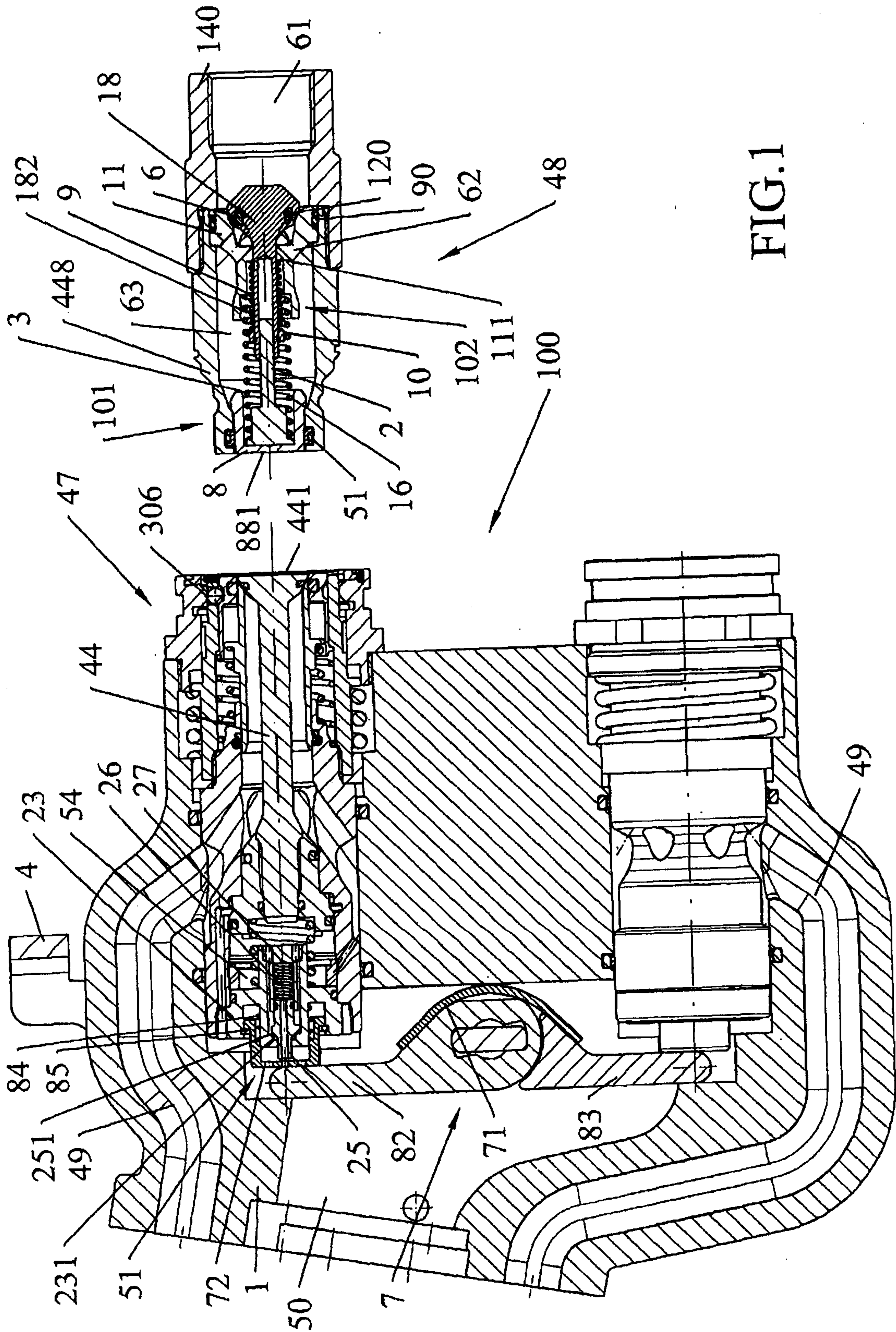


FIG.1

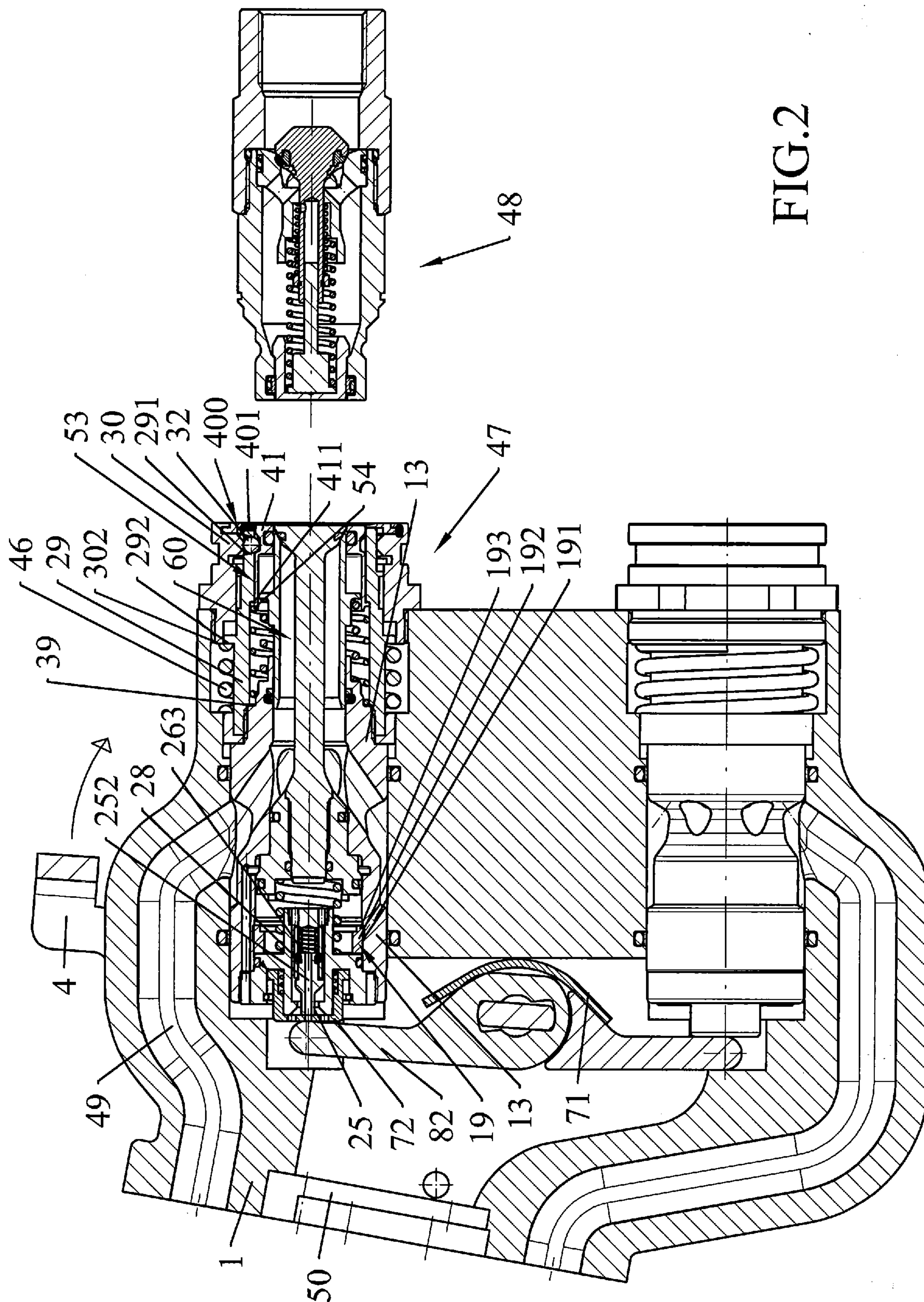


FIG. 2

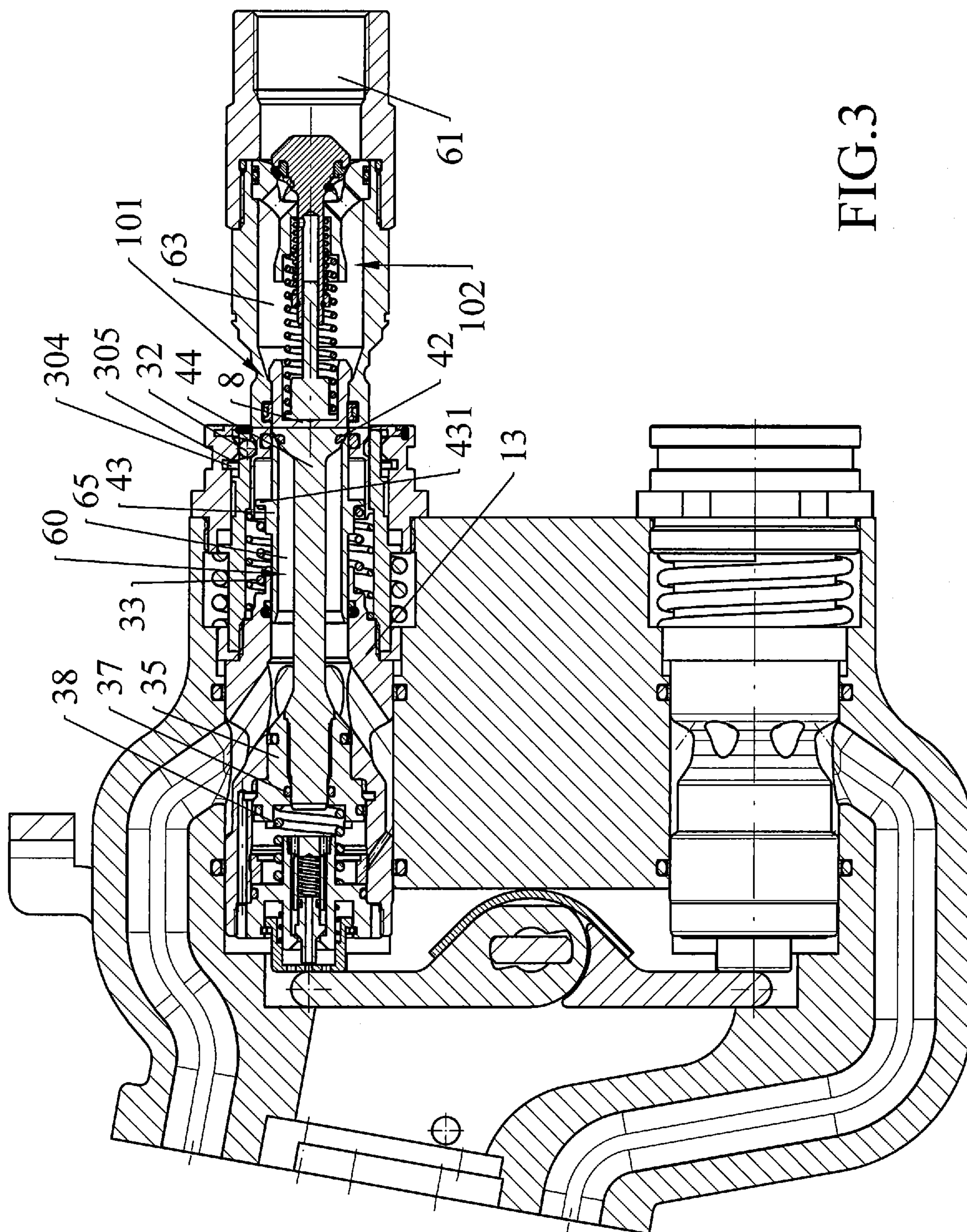


FIG. 3

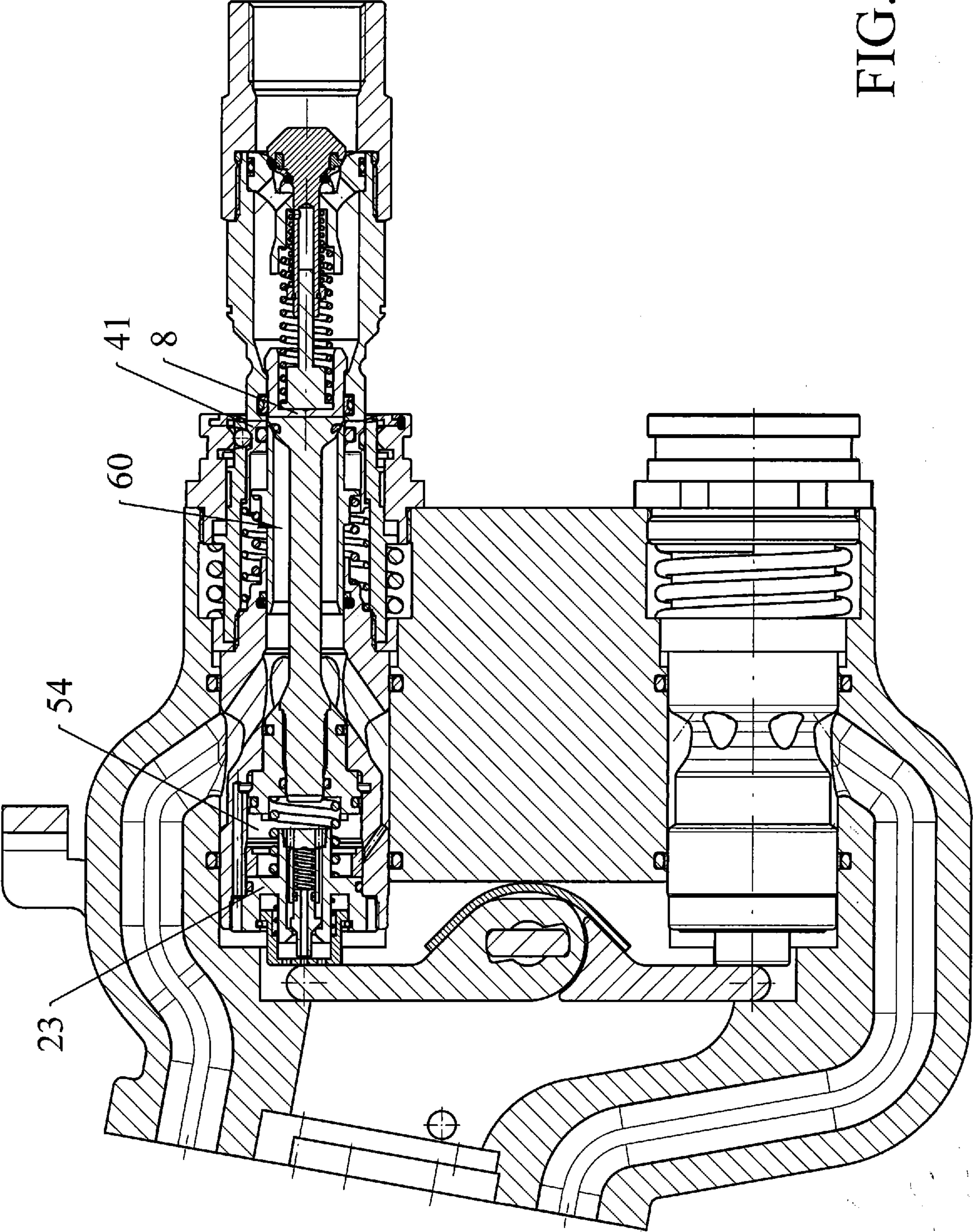


