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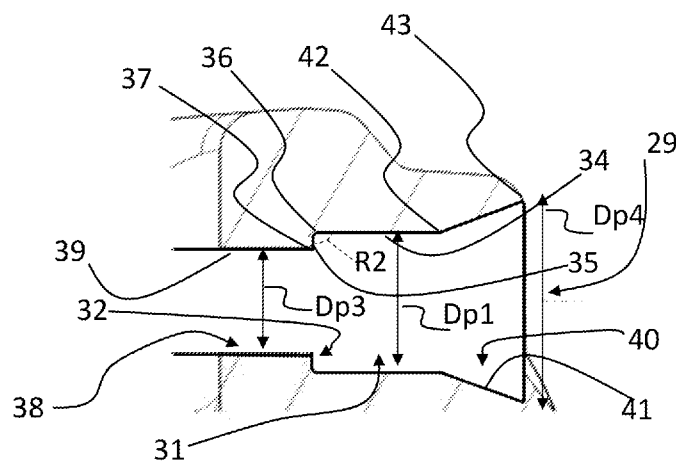


FIG. 5A

(57) Abstract: A caliper body, a pin and an elastic element assembly comprising a caliper body, a pad supporting pin, and an elastic element, wherein said elastic element is fitted on said supporting pin and wherein said supporting pin comprises portions which can be accommodated in a caliper body first housing (29) and in a second caliper body housing made in said caliper body without interfering in an axial direction with surfaces of said caliper body having an extension in a radial direction, wherein said elastic element is accommodated in a first housing first portion (31) of said caliper body first housing (29) and said elastic element (6) abuts against a first housing abutment portion (32) to define a limit stop of said supporting pin in said caliper body.

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"Caliper body, pin and elastic element assembly; brake caliper; pin assembly; caliper body; and assembly method for a pad supporting pin into a caliper body of a vehicle"

DESCRIPTION

[0001]. Field of the invention

[0002]. The present invention relates to a caliper body, pin and elastic element assembly, to a brake caliper, to a pin assembly, to a caliper body, and to an assembly method for a pad supporting pin into a caliper body of a vehicle.

[0003]. Background art

[0004]. In a disc brake of known type, the brake caliper is generally arranged to straddle a brake disc mounted on the hub of a vehicle wheel. The brake caliper usually comprises a caliper body which accommodates the brake pads and actuators to push the pads against the disc to achieve the braking action on the vehicle.

[0005]. In some known disc brake types, the pads are supported by supporting pins accommodated in appropriate caliper body housings made in the caliper body, wherein each supporting pin crosses through corresponding holes made in the backing plate for the friction material of each brake pad. Such supporting pins have a longitudinal extension axis, a pin head, and a pin tip arranged on opposite ends of the extension axis.

[0006]. The supporting pins are coupled with clearance relative to the respective caliper body housing and consequently elastic elements are used to axially constrain the pins to the caliper body

housings.

[0007]. In some cases, such elastic elements are coaxially pre-assembled to the pin body in a pin annular housing. The pin annular housing, in which the elastic element is accommodated, provides an axially extending, usually cylindrical, bottom wall, axially delimited by at least a housing first wall substantially transverse to the bottom wall minus flared machining connectors.

[0008]. Such elastic elements are usually expanding elastic elements and have a larger radial dimension than the radial dimension of the housing first wall in a resting condition. In this manner, when the supporting pin provided with the expanding elastic element is assembled to the caliper body, the expanding elastic element is radially compressed by the walls of the caliper body housing in the direction of the supporting pin, and the expanding elastic element is constrained by friction to the caliper body housing. As a result, the expanding elastic element provides an axial constraint aimed at preventing the pin from falling out of its housing.

[0009]. The expanding elastic element is inserted by sliding inside the caliper body housing, e.g., under a thrust action. Once the expanding elastic element is positioned inside the caliper body housing, and at least a pin abutment portion of the supporting pin is axially abutting against the caliper body defining the maximum insertion position of the pin in the caliper body, the elastic element forms an axial constraint relative to the pin thereby preventing the movements of the pin in the extraction direction

until the action in the axial direction applied by the housing first wall of the pin housing exceeds the static friction force between the elastic element and the caliper body, allowing the sliding of the elastic element relative to the caliper body and, consequently, allowing the pin to exit from its housing.

[0010]. For example, document **EP1425520** by the applicant, shows a brake pad supporting pin coupled to a barrel-shaped expanding elastic element.

[0011]. The shape of the supporting pins and the respective expanding elastic elements is such to satisfy the need to guarantee an easy assembly of a brake caliper assembly, as well as a simple replacement of the brake pads, e.g., during maintenance, and at the same time to satisfy the need to guarantee an axially constrained coupling between the supporting pins and the caliper body during vehicle use, withstanding the operating biases.

[0012]. In a further aspect, to guarantee the correct axial positioning of the supporting pin and elastic element assembly, the pad supporting pins of known type are worked to have a pin abutment portion which when the supporting pin has reached its maximum axial insertion position axially abuts against the caliper body, and the elastic expansion element forming a radial seal with the caliper body prevents the unwanted release of the supporting pin from the caliper body.

[0013]. The pad supporting pins are worked in different manners to obtain different pin abutment portions according to the type of caliper body on which they must be mounted, e.g., on monobloc

caliper bodies or on caliper bodies having two caliper half-bodies assembled together. Consistently, the caliper body housings in which the pin tip and pin head are housed, respectively, have different shapes according to the type of caliper body.

[0014]. Some types of pad supporting pins have a pin abutment portion, i.e., a shoulder, at the pin tip end having a larger radial dimension than a smaller diameter pin tip end portion, so that it comes into contact with the caliper body when the pin is inserted into the caliper body reaching its maximum axial insertion position.

[0015]. In other types of pad supporting pins, the pin portion in which the annular housing is obtained, in which the elastic element is arranged, has a larger radial dimension than the rest of the pin and thus has, in the direction of the pin tip, a pin fitting shoulder shaped to abut against a caliper body housing shoulder so that it abuts against the caliper body when the pin is inserted into the caliper body reaching its maximum axial insertion position. In such a case, the caliper body housings in which the pin portion in which the annular housing is obtained is accommodated usually comprises a first cylindrical portion and a second cylindrical portion having different diameters that are connected by the shoulder of the caliper body housing.