FIG.4

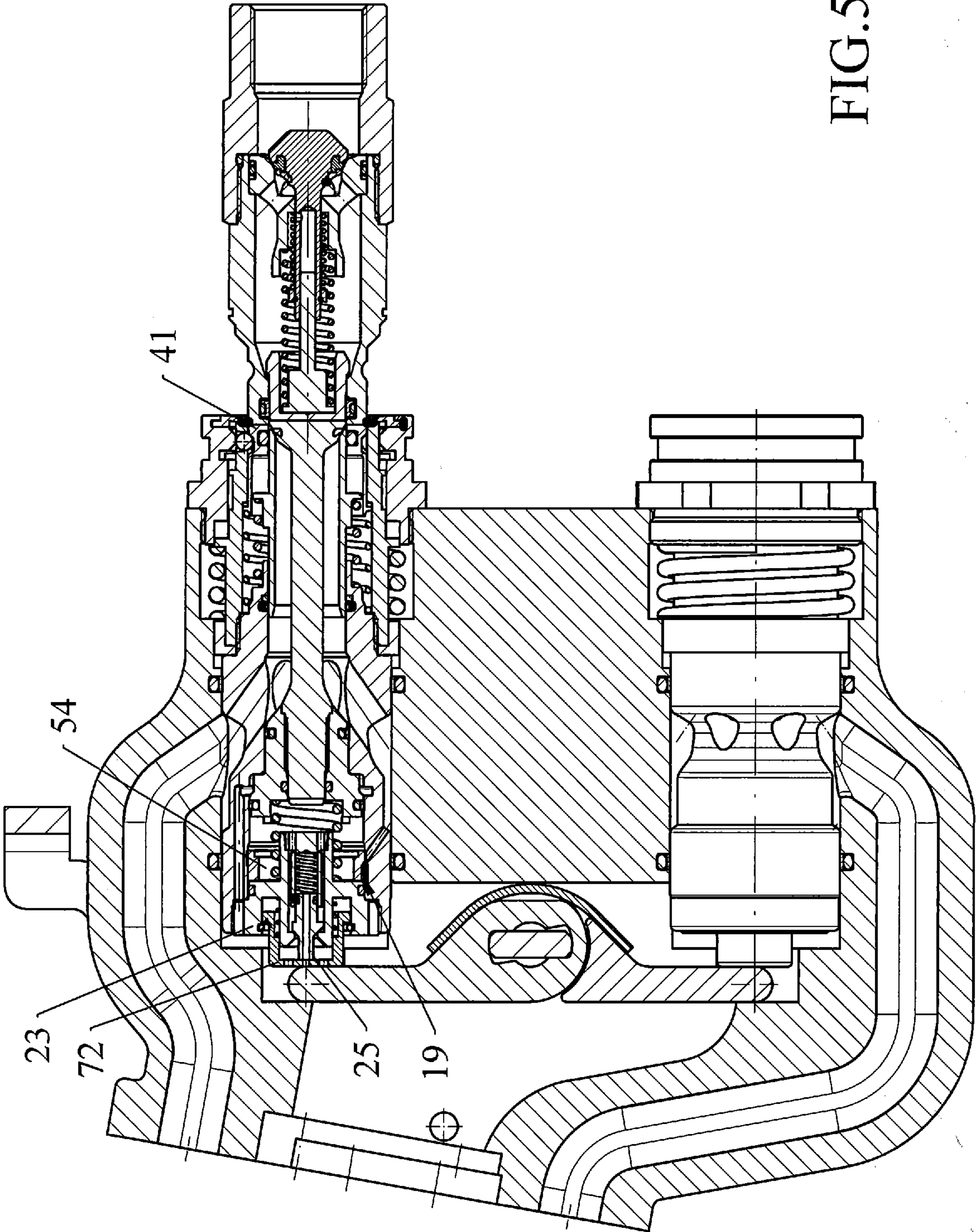


FIG.5

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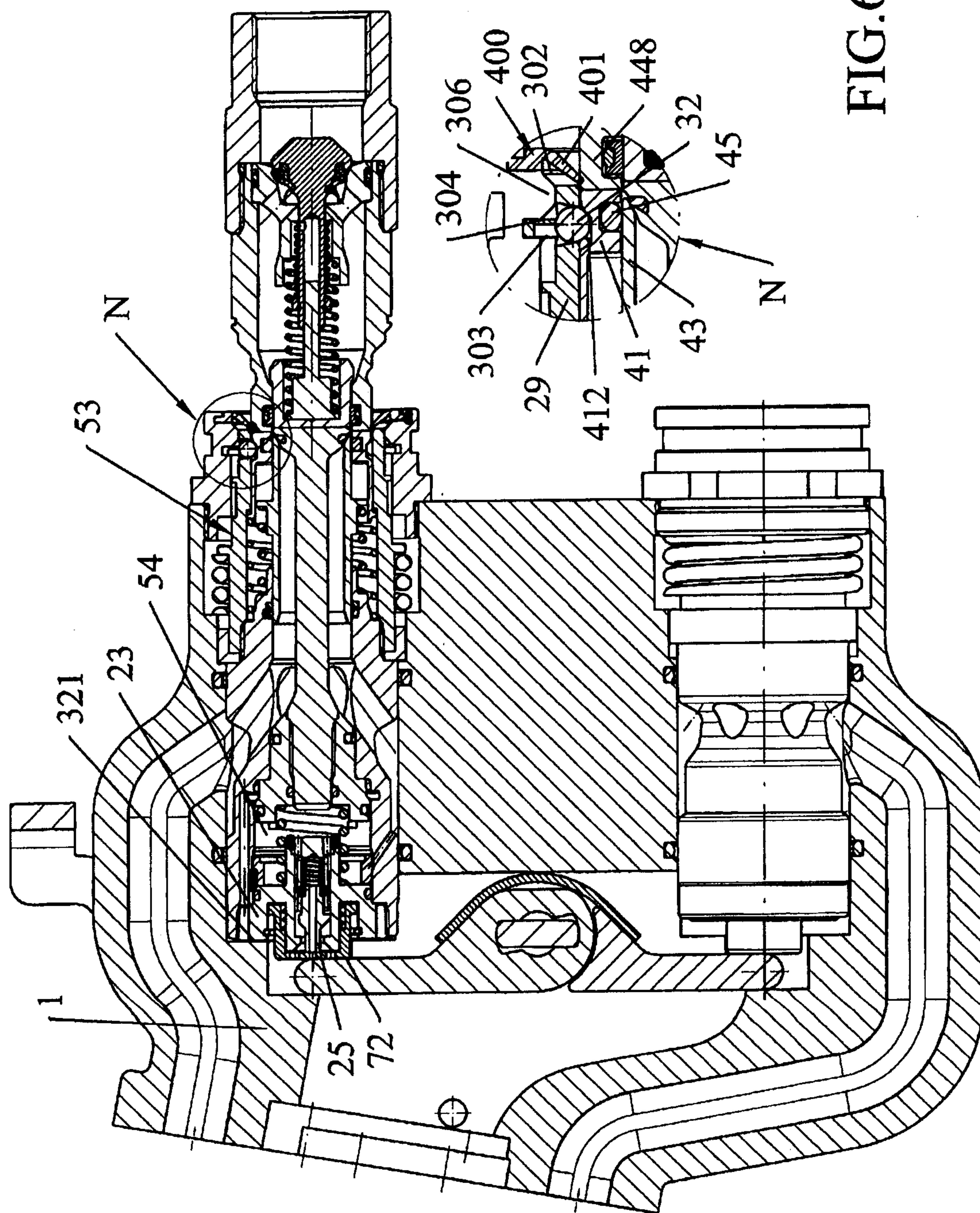
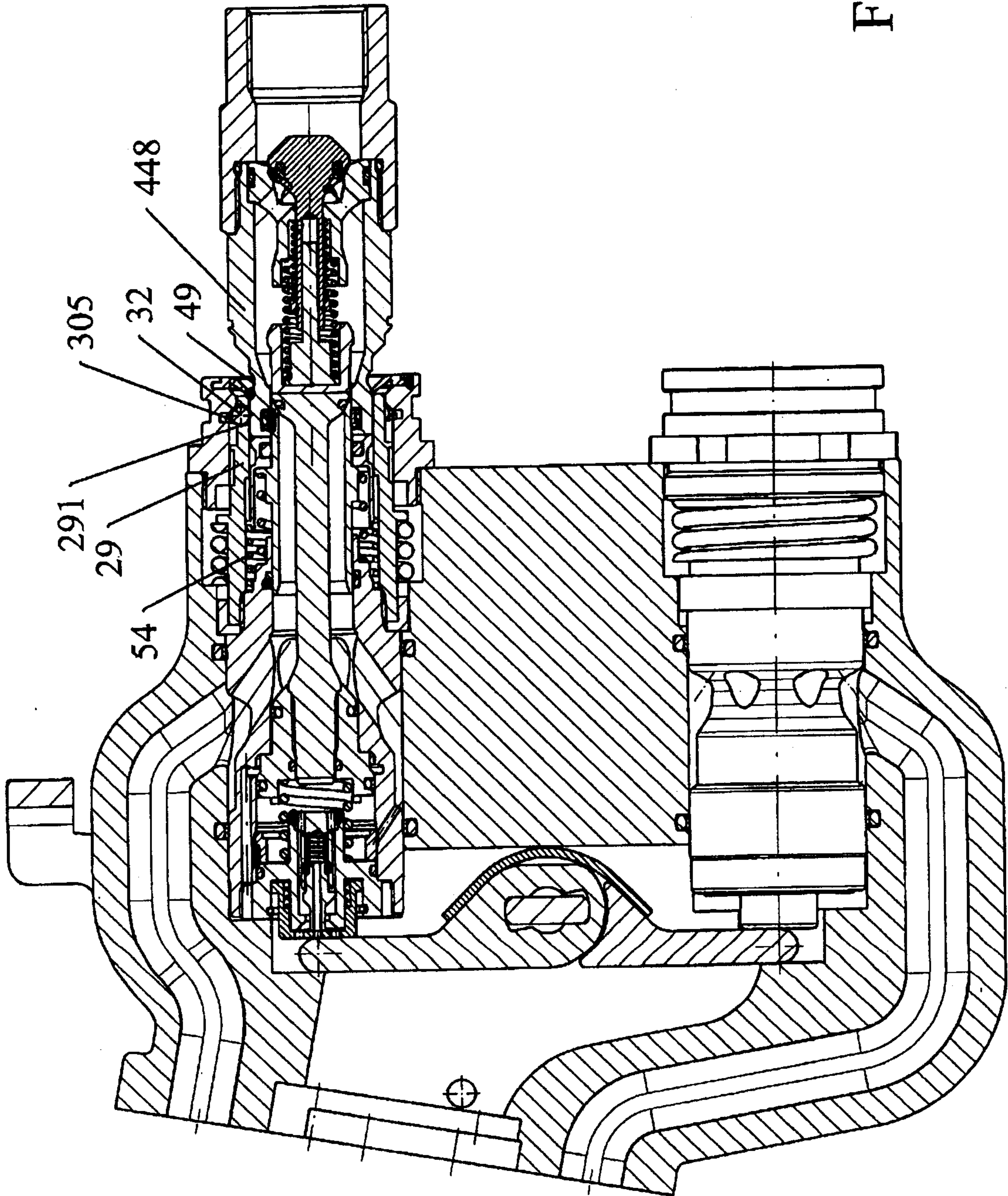


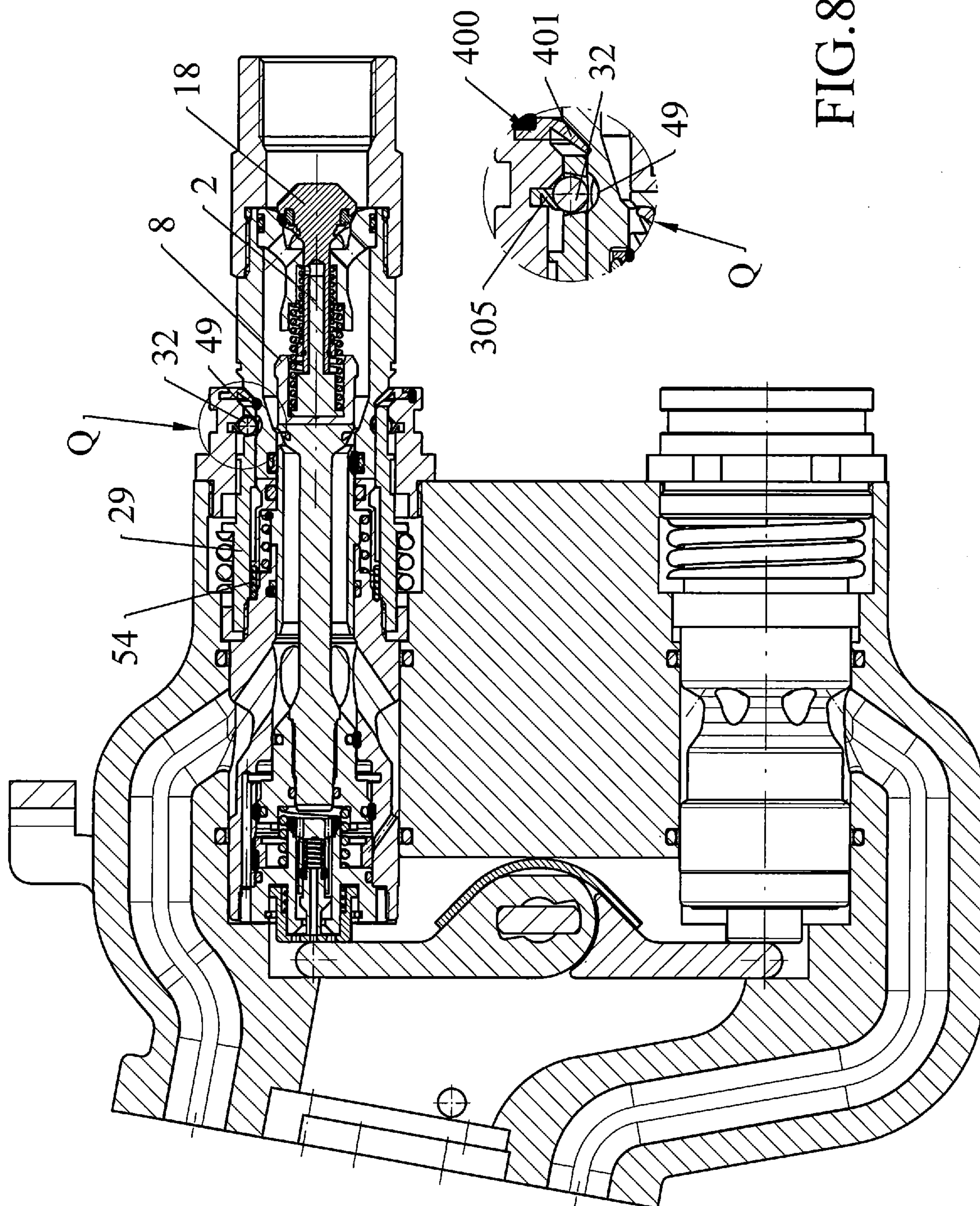
FIG. 6

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FIG.7

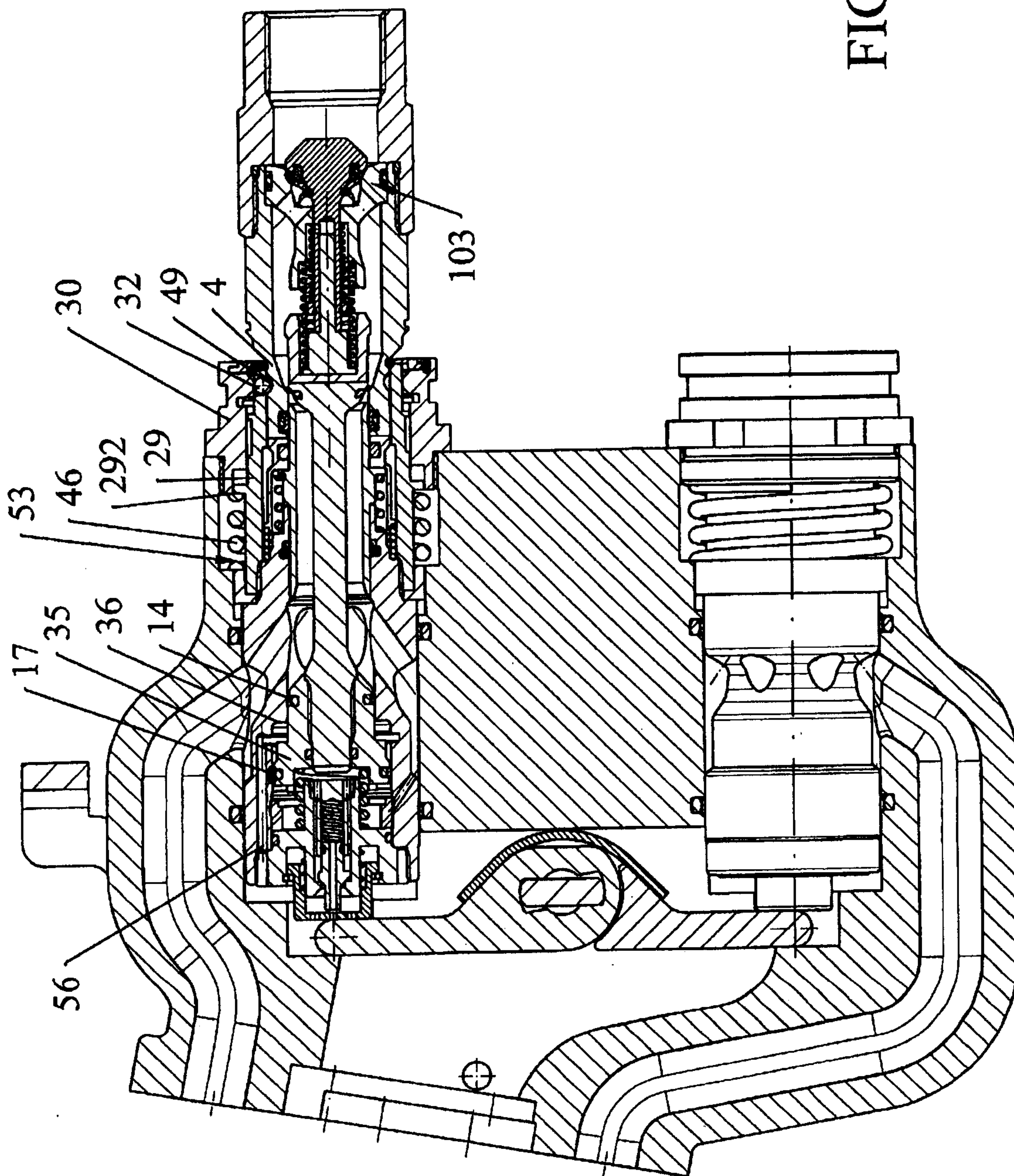


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FIG. 9



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FIG.10

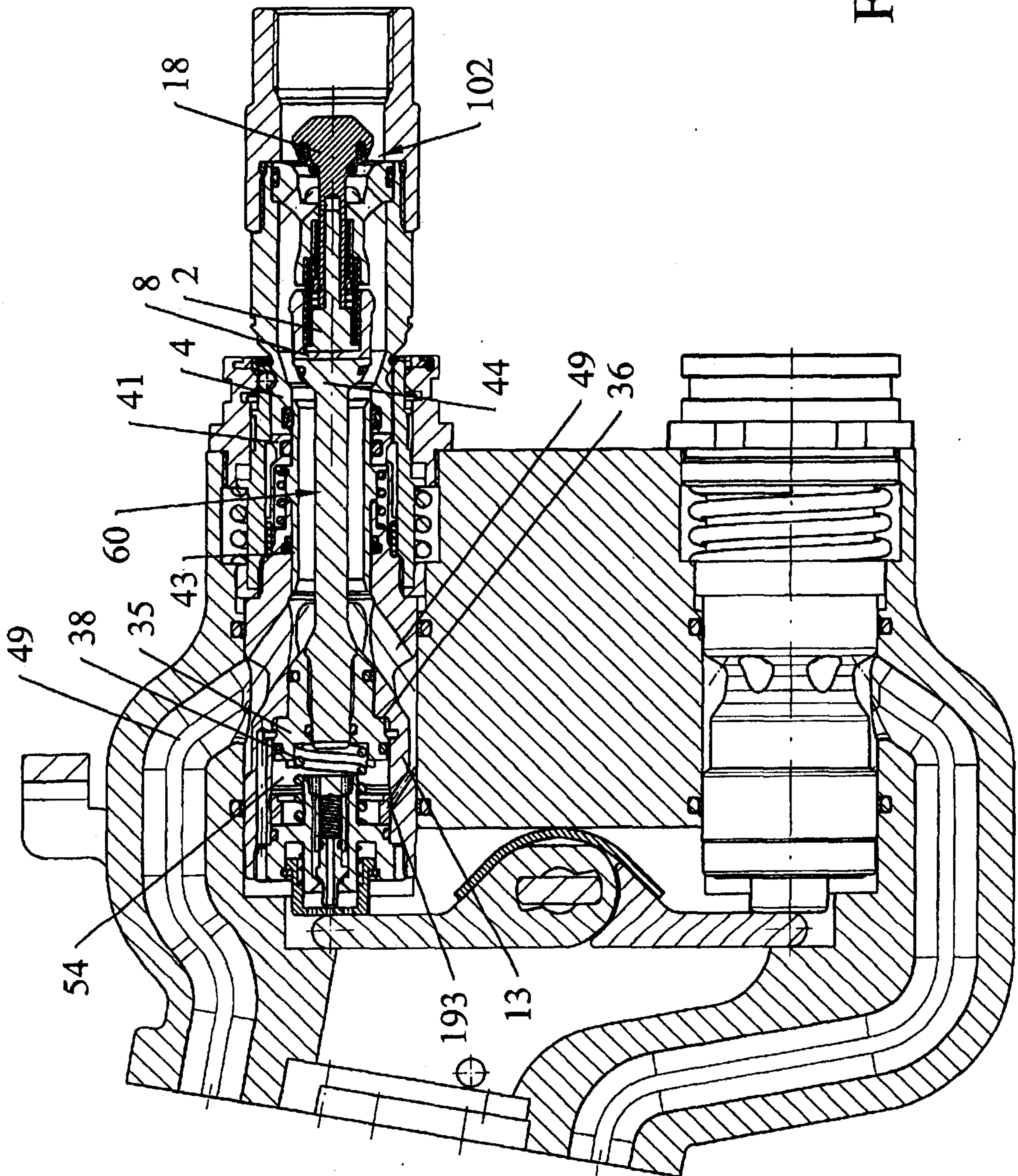
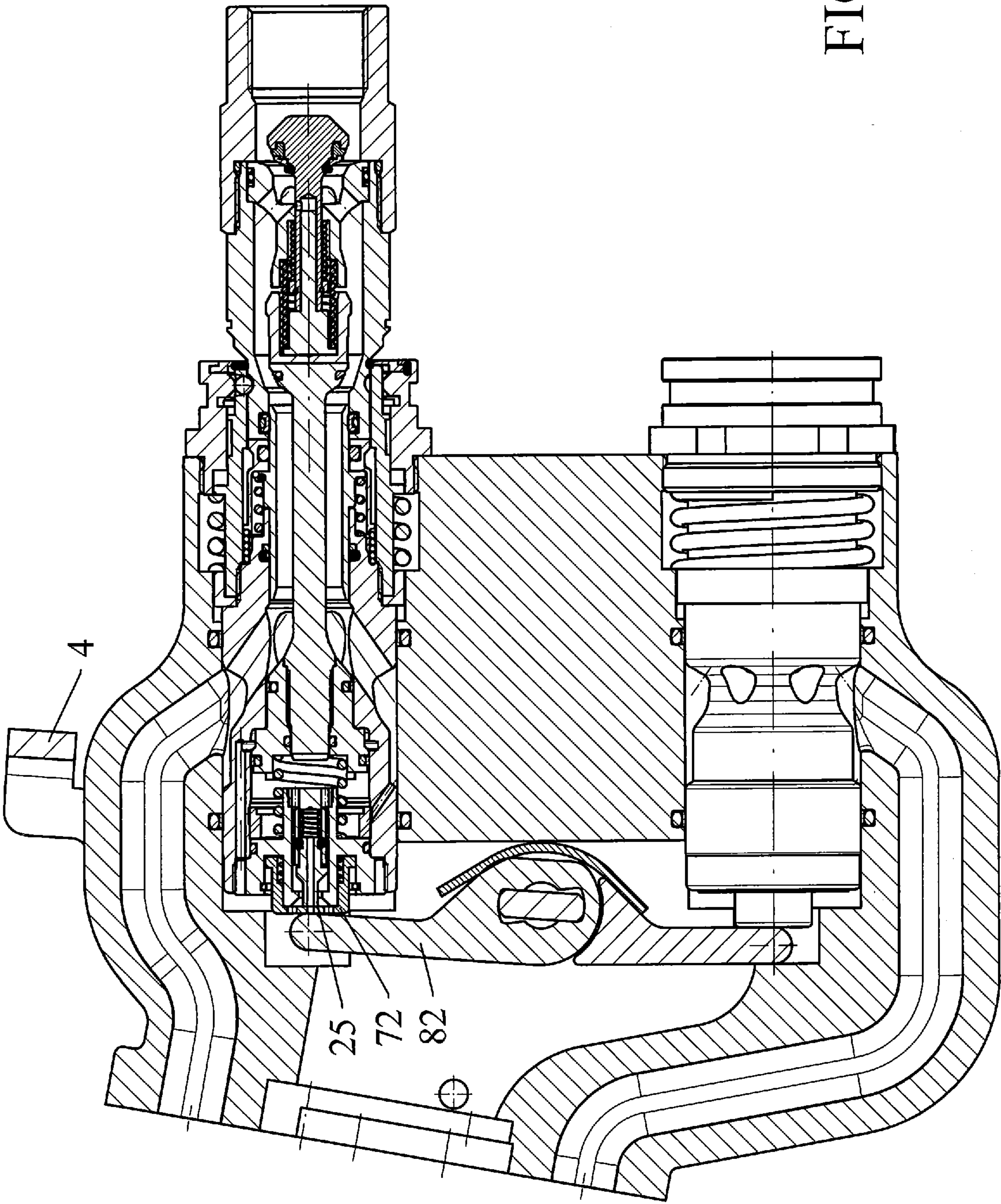
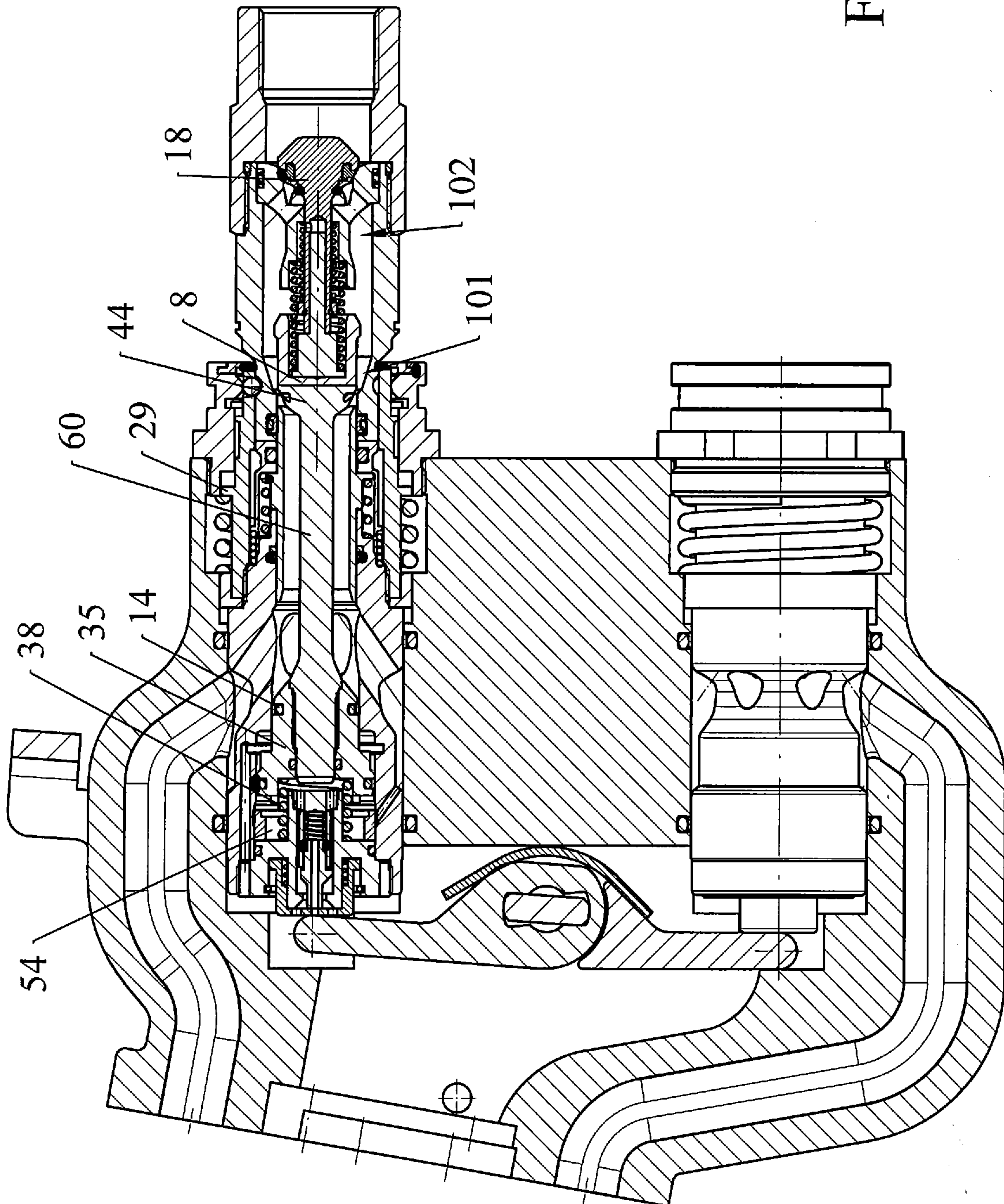