[0016]. Although such pad supporting pins and the corresponding elastic elements meet the requirements of obtaining simple assembly and easy maintenance, it has been found that the mechanical operations to define the pin abutment portions make the manufacturing of the supporting pins particularly complex and has a

significant impact on the final cost and processing time.

[0017]. Therefore, the need is strongly felt in the sector to make pad supporting pins which are easy to manufacture and which make it possible to reduce the production costs per piece, and at the same time make it possible to standardize the geometry of the pins for different types of calipers, thus further facilitating the assembly processes of such assemblies into respective caliper bodies.

[0018]. Therefore, the problem underlying the present invention is to provide a caliper body, pin and elastic element assembly, as well as a brake caliper, a pin assembly, a caliper body and assembly method for a pad supporting pin into a caliper body of a vehicle, which have structural and functional features to satisfy the aforesaid requirements and, at the same time, solve the drawbacks mentioned with reference to the prior art and satisfy the aforesaid felt needs.

[0019]. Solution

[0020]. It is the object of the present invention to provide a caliper body, pin and elastic element assembly, as well as a brake caliper, a pin assembly, a caliper body and an assembly method for a pad supporting pin in a caliper body of a vehicle, which are easy to manufacture and at the same time allow easy maintenance and assembly.

[0021]. This and other objects and advantages are achieved by a caliper body, pin and elastic element assembly according to claim **1**, as well as a brake caliper according to claim **7**, a pin assembly according to claim **8**, a caliper body according to claim **9** and a

retaining method for a pad supporting pin in a caliper body of a vehicle brake according to claim 10.

[0022]. Some advantageous embodiments are the object of the dependent claims.

[0023]. The analysis of this solution shows that the suggested solution makes it possible to obtain a simplification of the machining of the supporting pins, maintaining an easy correct positioning of the supporting pin and the respective elastic element inside the caliper body.

[0024]. Furthermore, the suggested solution reduces manufacturing costs by reducing the pin portions which must be machined after drawing.

[0025]. Furthermore, the suggested solutions make it possible to standardize the different types of pins and the different types of pin housings made in the caliper body, further reducing manufacturing costs and simplifying the assembly operations.

[0026]. Figures

[0027]. Further features and advantages of the caliper body, pin and elastic element assembly, brake caliper, pin assembly, caliper body, and assembly method, are given by way of non-limiting examples, with reference to the accompanying figures, in which:

[0028]. - figure 1A shows a side view of a known type monobloc brake caliper;

[0029]. - figures 1B and 1C are partial section views taken along the plane of section A of figure 1A of an insertion sequence of a brake pad supporting pin provided with an elastic element of the

known type into a monobloc caliper body, in which a pin abutment portion 46 that axially abuts against the caliper body is visible;

[0030]. - figure 2A shows a side view of a known type of brake caliper in which the caliper body comprises two half-bodies;

[0031]. - figures 2B and 2C are partial section views taken along the plane of section D of figure 2A of an insertion sequence of a brake pad supporting pin provided with an elastic element of the known type into a caliper body having two half-bodies, in which a pin abutment portion stop 46 that axially abuts against the caliper body is visible;

[0032]. - figure 3 shows in a perspective view of a caliper body, supporting pin and elastic element assembly according to the present invention, in which the caliper body may be monobloc or made in two pieces;

[0033]. - figures 4A-4C are partial section views of the caliper body of figure 3 of an insertion sequence of a pad supporting pin into a caliper body according to the present invention;

[0034]. - figures 5A-5B are partial section views of the first housing made in the caliper body in figures 4A-4C in two different configurations;

[0035]. - figures 6A and 6B respectively show a cross-section view of a cylindrical tubular elastic element according to the present invention and a barrel-shaped elastic element according to the present invention configured to be fitted on pad pins according to the present invention;

[0036]. - figures 7A and 7B respectively are side views of a pad

supporting pin of the known type for two-piece calipers and a pad supporting pin of the known type for monobloc calipers, in which the pin body portions, shoulders, made to axially abut against respective portions of the caliper body are visible;

[0037]. - figures 8A and 8B respectively show side views of a pad supporting pin for two-piece calipers according to the present invention and a pad supporting pin for monobloc calipers according to the present invention, in which the pin body of said pins is worked to prevent the pin body portions from axially abutting against the respective portions of the caliper body.

[0038]. Description of some preferred embodiments

[0039]. According to a general embodiment, a caliper body, pin and elastic element assembly (100) is indicated by reference numeral 100 as a whole.

[0040]. Said assembly 100 comprises a caliper body 28 of a brake caliper 27, brake pad supporting pin 1, and an elastic element 6.

[0041]. Said caliper body 28 comprises a first elongated element 44 and a second elongated element 45. Said first elongated element 44 comprises at least a caliper body first housing 29 and said second elongated element 45 comprises at least a caliper body second housing 30.

[0042]. According to an embodiment, each said first elongated element 44 and said second elongated element 45 are made in one piece.

[0043]. According to an embodiment, said first elongated element 44 and said second elongated element 45 are two separate pieces.

[0044]. Said caliper body first housing 29 and said caliper body second housing 30 each have axis housing G-G.

[0045]. Said caliper body first housing 29 has a caliper body first housing diameter D_p and wherein said caliper body second housing 30 has a caliper body second housing diameter D_s .

[0046]. Said caliper body first housing 29 and said caliper body second housing 30 comprise respective prevalent axial or longitudinal housing extensions or housing lengths along said housing axis G-G.

[0047]. Said caliper body first housing 29 comprises in succession at least a first housing first portion 31, a first housing abutment portion 32, and a first housing third portion 38.

[0048]. Said brake pad supporting pin 1 comprises a pin body 2 which extends along a pin axis X-X between a pin proximal end 3 and a pin distal end 4. Said pin axis X-X defines an axial direction A-A, either coincident with or parallel to said pin axis X-X, and a radial direction R-R transverse to said axial direction A-A. Said pin X-X is parallel and coincident with each housing axis G- G.