FIG.11



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FIG.12



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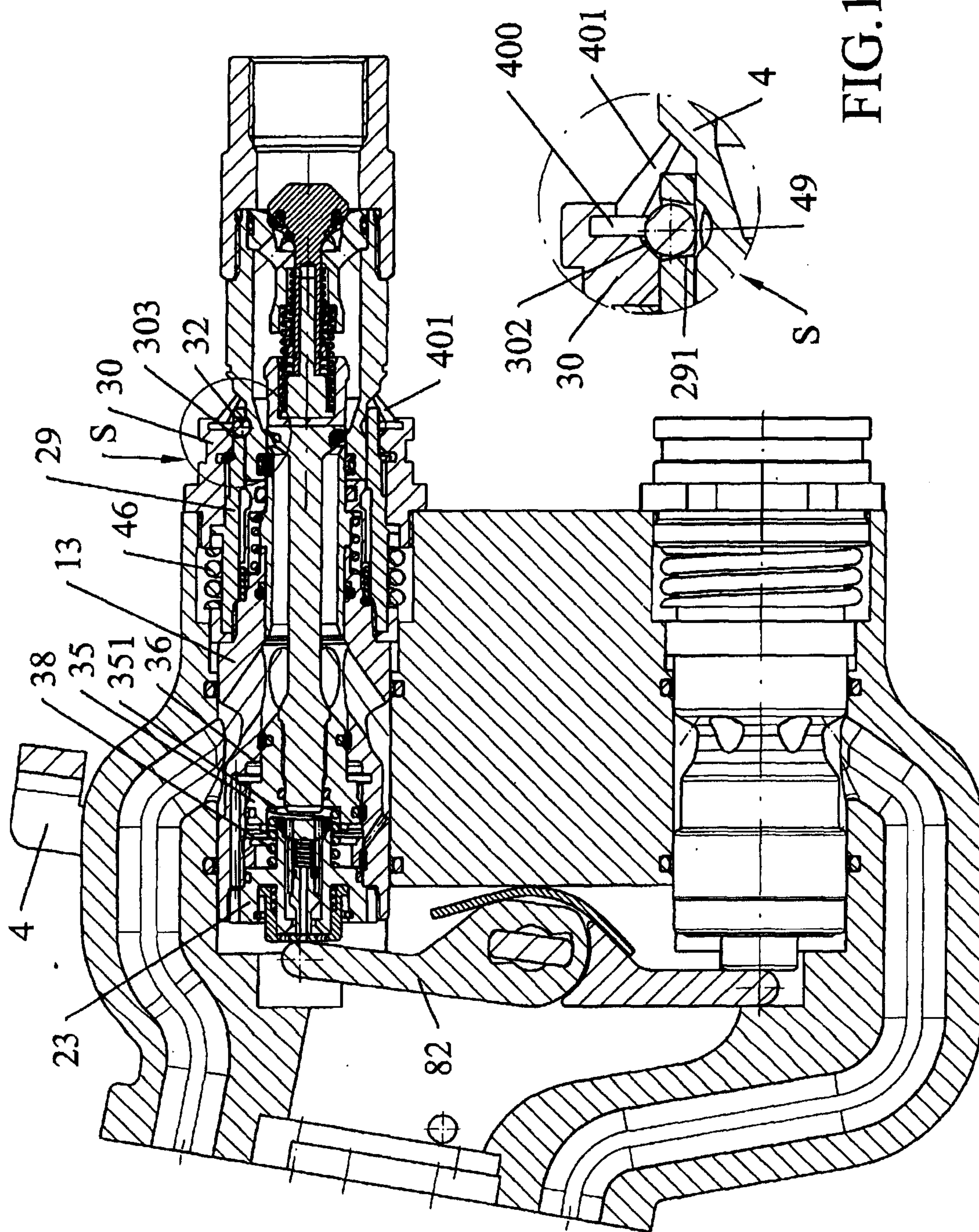
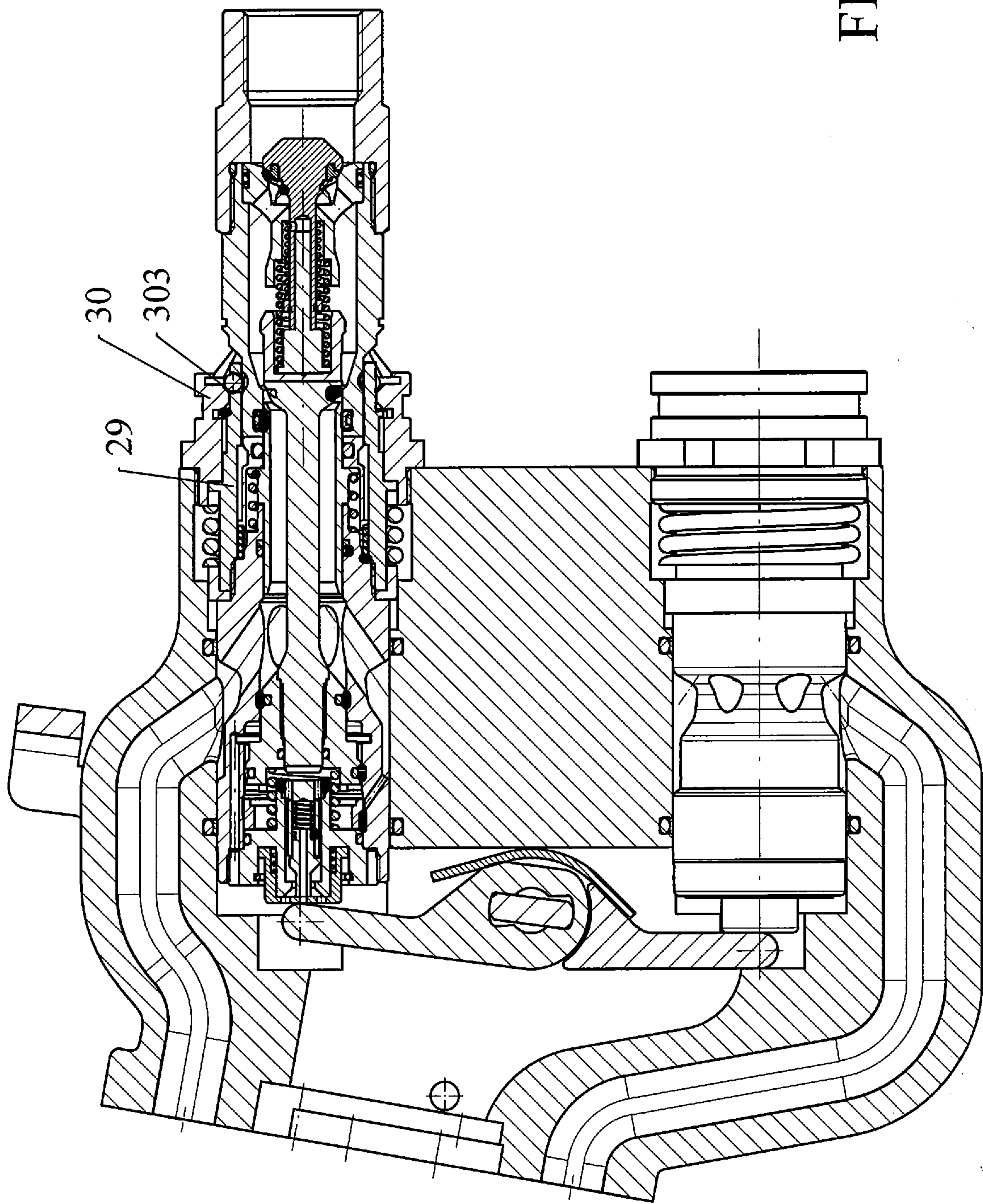
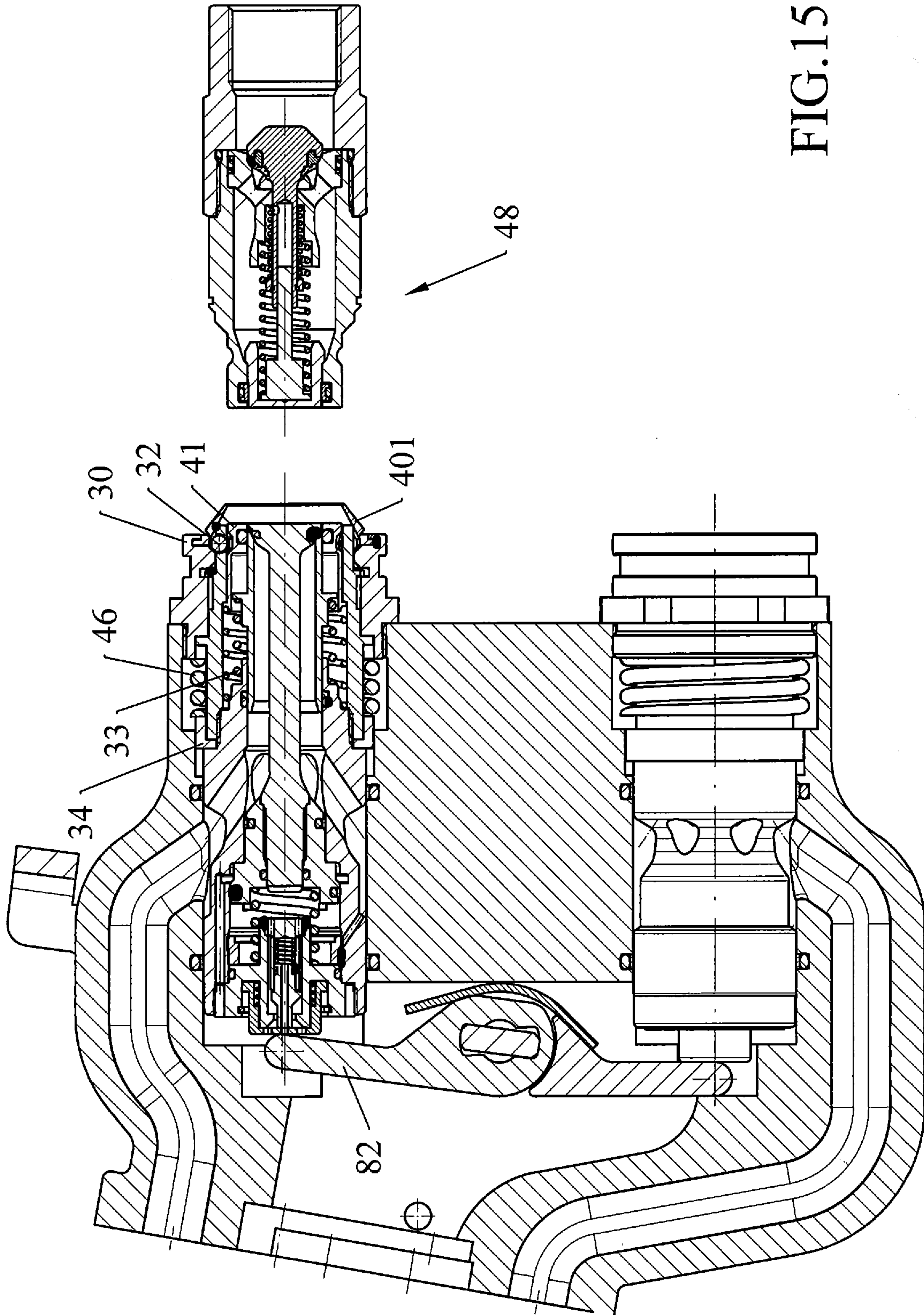