[0049]. Said pin 2 is adapted to fit into said caliper body first housing 29 and said caliper body second housing 30.

[0050]. According to an embodiment, said pin body 2 is cylindrical.

[0051]. Said pin body 2 comprises in succession at least an elastic element pin annular housing 5 and a pin shank 19. Said pin shank 19 has a pin shank diameter D_g , and said pin annular housing 5 has a pin annular housing diameter D_a .

[0052]. According to an embodiment, said pin body 2 comprises a pin head 17. Said pin head comprises a prevailing longitudinal or axial extension or length along said pin axis X-X.

[0053]. Said pin annular housing 4 and said pin shank 19 comprise respective prevailing longitudinal or axial pin body extensions or pin body lengths along said pin axis X-X.

[0054]. Said elastic element 6 is fitted on said pin body 2 and arranged in said pin annular housing 5. Said elastic element 6 comprises an elastic element outer diameter D_e . Said elastic element 6 can be accommodated in said first housing first portion 31 and is adapted to abut against said first housing abutment portion 38.

[0055]. According to an embodiment, said elastic element 6 comprises at least an inner diameter D_i .

[0056]. Said elastic element 6 comprises an elastic element prevailing longitudinal or axial extension or elastic element length along said axial direction A-A.

[0057]. Within this description, the diameter of an element means the values that the diameter of said element may assume in a cross-section at the axial direction A-A along the longitudinal or axial length or extent of said element.

[0058]. Said pin shank diameter D_g measured in any cross-section relative to said pin axis X-X of said pin shank 19 along its longitudinal extension is either smaller than or equal to said caliper body first housing diameter D_p measured in any cross-section relative to said housing axis G-G of said first housing third portion 38 along its longitudinal extension.

[0059]. Said pin shank diameter D_g measured in any cross-section relative to said pin axis X-X of said pin shank 19 along its longitudinal extension is either smaller than or equal to said caliper body second housing diameter D_s measured in any cross-section relative to said housing axis G-G of said caliper body second housing 30 along its longitudinal extension.

[0060]. According to an embodiment, said pin annular housing diameter D_a measured in any cross-section relative to said pin axis X-X of said pin annular housing 5 along its longitudinal extension is either smaller than or equal to said caliper body first housing diameter 29 measured in any cross-section relative to said housing axis G-G of said caliper body first housing 29 along its longitudinal extension.

[0061]. According to an embodiment, said elastic element inner diameter D_i measured in any cross-section of said pin axis X-X of said elastic element 6 along its longitudinal extension is either greater than or equal to said pin annular housing diameter D_a measured in any cross-section relative to said pin axis X-X of said pin annular housing 5 along its longitudinal extension.

[0062]. Said elastic element outer diameter D_e measured in at least a cross-section relative to said pin axis X-X of said elastic element 6 along its extension is greater than said shank diameter D_g measured in any cross-section relative to said pin axis X-X of pin shank 19 along its longitudinal extension.

[0063]. Said elastic element outer diameter D_e measured in at least a cross-section relative to said pin axis X-X of said elastic

element 6 along its longitudinal extension is equal to said first housing diameter D_s measured in at least a cross-section relative to said housing axis G-G of said first housing first portion 31 along its longitudinal extension.

[0064]. Said elastic element outer diameter D_e measured in at least a cross-section area at said pin axis X-X of said elastic element 6 along its longitudinal extent is greater than said first housing diameter D_s measured in at least a cross-section area at said housing axis (G-G) of said first housing abutment portion 32 along its longitudinal extension so that said elastic element 6 axially abuts with said first housing abutment portion 32 defining a limit stop of said supporting pin 1 in said caliper body 28.

[0065]. By virtue of the suggested solution, at least said pin annular housing 5 and said pin shank 19 have dimensions such that they can be accommodated respectively in said caliper body first housing 29, and in said first housing third portion 38 and said caliper body second housing 30, without interfering in axial direction A-A with surfaces having extension in radial direction R-R of said caliper body 28.

[0066]. By virtue of the suggested solution, said elastic element 6 has dimensions such as to form said axial abutment with said first housing abutment portion 32 to define said limit stop of the pin 1 in said caliper body 2 preventing the pin body 2 from going into axial abutment with the caliper body 2, i.e., with surfaces having extension in radial direction R-R of said caliper body 28.

[0067]. By virtue of the suggested solutions, said pin body 2 is

shaped to prevent the pin body 2 from axially abutting against the caliper body 2. In other words, the pin body 2 is free of pin body abutment portions which could hinder insertion of the pin 1 into the caliper body 28.

[0068]. By virtue of the suggested solutions, the caliper body housings 29, 30 of said caliper body 28 are shaped to allow sliding of the pin body 2 without axial abutments and to allow said limit stop of the pin 1 in the caliper body 2 by virtue of the provision of a first housing abutment portion 32 adapted to axially interfere with said elastic element 6.

[0069]. According to an embodiment, said elastic element inner diameter D_i measured in any cross-section relative to said pin axis X-X of said elastic element 6 along its longitudinal extension is smaller than said pin shank diameter D_g measured in at any cross-section relative to said pin axis X-X of said pin 19 along its longitudinal extension.

[0070]. According to an embodiment, said pin head 17 has a pin head diameter D_t .

[0071]. According to an embodiment, said elastic element inner diameter D_i measured in any cross-section of said pin axis X-X of said elastic element 6 along its longitudinal extension is smaller than said pin head diameter D_t measured in any cross-section relative to said pin axis X-X of said pin head 17 along its longitudinal extension.

[0072]. According to an embodiment, said pin head diameter D_t is smaller than said first housing diameter D_{sa} measured in each cross-

section area at said housing axis G-G of said first housing first portion 31 and of said first housing abutment portion 32.

[0073]. According to an embodiment, said elastic element 6 has such dimensions as to form a radial seal with said first housing first portion 31 to apply a friction force which opposes a force to remove the pin 1 from the caliper body 28.

[0074]. According to an embodiment, said elastic element 6 comprises an elastic element radially outer axial wall 14 adapted to form said radial seal with said first housing first portion 31 of said caliper body first housing 29.

[0075]. According to an embodiment, said pin shank 19 comprises at least a pin first shoulder 7 which axially delimits said annular housing 5 in the direction of said pin distal end 4.

[0076]. According to an embodiment, said pin head 17 comprises a second pin shoulder 16 which axially delimits said annular housing 5 in the direction of said proximal pin end 3.

[0077]. According to an embodiment, said first pin shoulder 7 extends in a radial direction R-R between a first shoulder radially inner edge 10 and a first shoulder radially outer edge 11.

[0078]. According to an embodiment, said elastic element 6 comprises at least an elastic element first wall 12 and an elastic element second wall 13.

[0079]. According to an embodiment, said elastic element 6 comprises an elastic element third wall 15 adapted to face to said pin second shoulder 16.

[0080]. According to a first embodiment, said elastic element

first wall 12 is adapted to abut against said pin first shoulder 7.

[0081]. According to an embodiment, said elastic element second wall 13 is adapted to form said axial abutment with said first housing abutment portion 32 of said first housing 29.

[0082]. According to a second embodiment, said elastic element second wall 13 is radially outer relative to said first shoulder radially outer edge 11 both when said pin 1 is inserted in the housings 29, 30 of the caliper body and when said pin 1 is outside the caliper body 28.

[0083]. According to an embodiment, said elastic element first wall 12 is radially inner relative to said first shoulder radially outer edge 11 both when said pin 1 is inserted in the housings 29, 30 of the caliper body 28 and when said pin 1 is outside the caliper body 28.

[0084]. According to an embodiment, said elastic element 6 comprises an elastic element body which is elastically reversible between a resting configuration and a compression configuration.

[0085]. According to an embodiment, in said resting configuration, said elastic element outer diameter D_e measured in at least a cross-section of said axial direction A-A of said elastic element 6 along its longitudinal extension is greater than said first housing diameter D_{sa} measured in at least a cross-section of said axial direction A-A of said first housing first portion 31 along its longitudinal extension. In said compression configuration, said elastic element outer diameter D_e measured in at least a cross-section relative to said axial direction A-A of said elastic element

6 along its longitudinal extension is equal to said first housing diameter D_{sa} measured in at least a cross-section relative to said axial direction A-A of a first housing first portion 31 along its longitudinal extension.

[0086]. According to an embodiment, said elastic element 6 comprises at least an elastic element radially inner axial wall 21. Said radially inner axial wall 21 being adapted to face the outer surface of said pin body 2 at said pin annular housing 5.

[0087]. According to an embodiment, said elastic element 6 has an elastic element through opening 20 which allows said elastic element 6 to pass from said resting configuration to said compressed configuration or to an extended configuration to fit said elastic element 6 to the pin body 2 in a simplified manner.

[0088]. According to an embodiment, said elastic element through opening 20 extends in a radial direction R-R, between said elastic element radially outer axial wall 14 and an elastic element radially inner axial wall 21, and in an axial direction A-A, between said elastic element first wall 12 and said elastic element second wall 13, and said elastic element third wall 15.

[0089]. According to an embodiment, said elastic element second wall 13 extends seamlessly at least in a radial direction R-R from said elastic element first wall 12.

[0090]. According to an embodiment, said elastic element second wall 13 is connected to said elastic element radially outer axial wall 14 with a first connection radius R_1 .

[0091]. According to an embodiment, said elastic element first

wall 12 is substantially a circular crown which extends in a radial direction R-R facing said first pin shoulder 7.

[0092]. According to an embodiment, said elastic element second wall 13 is substantially a circular crown.

[0093]. According to an embodiment, said elastic element first wall 12 and said elastic element second wall 13 are coplanar and orthogonal to said pin axis X-X.

[0094]. According to an embodiment, said elastic element radially outer axial wall 14 is a cylindrical wall. According to an embodiment, said elastic element radially inner axial wall 21 is a cylindrical wall.

[0095]. According to an embodiment, said elastic element third wall 15 extends seamlessly at least in radial direction R-R between said elastic element radially outer axial wall 14 and said elastic element radially inner axial wall 21.

[0096]. According to an embodiment, said the elastic element third wall 15 is a circular crown having extension exclusively in the radial direction R-R.

[0097]. According to an embodiment, said elastic element first wall 12 and said elastic element third wall 15 are perpendicular to said axial direction A-A and are spaced along said axial direction A-A of said elastic element axial extension.

[0098]. According to an embodiment, said elastic element 6 is annular and has an elastic element through opening 20.

[0099]. According to an embodiment, said elastic element 14 is barrel-shaped.

[00100]. According to an embodiment, said elastic element 6 is cylindrical-tubular-shaped.

[00101]. According to an embodiment, the cylindrical-tubular-shaped elastic element 6 makes it possible to achieve a stable abutment between the circular-crown-shaped elastic element second wall 13 and the first housing second portion 32. In this manner, unlike the prior art, the elastic element 6 is free of truncated portions, or blunt portions, which can be wedged within a portion of the first caliper body housing 20 consequently tightening the elastic element 6 and reducing the radial seal and holding force of the pin.

[00102]. According to an embodiment, said first housing 29 and said second housing 30 are through housings.

[00103]. According to an embodiment, said caliper body 28 comprises a second housing wall 33 which defines said caliper body second housing 30.

[00104]. According to an embodiment, said second housing wall 33 is cylindrical, wherein said second housing diameter D_s is constant throughout the axial extension of the second housing 30.

[00105]. According to an embodiment, said caliper body 28 comprises a first housing first wall 34 which defines said first housing portion 31.

[00106]. According to an embodiment, said first housing first wall 34 is a cylindrical wall and a first housing first portion diameter D_{p1} which is constant throughout the axial extension of the first housing first portion 31.

[00107]. According to an embodiment, said caliper body 28 comprises

a first housing second wall 35 which defines said first housing abutment portion 32.

[00108]. According to an embodiment, said first housing second wall 35 extends in at least in a radial direction R-R between a first housing second wall radially outer edge 36 and a first housing second wall radially outer edge 37.