FIG.14



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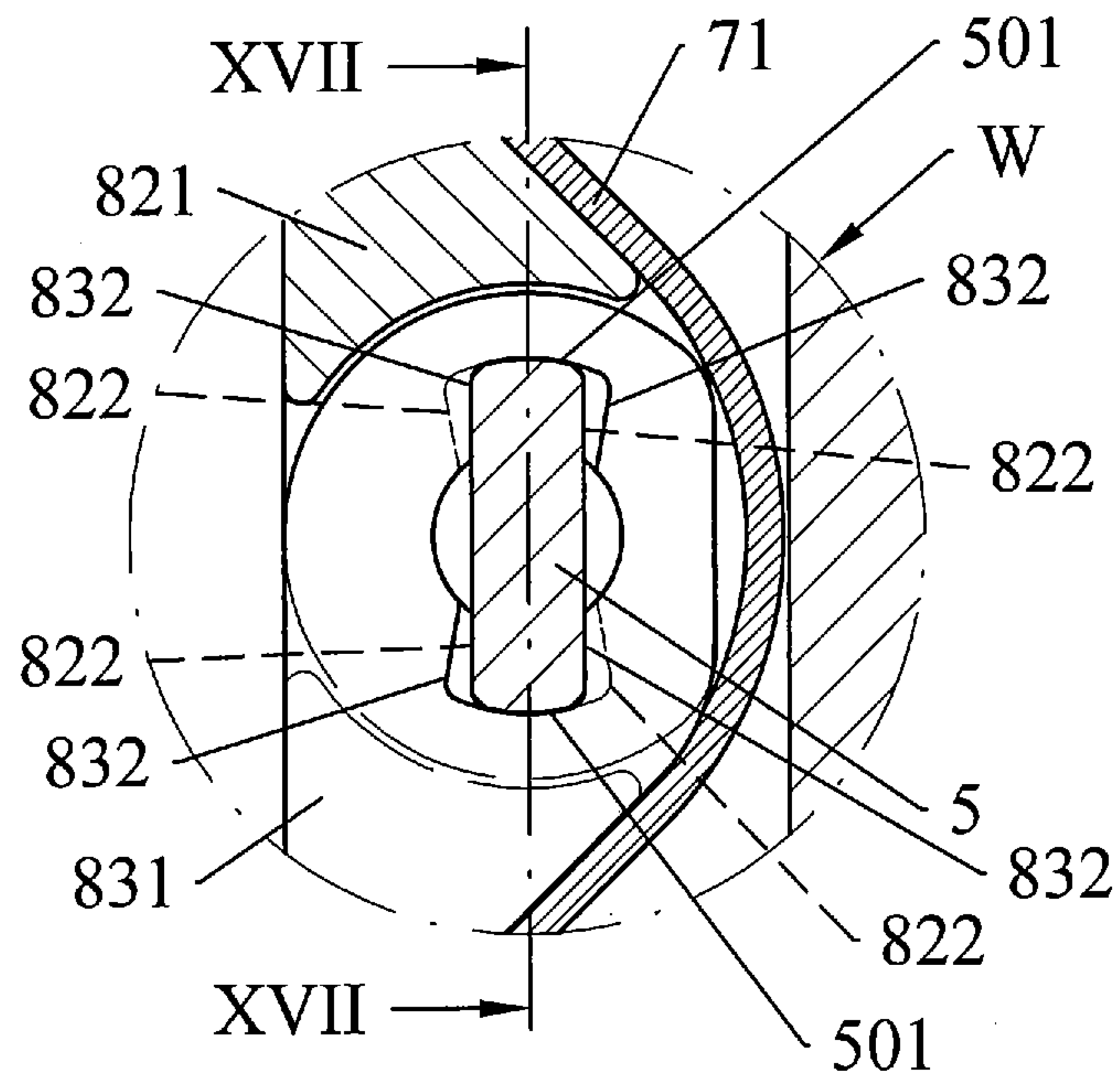