[00109]. According to an embodiment, said caliper body first housing 29 comprises a first housing third portion 38.

[00110]. According to an embodiment, said caliper body 28 comprises a first housing third wall 39 which defines said first housing third portion 38.

[00111]. According to an embodiment, said first housing third wall 39 is cylindrical and first housing third portion diameter $Dp3$.

[00112]. According to an embodiment, said first housing third portion diameter $Dp3$ is equal to said second housing diameter Ds .

[00113]. According to an embodiment, said first housing second wall radially inner edge 37 has a diameter equal to said first housing third portion diameter $Dp3$.

[00114]. According to an embodiment, said first housing second wall 35 is connected to said first housing first wall 34 with a second connection radius $R2$.

[00115]. According to an embodiment, said first housing second wall radially outer edge 36 has a diameter equal to said first housing first portion diameter $Dp1$, and wherein said first housing second wall radially inner edge 37 has a diameter smaller than said first housing first portion diameter $Dp1$.

[00116]. According to an embodiment, said first housing second wall 35 is a circular crown which defines a first housing shoulder.

[00117]. According to an embodiment, said first housing second wall 35 is a conical crown which defines a first housing inner chamfer.

[00118]. According to an embodiment, said caliper body first housing 29 comprises a first housing fourth portion 40.

[00119]. According to an embodiment, said caliper body 28 comprises a first housing fourth wall 41 which defines said first housing fourth portion 40.

[00120]. According to an embodiment, said first housing fourth wall 41 extends in at least an axial direction A-A between a first housing fourth wall first edge 42 and a first housing fourth wall second edge 43.

[00121]. According to an embodiment, said first housing fourth wall second edge 43 defines an insertion port for inserting said pin 1 into said caliper body 28.

[00122]. According to an embodiment, said first housing fourth wall first edge 42 has a diameter equal to said first housing first portion diameter D_{p1} .

[00123]. According to an embodiment, said first housing fourth wall radially inner edge 43 has a greater diameter than said first housing first portion diameter D_{p1} .

[00124]. According to an embodiment, said first housing fourth wall 41 also extends in radial direction R-R and is a conical crown which defines a first housing outer chamfer which facilitates insertion of said pin 1 into said first housing 29.

[00125]. According to an embodiment, said first housing fourth wall 41 is cylindrical and has a first housing fourth portion constant diameter D_{p4} which is greater than said first housing first portion diameter D_{p1} .

[00126]. According to an embodiment, the first connection radius $R1$ of the elastic element 6 is not smaller than the second connection radius $R2$ of the caliper body first housing 29.

[00127]. According to an embodiment, said pin distal end 4 has a pin distal end diameter D_d and said pin shank 19 comprises a shank tapered portion 8 and a shank constant diameter portion, wherein the shank constant diameter portion has a diameter greater than a pin distal end diameter D_d .

[00128]. According to an embodiment, said shank tapered portion 8 extends along said axial direction A-A towards said pin distal end 4 seamlessly reducing said shank diameter D_g from the value of said shank constant diameter portion diameter to said pin distal end diameter D_d to facilitate insertion of said pin 1 in said housings 29, 30 preventing the body of pin 2 from abutting against the portions of said caliper body 28. In other words, the pin shank 19 has a cylindrical shape with a constant diameter first stretch and a truncated shape second stretch corresponding to the shank tapered portion 8.

[00129]. According to an embodiment, said pin body 2 comprises a reduced diameter pin portion 9 which defines said annular housing 5 for accommodating said elastic element 6.

[00130]. According to an embodiment, said pin shank 19 comprises a

central pin portion 18 which has a central portion cut-away 22 for accommodating a brake caliper spring.

[00131]. The present invention further relates to a brake caliper 27. Said brake caliper 27 comprises a caliper body, supporting pin and elastic element assembly 100 as described above and at least a brake pad 23a, 23b.

[00132]. According to an embodiment, each brake pad 23a, 23b has a backing plate 24 connected to a friction material 25, wherein each backing plate 24 comprises at least a plate through hole 26 for accommodating said brake pad supporting pin 2.

[00133]. According to an embodiment, said brake caliper 27 is a monobloc caliper.

[00134]. According to an embodiment, said caliper body 28 comprises two caliper half-bodies.

[00135]. The present invention further relates to a disc brake assembly for a vehicle, comprising a brake disc connected to a hub of a wheel of the vehicle, and a brake caliper 27 as previously described, in which said caliper body 28 is arranged to straddle the brake disc.

The present invention further relates to a pin assembly comprising a pad supporting pin 1 and an elastic element 6 adapted to cooperate with a caliper body 28 comprising a first elongated element 44 and a second elongated element 45. Said first elongated element 44 comprising at least a caliper body first housing 29 and said second elongated element 45 comprising at least a caliper body second housing 30, wherein said caliper body first housing 29 and said

caliper body second housing 30 each have a housing axis G-G, wherein said caliper body first housing 29 comprises in succession at least a first housing first portion 31, a first housing abutment portion 32 and a first housing third portion 38, said caliper body first housing 29 having a prevailing longitudinal extension and having a caliper body first housing diameter D_p , and said caliper body second housing 30 having a prevalently longitudinal extension and having a caliper body second housing diameter D_s . Said supporting pin 1 comprises a pin body 2 which extends along a pin axis X-X between a proximal pin end 3 and a distal pin end 4, wherein said pin axis X-X defines an axial direction A-A, either coincident with or parallel to said pin axis X-X, and a radial direction R-R transverse to said axial direction A-A, wherein said pin body 2 is adapted to fit into said caliper body first 29 and said caliper body second housing 30, wherein said pin X-X is parallel and coincident with each housing axis G-G. Said pin body (2) comprises in succession at least a pin annular housing (5) for elastic element and a pin shank 19 of a prevailing longitudinal extension. Said pin shank 19 has a pin shank diameter D_g . Said elastic element 6 is fitted on said pin body 2 and arranged in said pin annular housing 5, wherein said elastic element 6 can be accommodated in said first housing first portion 31, wherein said elastic element 6 is adapted to abut against said first housing abutment portion 38, wherein said elastic element 6 comprises an elastic element outer diameter D_e . Said pin shank diameter D_g measured in any cross-section relative to said pin axis X-X of said pin shank 19 along its longitudinal extension is either

smaller than or equal to said caliper body second housing diameter D_s measured in any cross-section relative to said housing axis G-G of said caliper body second housing 30 along its longitudinal extension and to said caliper body first housing diameter D_p measured in any cross-section relative to said housing axis G-G of said first housing third portion 32. Said elastic element outer diameter D_e measured in at least a cross-section relative to said pin axis X-X of said elastic element 6 is greater than said shank diameter D_g measured in any cross-section relative to said pin axis X-X of pin shank 19 along its longitudinal extension.