FIG. 16

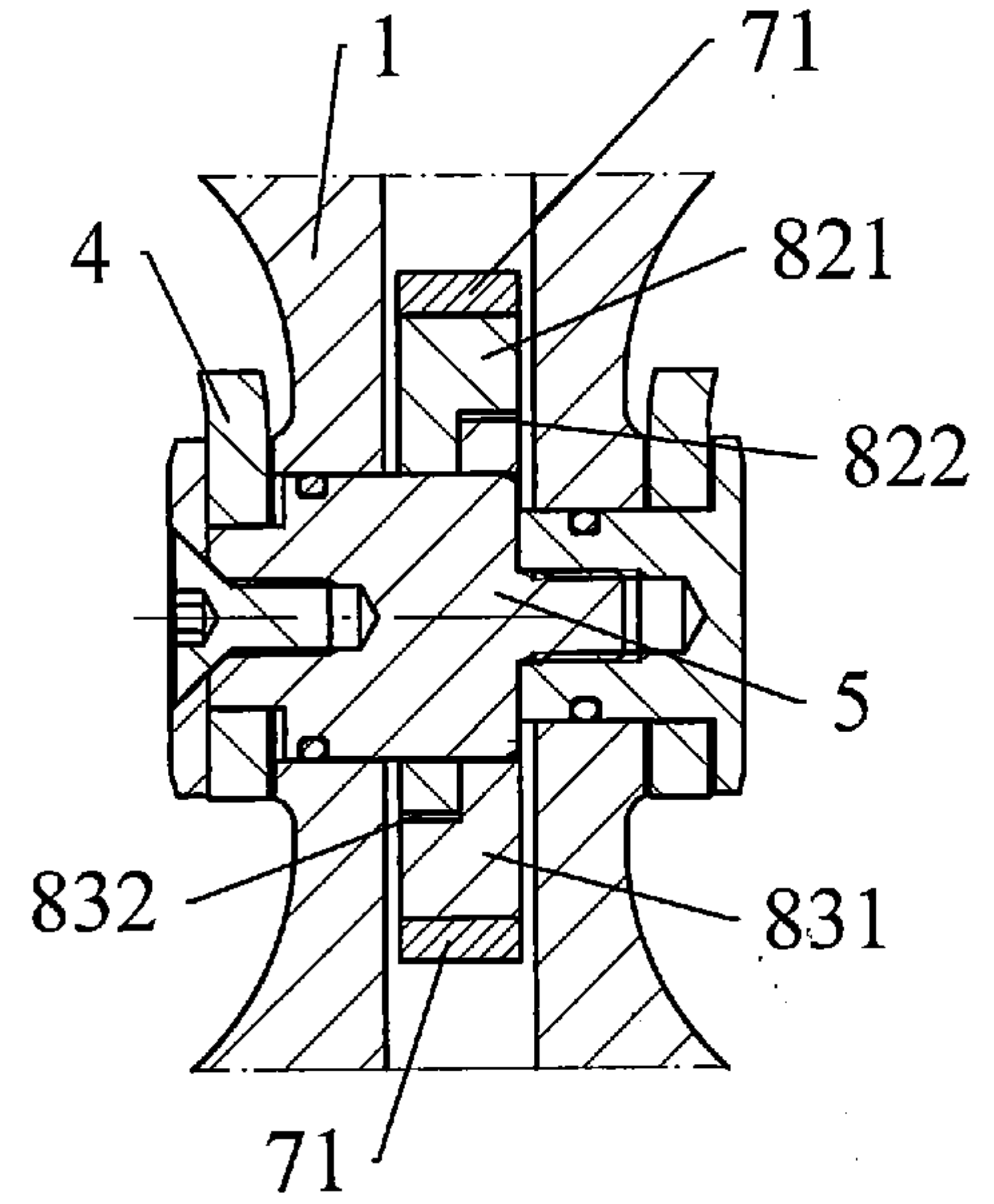


FIG. 17

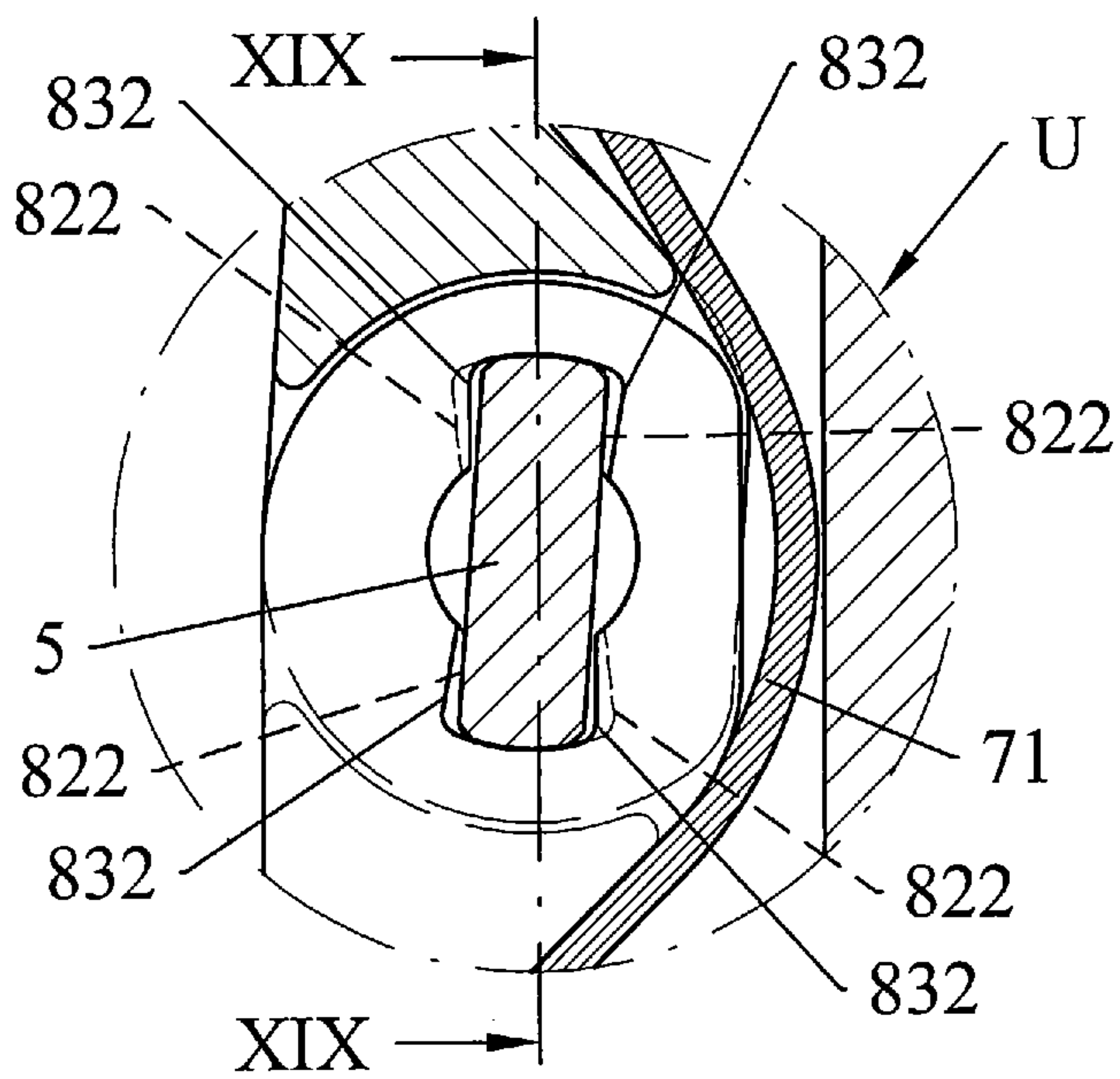


FIG. 18

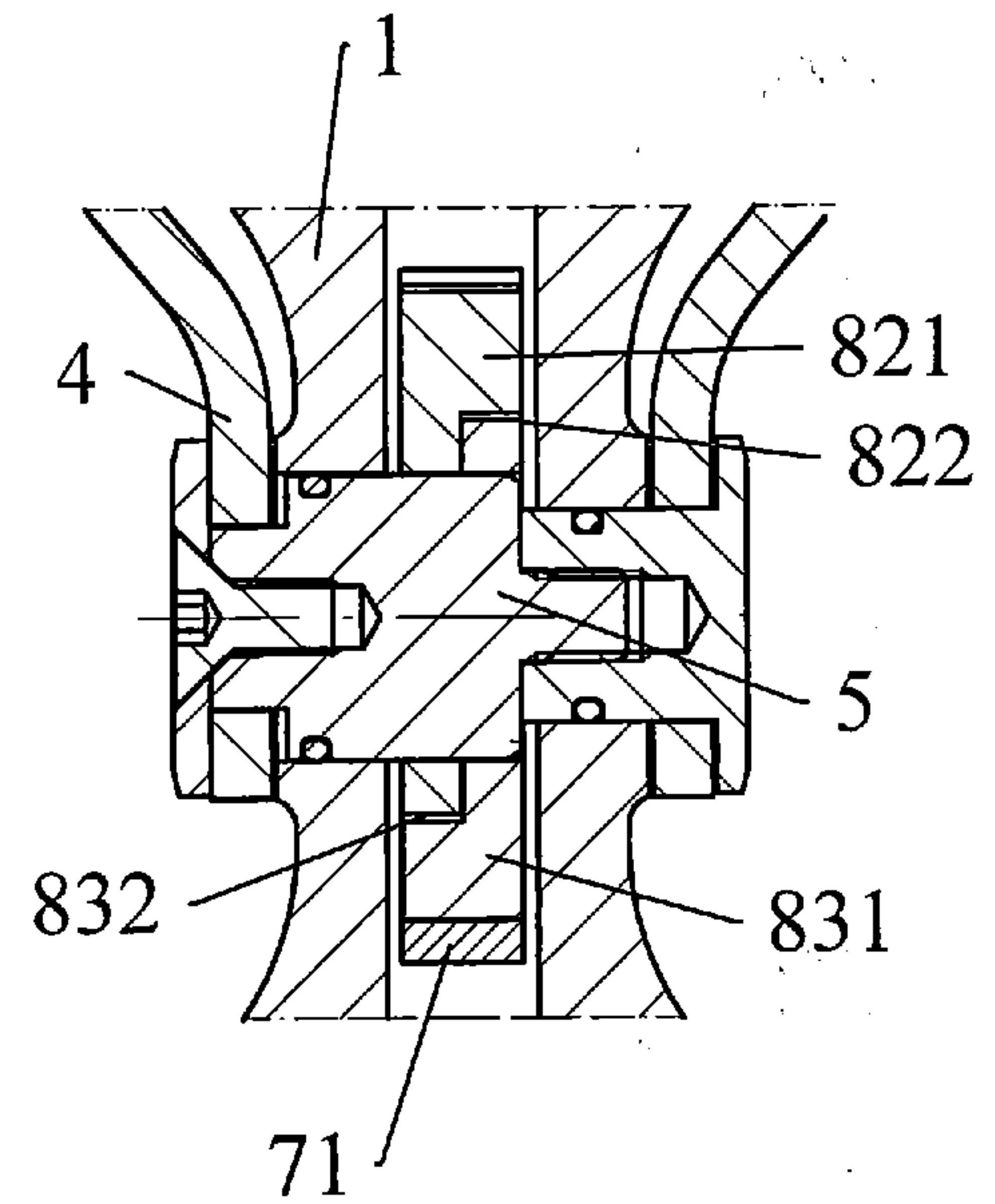


FIG. 19

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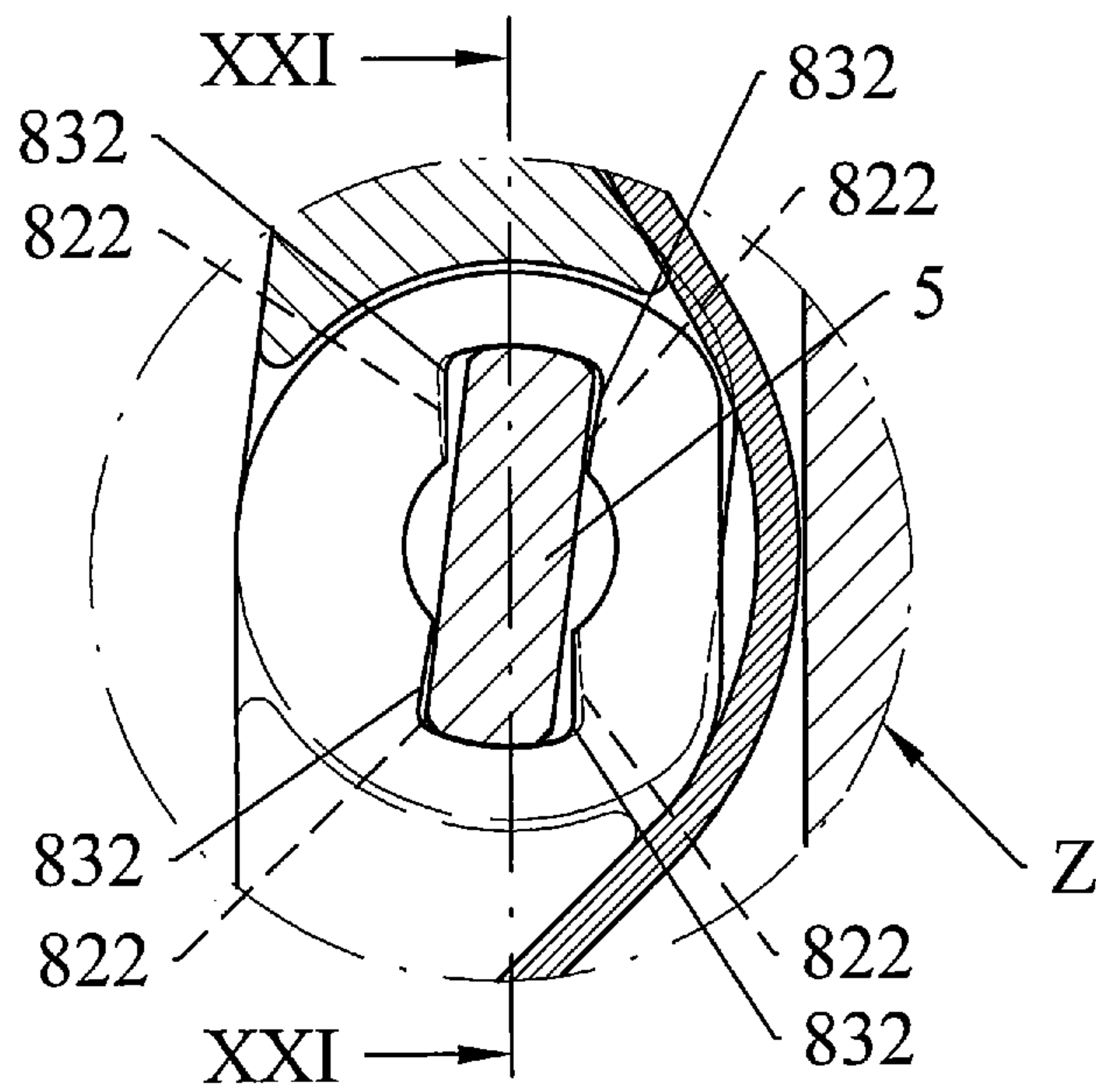