[00136].

[00137]. According to an embodiment, said pad supporting pin 1 is part of said caliper body, supporting pin and elastic element assembly 100 as described above.

[00138]. The present invention further relates to a caliper body 28 of a brake caliper 27 adapted to cooperate with a pin assembly as described above..

[00139]. Said caliper body 28 comprises a first elongated element 44 and a second elongated element 45, wherein said first elongated element 44 comprises at least a caliper body first housing 29 and said second elongated element 45 comprises at least a caliper body second housing 30, wherein said caliper body first housing 29 and said caliper body second housing 30 each have axis G-G, wherein said caliper body first housing 29 comprises in succession at least a first housing first portion 31, a first housing abutment portion 32 and a first housing third portion 38, said caliper body first

housing 29 having a prevailing longitudinal extension and having a caliper body first housing diameter D_p , and said caliper body second housing 30 having a prevailing longitudinal extension and having a caliper body second housing diameter D_s , wherein said caliper body second housing diameter D_s measured in any cross-section relative to said housing axis G-G of said caliper body second housing 30 along its longitudinal extension is either greater than or equal to said pin shank diameter D_g measured in any cross-section relative to said pin axis X-X of said pin shank 19 along its longitudinal extension, wherein said caliper body first housing diameter D_p measured in any cross-section relative to said housing axis G-G of said first housing third portion 32 is either greater than or equal to said pin shank diameter D_g measured in any cross-section relative to said pin axis X-X of said pin shank 19 along its longitudinal extension, wherein said first housing diameter D_p measured in at least at one cross-section relative to said housing axis G-G of said first housing first portion 31 is equal to said elastic element outer diameter D_e measured in at least a cross-section relative to said pin axis X-X of said elastic element 6, and wherein said first housing diameter D_p measured in at least a cross-section relative to said housing axis G-G of said first housing abutment portion 32 is smaller than said elastic element outer diameter D_e measured in at least a cross-section relative to said pin axis X-X of said elastic element 6 so that said first housing abutment portion 32 axially abuts said elastic element 6 by defining a limit stop abutment of said supporting pin 1 in said caliper body 28.

[00140]. According to an embodiment, said caliper body 28 is part of said caliper body, supporting pin and elastic element assembly 100 as described above.

[00141]. The present invention further relates to an assembling method for a pad supporting pin 1 into a caliper body 28 of a vehicle.

[00142]. Said method provides the following steps:

[00143]. - providing a pad supporting pin comprising a pin body 2 extending along a pin axis X-X between a proximal pin end 3 and a distal pin end 4 and comprising in succession at least a pin annular housing 5 and pin shank 19 in succession,

[00144]. - providing an elastic element 6 and fitting it on said pin body 2 at said annular housing 5

[00145]. - providing a caliper body 28 of a brake caliper 27, wherein said caliper body 28 comprises a first elongated element 44 and a second elongated element 45, wherein said first elongated element 44 comprises at least a caliper body first housing 29 and said second elongated element 45 comprises at least a caliper body second housing 30, wherein said first caliper body first housing 29 and said caliper body second housing 30 each have a housing axis G-G parallel to and coincident with said pin axis X-X, wherein said caliper body first housing 29 comprises in succession at least a first housing first portion 31, a first housing abutment portion 32, and a first housing third portion 38,

[00146].

[00147]. - inserting said pin 1 in said caliper body 28 for a first

insertion stretch, wherein in said first insertion stretch said pin distal end 4 slides through the caliper body first housing 29 in the direction of said caliper body second housing 30 until it enters into said caliper body second housing 30, and wherein at the end of said first insertion stretch said pin annular housing 5 and said elastic element 6 are positioned at a mouth of said caliper body first housing 29,

-

inserting said pin 1 into said caliper body 28 for a second insertion stretch by applying a force to said pin proximal end 3 in the direction of said pin distal end 4, wherein in said second insertion stretch said pin distal end 4 slides inside said caliper body second housing 30 and said elastic element 6 slides inside said first housing first portion 31 until said elastic element 6 axially abuts said first housing abutment portion 32 defining a limit stop abutment of said pin 2 inside said caliper body 28, preventing the pin body 2 from axially abutting the caliper body surfaces 28 which extend in a radial direction R-R.

[00148]. .

[00149]. According to an embodiment, said pad supporting pin 1 and said caliper body 28 are part of said caliper body, supporting pin and elastic element assembly 100 as described above. According to an embodiment, said method comprises providing a caliper body, pin and elastic element assembly 100 as described above.

[00150]. The suggested solutions, by virtue of a pin body free from portions configured to work a caliper body, and by virtue of the

provision of an elastic element 6 having dimensions such as to form both a radial seal and an axial abutment with a caliper body, make it possible to obtain a pin 1 in which, unlike that known in the prior art, the elastic element 6 has the dual function of forming a radial seal with the caliper body and of axially abutting against the caliper body, respectively limiting the movements of the pin in the extraction direction from the caliper body 28 and defining the maximum axial insertion position, or axial abutment position, of said pin 1 in the caliper body 28 without the pin body 2 abutting against the caliper body 28.

[00151]. The suggested solutions, by virtue of the provision of the elastic element 6 configured to form a radial seal with the caliper body and configured abut axially against the caliper body, makes it possible to avoid providing complex machining to form portions of the axial abutment pin with the caliper body and thus limit the turning operations of the raw drawn supporting pin 2 substantially to make the annular housing 5.

[00152]. By virtue of the suggested solutions, it is possible to produce extremely simple pad supporting pins 1 in which said pins 1 have substantially constant diameter pin bodies 2, minus the portion of the pin in which the annular housing for the elastic element is made, and free from further abutments.

[00153]. Furthermore, the provision of a cylindrical-tubular-shaped elastic element 6 is very advantageous compared to the use of a known barrel-shaped elastic element, because it can be obtained from commercially available standard cylindrical-shaped drawn material

further lowering the production costs of the pin 1.

[00154]. By virtue of the suggested solutions, it is possible to make assemblies 1 in a simplified manner, limiting the turning operations of the pin body to a maximum of 25% of the surface of the supporting pins 2. Conversely, the supporting pins of the known type have turning operations concerning more than 80% of the outer surface.

[00155]. By virtue of the suggested solutions, it is possible to make caliper bodies 28 of brake calipers 27 of both the monobloc and two-piece type by unifying the caliper body housings which accommodate the pin 1 for both types of brake calipers. In this manner, the same pin 1 can be used for both of these types of brake calipers, further simplifying the organization of assembly line operations.

LIST OF REFERENCES

- 100 caliper body, pin and elastic element assembly
- 1 brake pad supporting pin
- 2 supporting pin body
- 3 pin proximal end
- 4 distal pin end
- 5 pin annular housing
- 6 elastic element
- 7 pin first shoulder
- 8 shank tapered portion
- 9 reduced diameter pin portion
- 10 first shoulder radially inner edge
- 11 first shoulder radially outer edge
- 12 elastic element first wall
- 13 elastic element second wall
- 14 elastic element radially outer axial wall
- 15 elastic element third wall
- 16 pin second shoulder
- 17 pin head
- 18 pin central portion
- 19 pin shank
- 20 elastic element through opening
- 21 elastic element radially inner axial wall
- 22 caliper spring pin central portion cut-away
- 23a brake pad
- 23b brake pad
- 24 backing plate
- 25 friction material
- 26 plate through hole
- 27 brake caliper
- 28 caliper body
- 29 caliper body first housing
- 30 caliper body second housing

31	first housing first portion
32	first housing abutment portion
33	second housing wall or first housing second portion
34	first housing first wall
35	first housing second wall
36	first housing second wall radially outer edge
37	first housing second wall radially inner edge
38	first housing third portion
39	first housing third wall
40	first housing fourth portion
41	first housing fourth wall
42	first housing fourth wall first edge
43	first housing fourth wall second edge
44	caliper body elongated first element
45	caliper body elongated second element
46	pin abutment portions
Dt	pin head diameter
Da	pin annular housing diameter
Dg	pin shank diameter
Dd	pin distal end diameter
Dp	first housing diameter
Ds	second housing diameter
Dp1	first housing first portion diameter
Dp3	first housing third portion diameter
Dp4	first housing fourth portion diameter
De	elastic element outer diameter
Di	elastic element inner diameter
R1	first connection radius
R2	second connection radius
X-X	pin axis
A-A	axial direction
R-R	radial direction
G-G	caliper body housing axis

CLAIMS

- 1.** A caliper body, pin and elastic element assembly (100), comprising
- a caliper body (28) comprising a first elongated element (44) and a second elongated element (45), wherein said first elongated element (44) comprises at least a caliper body first housing (29) and said second elongated element (45) comprises at least a caliper body second housing (30), wherein said caliper body first housing (29) and said caliper body second housing (30) each have a housing axis (G-G), wherein said caliper body first housing (29) comprises at least a first housing first portion (31), a first housing abutment portion (32) and a first housing third portion (38), said caliper body first housing (29) having a caliper body first housing diameter (D_p), and said caliper body second housing (30) having a caliper body second housing diameter (D_s);
 - a brake pad supporting pin (1) comprising a pin body (2) which develops along a pin axis (X-X) between a proximal pin end (3) and a distal pin end (4), wherein said pin body (2) is adapted to be inserted into said caliper body first housing (29) and said caliper body second housing (30),
- wherein said pin body (2) comprises at least a pin annular housing (5) for elastic element and a pin shank (19) having a prevailing longitudinal extension,
- wherein said pin shank (19) has a pin shank diameter (D_g),
- wherein said assembly (100) comprises an elastic element (6), wherein said elastic element (6) is fitted on said pin body (2) in

said pin annular housing (5), wherein said elastic element (6), when said supporting pin (1) is fitted in said first and second housing (29, 30), it is accommodated in said first housing first portion (31) and abuts said first housing abutment portion (32), wherein said elastic element (6) comprises an elastic element outer diameter (De),

wherein said pin shank diameter (Dg) measured in any cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension is either smaller than or equal to said caliper body second housing diameter (Ds) measured in any cross-section with respect to said housing axis (G-G) of said caliper body second housing (30) and of said caliper body first housing diameter (Dp) measured in any cross-section with respect to said housing axis (G-G) of said first housing third portion (38),

wherein said elastic element outer diameter (De) measured in at least a cross-section with respect to said elastic element (6) is greater than said shank diameter (Dg) measured in any cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension,

wherein said elastic element outer diameter (De) measured in at least a cross-section of said elastic element (6) is either greater than or equal to said first housing diameter (Dp) measured in at least a cross-section with respect to said housing axis (G-G) of said first housing first portion (31),

and wherein said elastic element outer diameter (De) measured in at least a cross-section of said elastic element (6) is greater than

said first housing abutment portion (32) wherein, when said supporting pin (1) is fitted in said first and second housing (29, 30), said elastic element (6) axially abuts said first housing abutment portion (32) defining a limit stop abutment of said supporting pin (1) in said caliper body (28).