FIG. 20

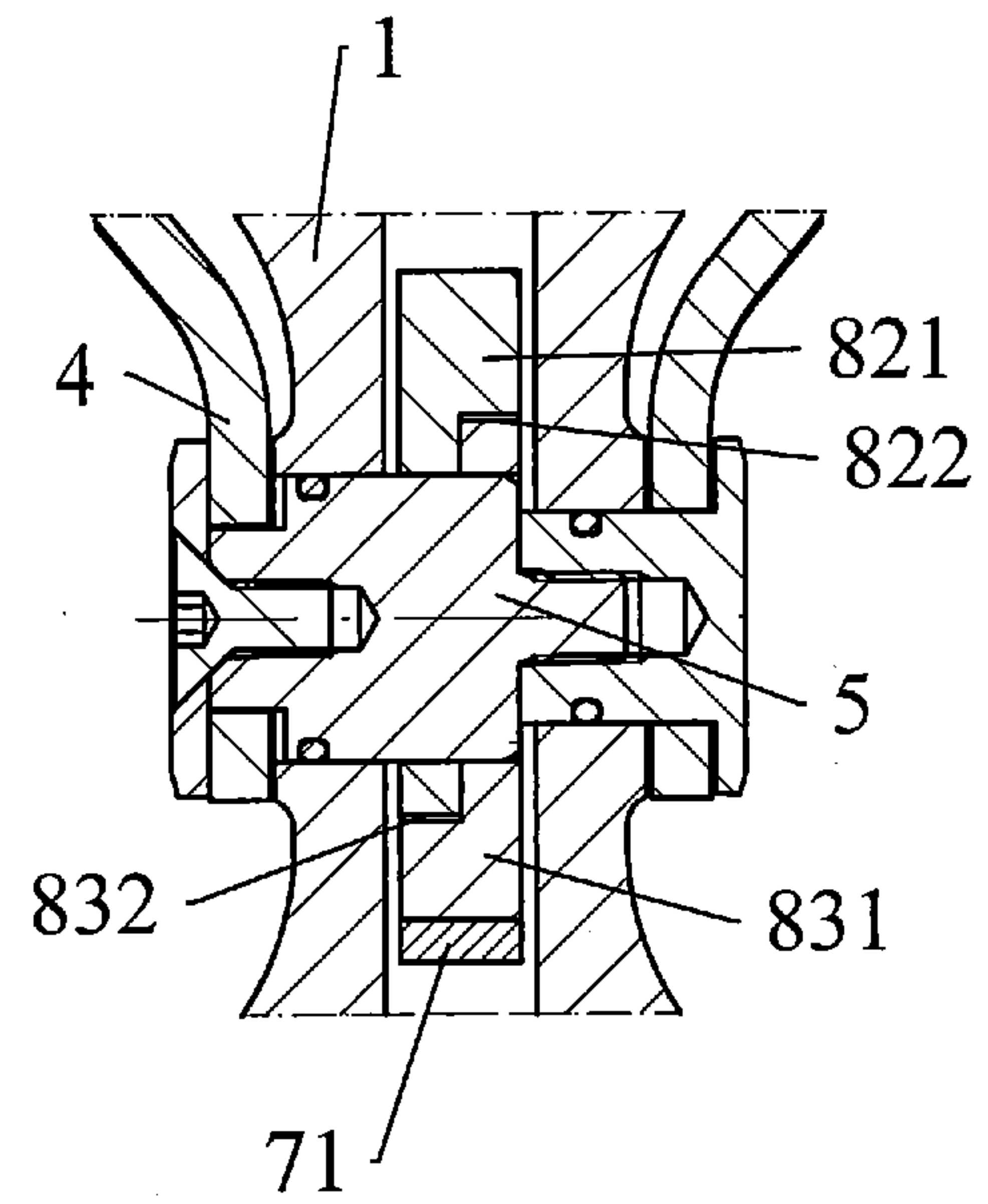


FIG. 21

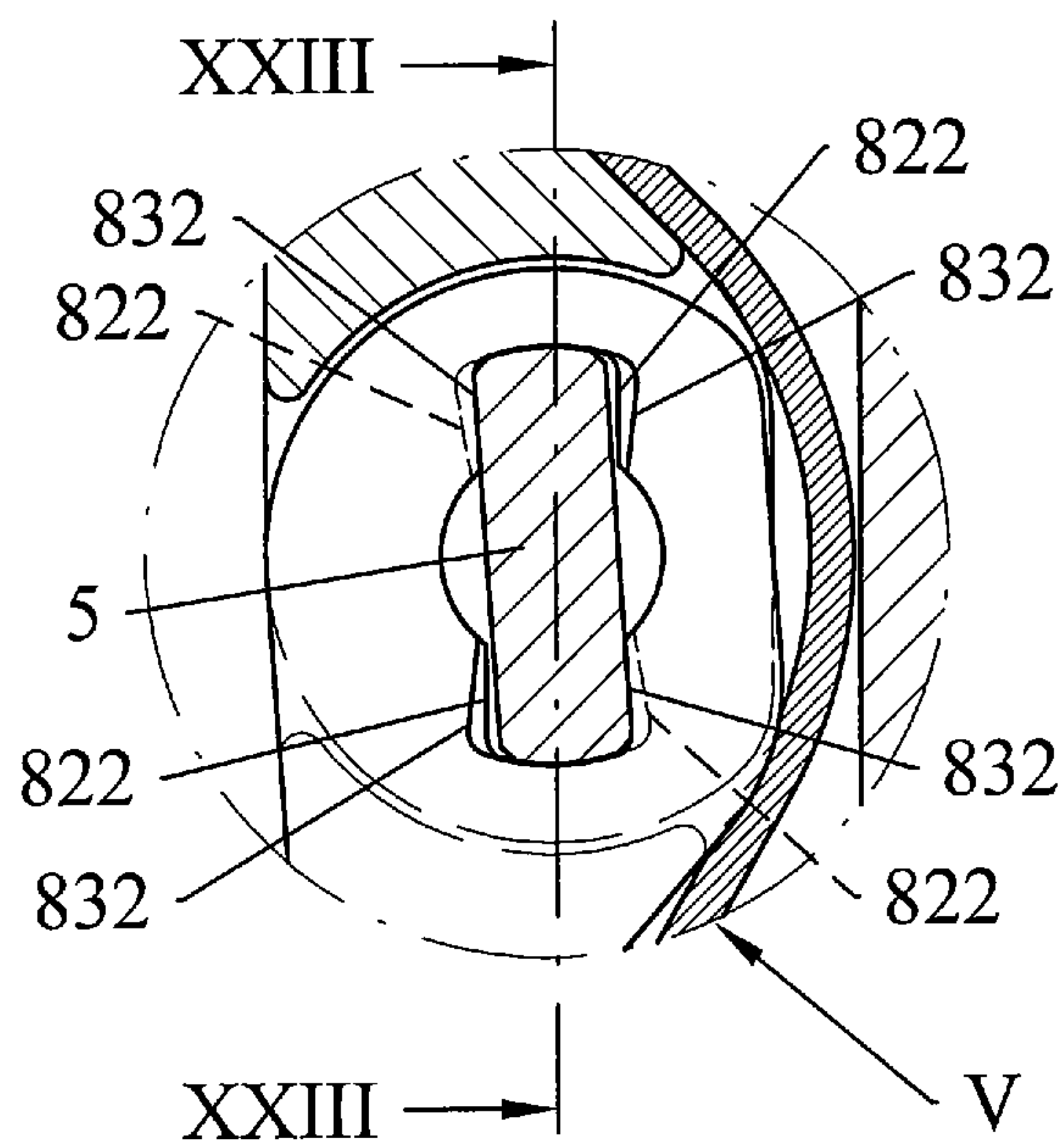


FIG. 22

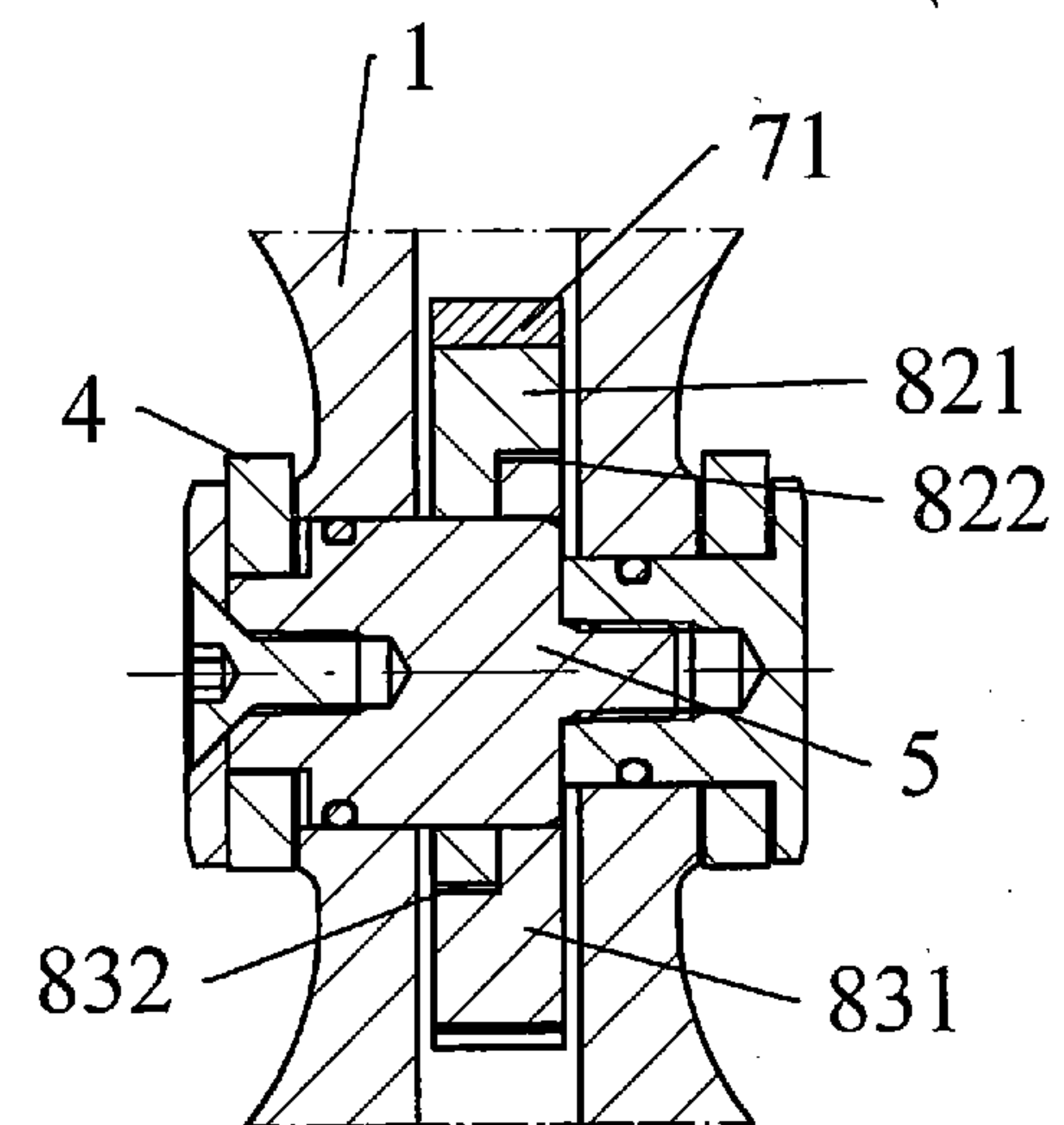


FIG. 23

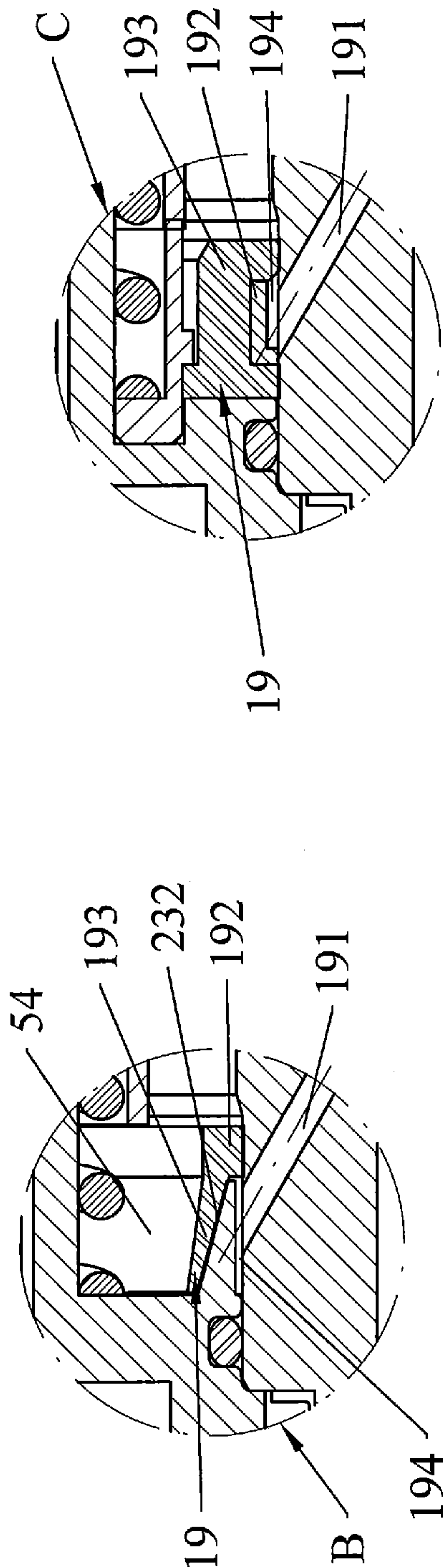


FIG.24

FIG.25

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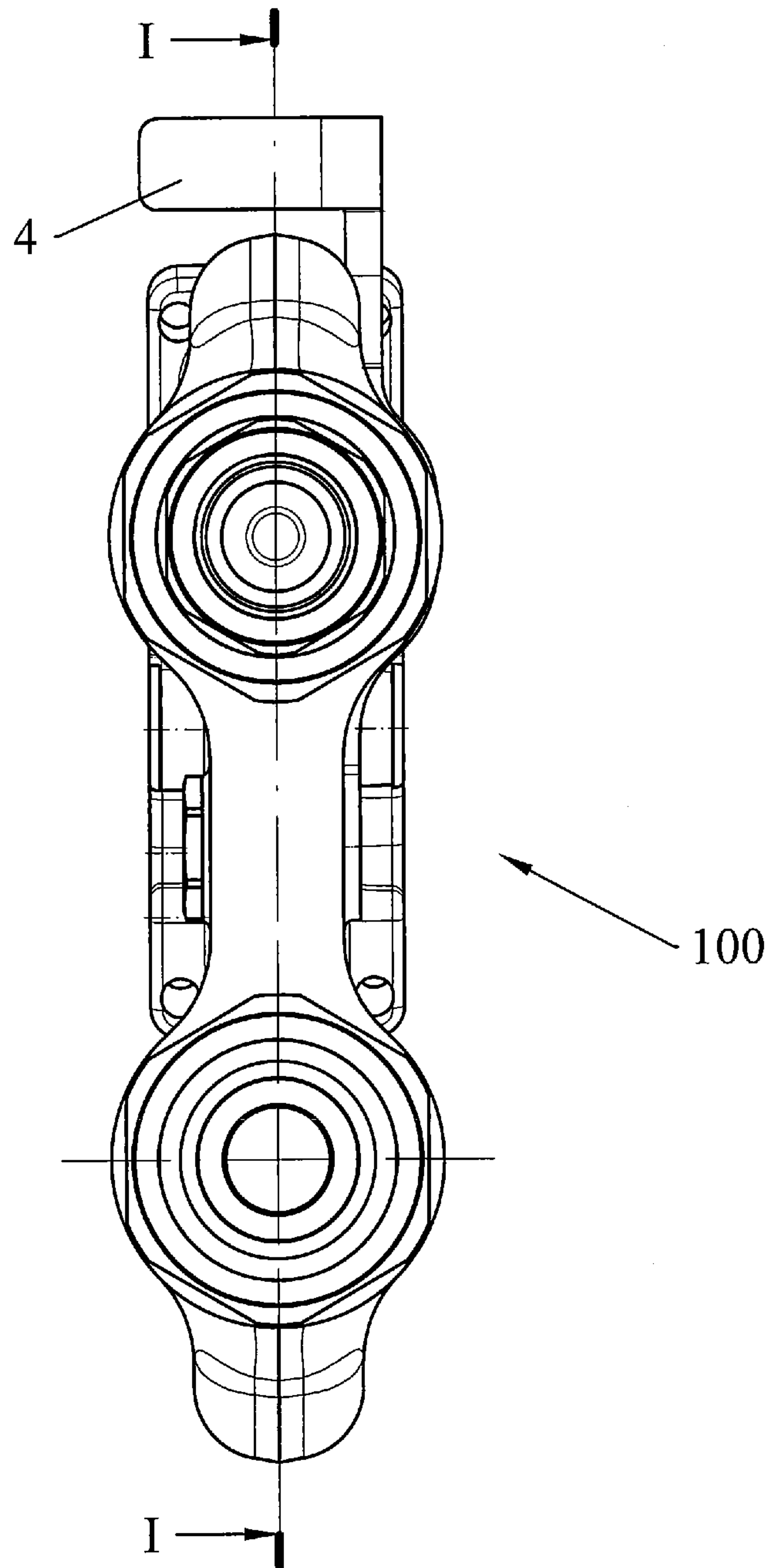
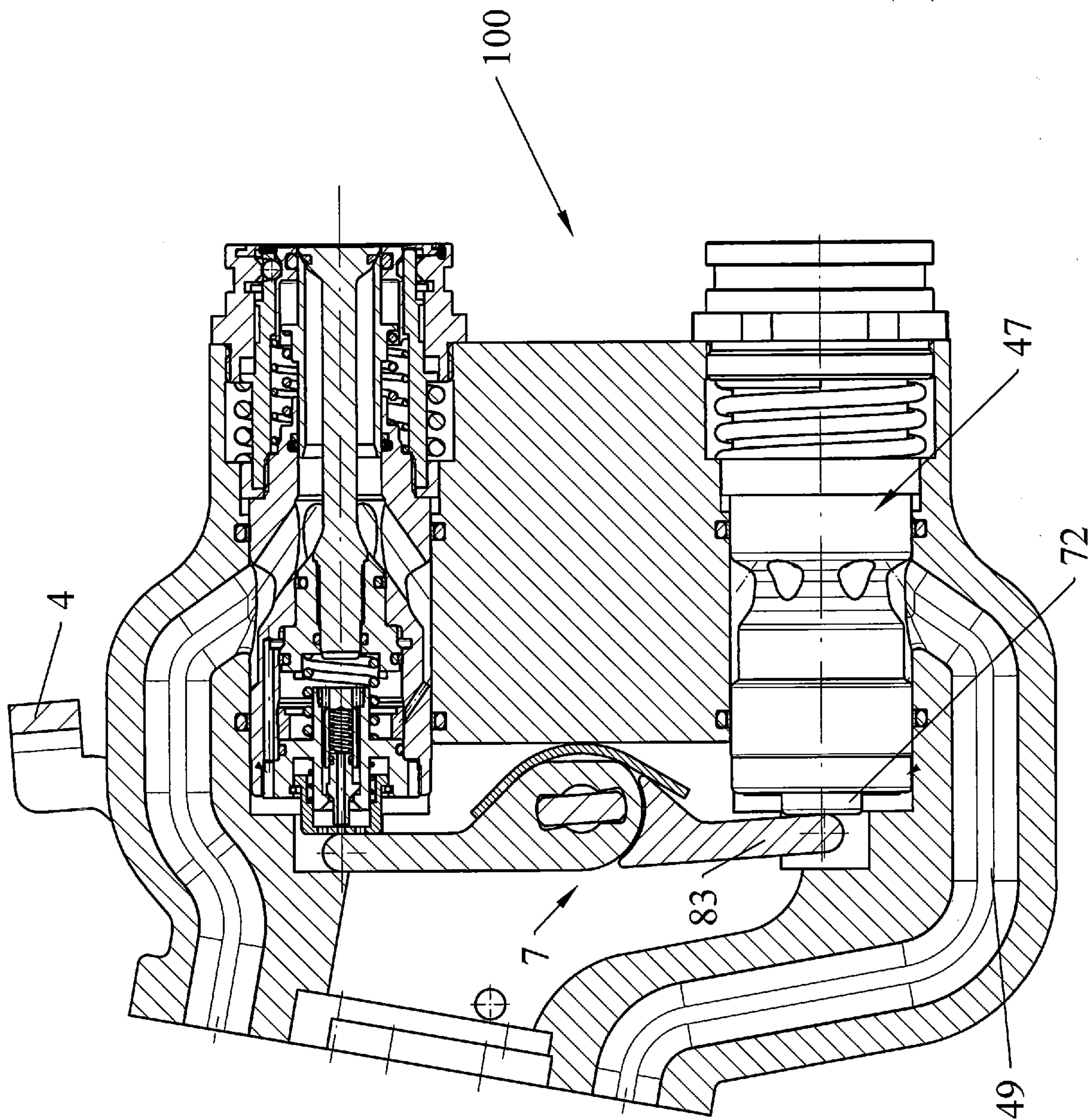


FIG.26

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FIG.27



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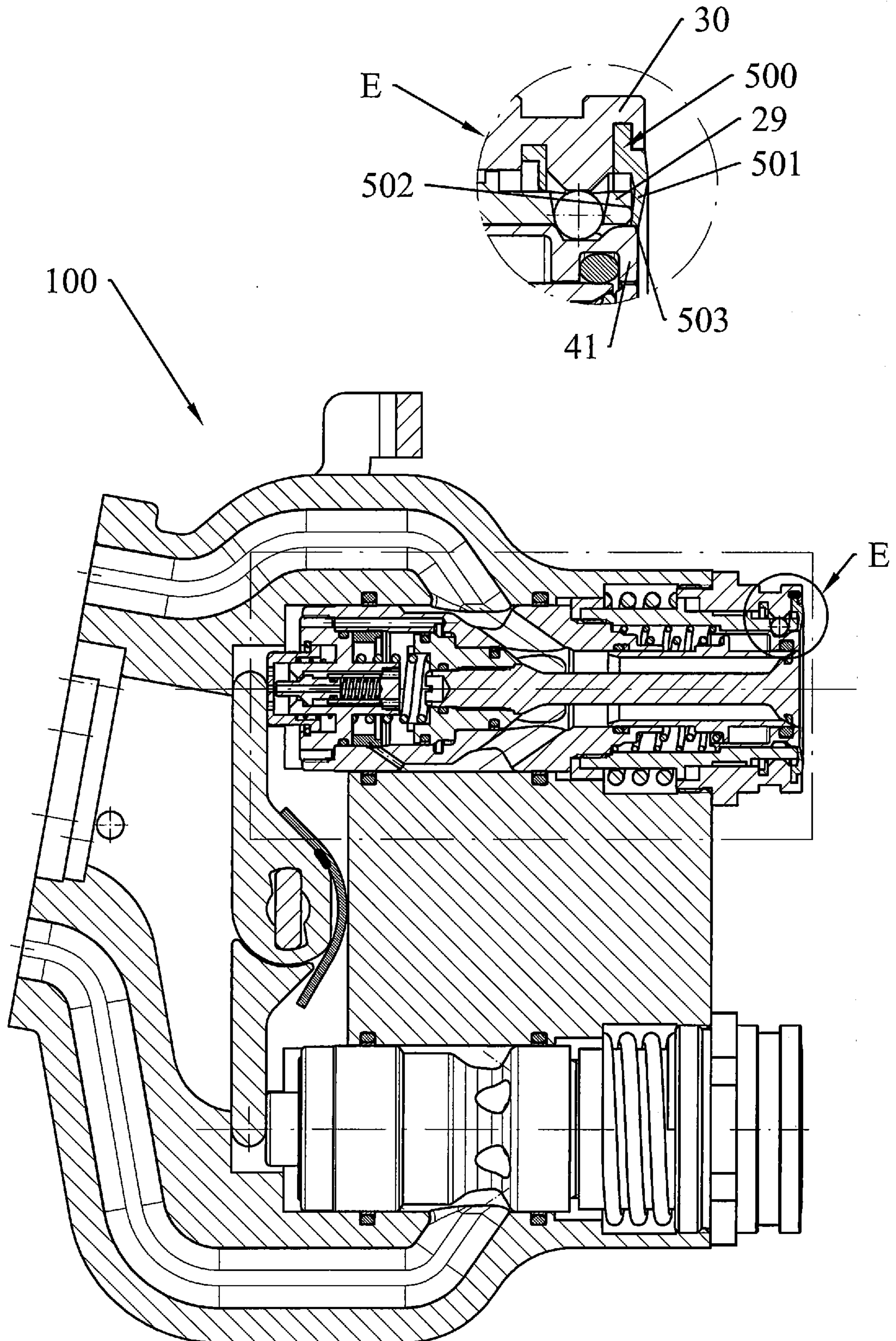


FIG.28

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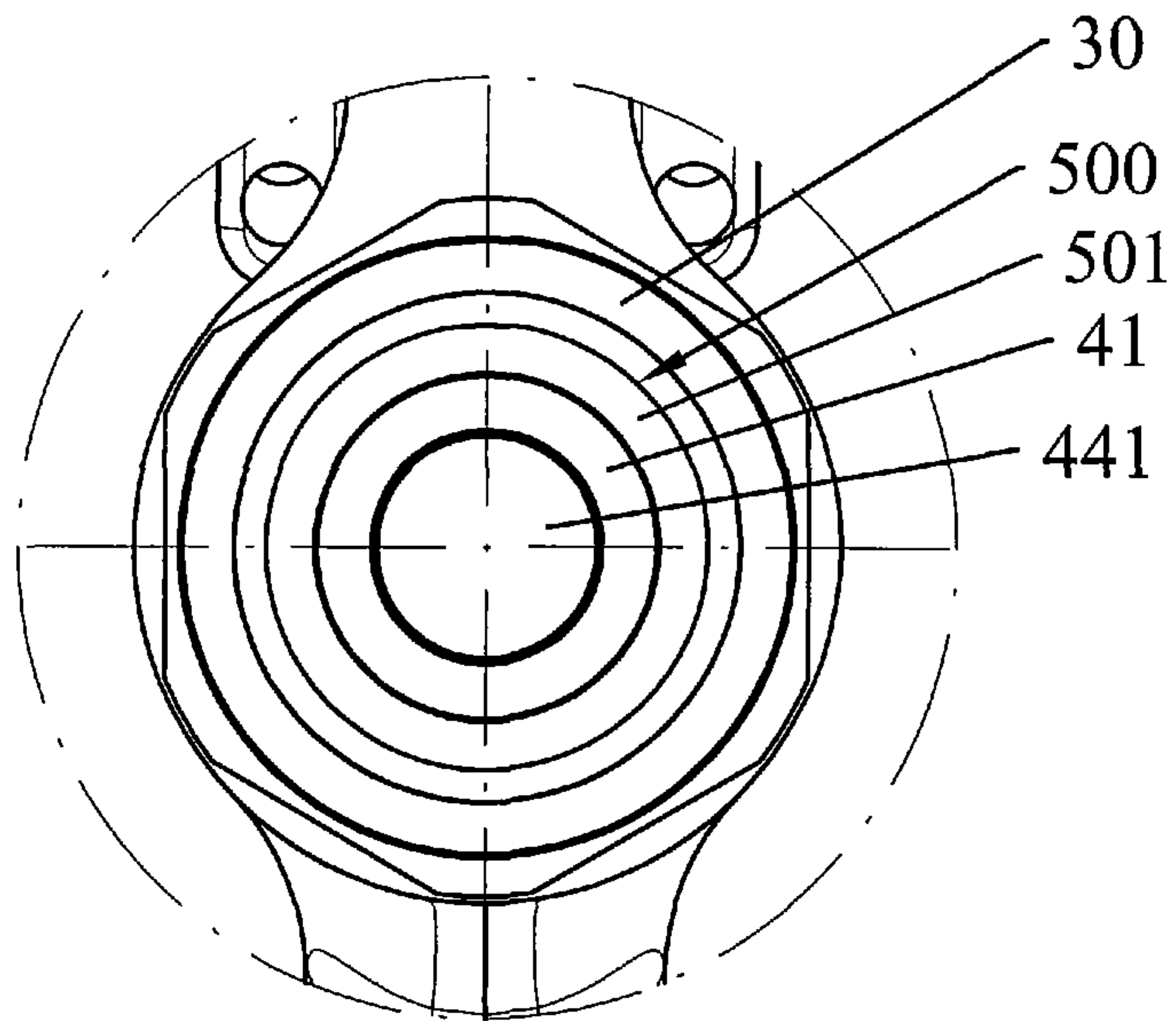


FIG. 29

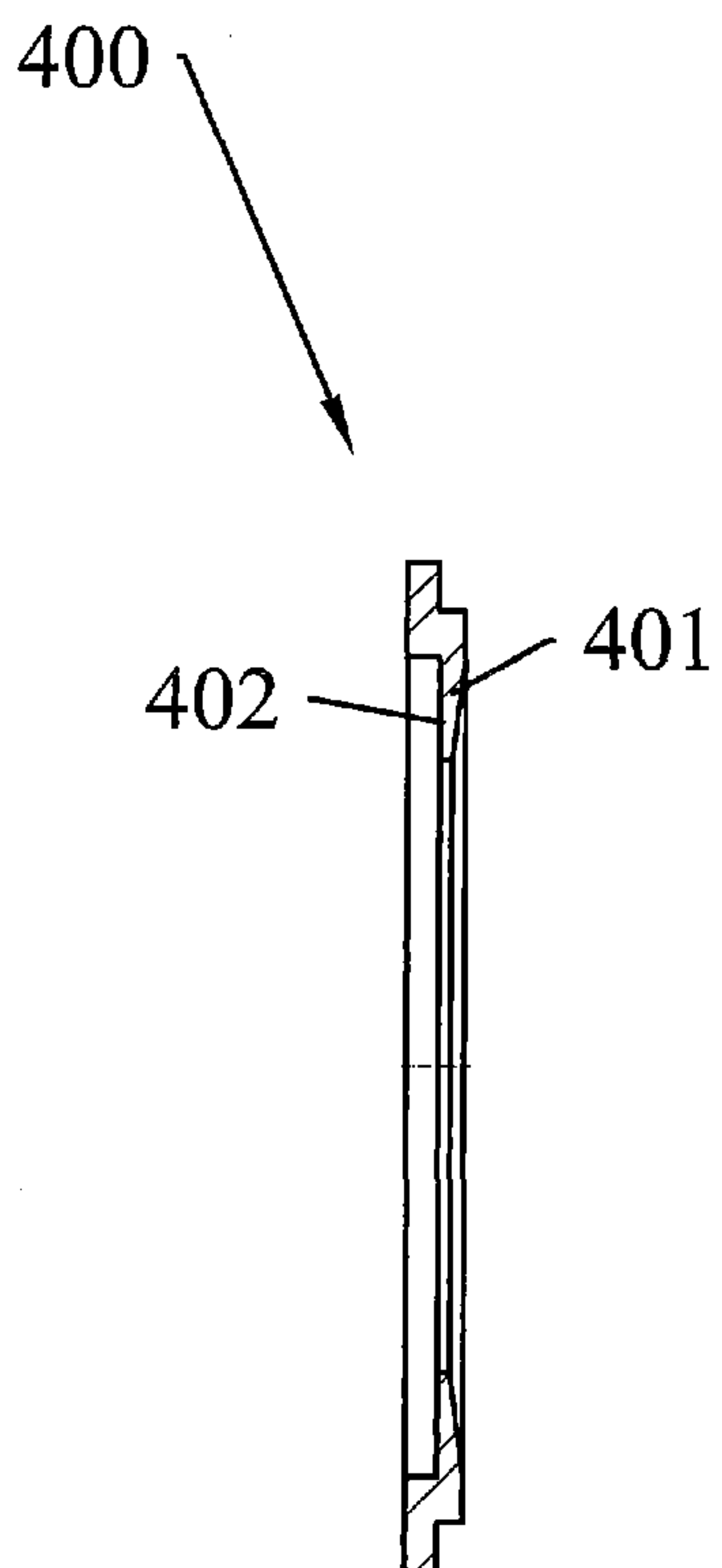


FIG. 30

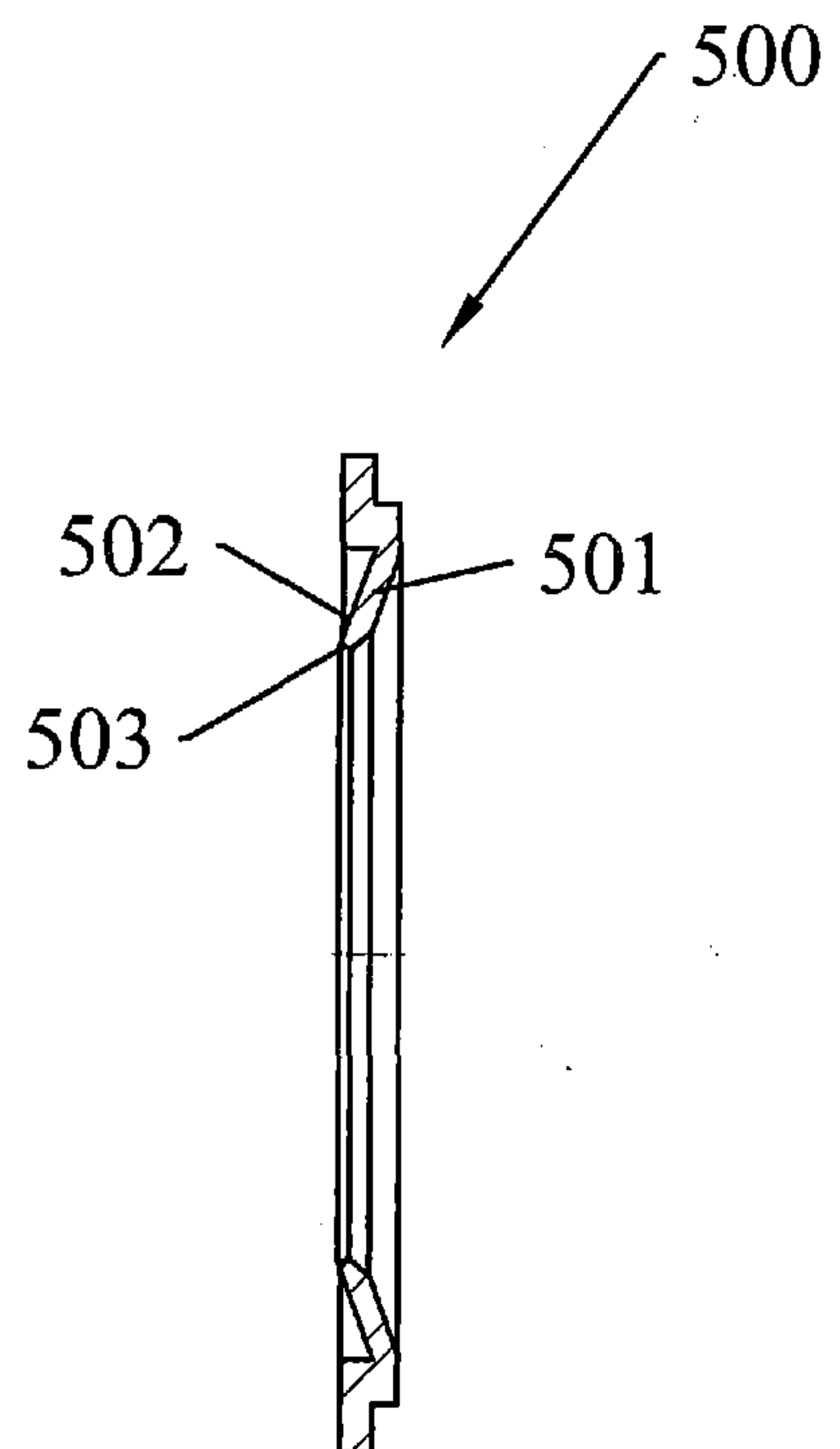


FIG. 31

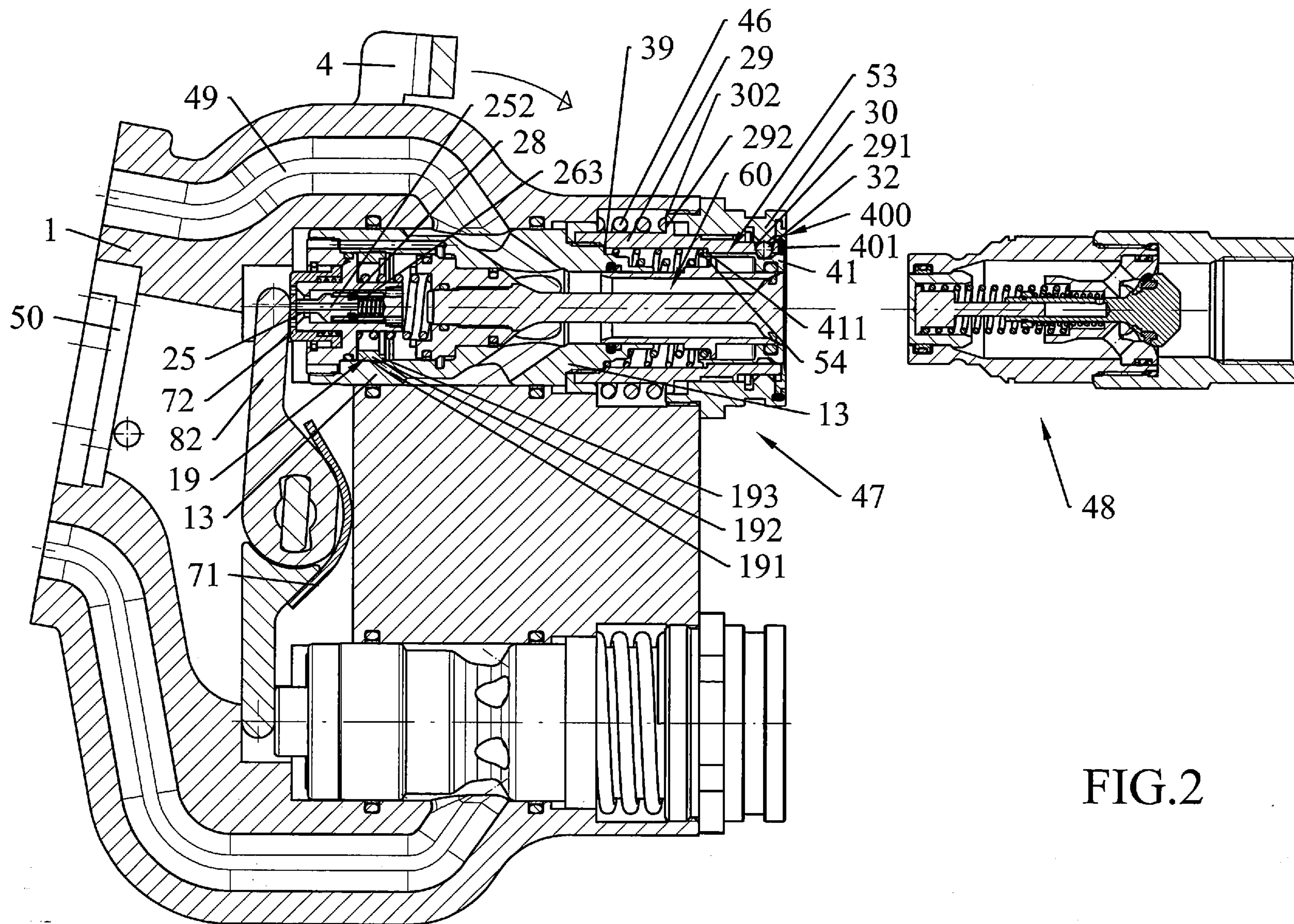


FIG.2