2. A caliper body, pin and elastic element assembly (100), according to claim 1, wherein

wherein said pin annular housing (5) has a pin annular housing diameter (D_a),

wherein said pin annular housing diameter (D_a) measured in any cross-section with respect to said pin axis (X-X) of said pin annular housing (5) along its longitudinal extension is either smaller than or equal to said caliper body first housing diameter (29) measured in any cross-section with respect to said pin axis (G-G) of said caliper body first housing (29) along its longitudinal extension,

and/or

said elastic element (6) comprises an elastic element inner diameter (D_i), wherein said elastic element inner diameter (D_i) measured in any cross-section with respect to said pin axis (X-X) of said elastic element (6) along its longitudinal extension is either greater than or equal to said diameter of said pin annular housing (5) measured in any cross-section with respect to said pin axis (X-X) of said pin annular housing (5) along its longitudinal extension, and wherein said elastic element inner diameter (D_i) measured in any

cross-section with respect to said pin axis (X-X) of said elastic element (6) along its longitudinal extension is smaller than said pin shank diameter (D_g) measured in at least a cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension;

and/or wherein said pin body (2) comprises a pin head (17), wherein said pin head (17) has a pin head diameter (D_t), wherein said elastic element inner diameter (D_i) measured in any cross-section with respect to said pin axis (X-X) of said elastic element (6) along its longitudinal extension is smaller than said pin head diameter (D_t) measured at any cross-section with respect to said pin axis (X-X) of said pin head (17) along its longitudinal extension, and wherein said pin head diameter (D_t) is smaller than said first housing diameter (D_p) measured at each cross-section with respect to said housing axis (G-G) of said first housing first portion (31) and said first housing abutment portion (32) along their longitudinal extensions;

and/or wherein said elastic element (6) has dimensions such as to achieve a radial sealing with said first housing first portion (31) to apply a friction force which opposes a force to remove the pin (1) from the caliper body (28), wherein said elastic element (6) comprises an elastic element radially outer axial wall (14) adapted to achieve said radial sealing with said first housing first portion (31);

and/or wherein said pin shank (19) comprises at least a pin first shoulder (7) which axially delimits said annular housing (5) in the

direction of said pin distal end (4), wherein said pin first shoulder (7) develops in a radial direction (R-R) between a first shoulder radially inner edge (10) and a first shoulder radially outer edge (11), wherein said elastic element (6) comprises at least an elastic element first wall (12) and an elastic element second wall (13), wherein said elastic element first wall (12) is adapted to abut said first pin shoulder (7), and wherein said elastic element second wall (13) is adapted to axially abut said first housing abutment portion (32) of said first housing (29); and/or wherein, when said pin (1) is inserted in said caliper body housings (29, 30), said pin (1) axially abuts said caliper body (28) exclusively by means of said elastic element (6).

3. A caliper body, pin and elastic element assembly (100), according to claim 2, wherein said elastic element second wall (13) is radially outer relative to said first shoulder radially outer edge (11) both when said pin (1) is inserted in the housings (29, 30) of the caliper body and when said pin (1) is outside the caliper body (28);

and/or wherein said elastic element first wall (12) is radially inner relative to said first shoulder radially outer edge (11) both when said pin (1) is inserted in the housings (29, 30) of the caliper body (28) and when said pin (1) is outside the caliper body (28);

and/or wherein such an elastic element (6) comprises an elastic element body which is elastically deformable at least in a radial

direction (R-R) between a resting configuration and a compression configuration,

wherein, in said resting configuration, said elastic element outer diameter (De) measured in at least a cross-section with respect to said pin axis (X-X) of said elastic element (6) along its longitudinal extension is greater than said first housing diameter (Dp) measured in at least a cross-section with respect to said housing axis (G-G) of said first housing first portion (31) along its longitudinal extension,

and wherein in said compression configuration, said elastic element outer diameter (De) measured in at least a cross-section with respect to said pin axis (X-X) of said elastic element (6) along its longitudinal extension is equal to said first housing diameter (Dp) measured in at least a cross-section with respect to said housing axis (G-G) of said first housing first portion (31) along its longitudinal extension;

and/or wherein said elastic element (6) has an elastic element through-opening (20), wherein said elastic element through-opening (20) develops in a radial direction (R-R), between said elastic element radially outer axial wall (14) and an elastic element radially inner axial wall (21), and in an axial direction (A-A), between said elastic element first wall (12) and said elastic element second wall (13), and said elastic element third wall (15).

4. A caliper body, pin and elastic element assembly (100) according to claim 2, wherein said elastic element second wall (13) develops

seamlessly at least in a radial direction (R-R) from said elastic element first wall (12);

and/or wherein said elastic element second wall (13) is connected to said elastic element axial wall (14) with a first radius of connection (R1);

and/or wherein said elastic element first wall (12) is substantially a circular crown which develops in a radial direction (R-R) facing said first pin shoulder (7);

and/or wherein said elastic element second wall (13) is substantially a circular crown;

and/or wherein said elastic element axial wall (14) is a cylindrical wall;

and/or wherein said elastic element (6) has a cylindrical conformation.

5. A caliper body, pin and elastic element assembly (100), according to claim 1, wherein said first housing (29) and said second housing (30) are through housings;

and/or wherein said caliper body (28) comprises a second housing wall (33) which defines said caliper body second housing (30), wherein said second housing wall (33) is cylindrical, wherein said second housing diameter (Ds) is constant;

and/or wherein said caliper body (28) comprises a first housing first wall (34) which defines said first housing first portion (31), wherein said first housing first wall (34) is a cylindrical wall and has a first housing first portion diameter (Dp1);

and/or wherein said caliper body (28) comprises a first housing second wall (35) which defines said first housing abutment portion (32), wherein said first housing second wall (35) develops at least in a radial direction (R-R) between a first housing second wall radially outer edge (36) and a first housing second wall radially inner edge (37);

and/or wherein said caliper body first housing (29) comprises a first housing third portion (38), wherein said caliper body (28) comprises a first housing third wall (39) which defines said first housing third portion (38), wherein said first housing third wall (39) is cylindrical and has a first housing third portion diameter (Dp3);

and/or wherein said caliper body first housing (29) comprises a first housing fourth portion (40), wherein said caliper body (28) comprises a first housing fourth wall (41) defining said first housing fourth portion (40); wherein said first housing fourth wall (41) develops at least in an axial direction (A-A) between a first housing fourth wall first edge (42) and a first housing fourth wall second edge (43) which defines an insertion mouth to insert said pin (1) in said caliper body (28).

6. A caliper body, pin and elastic element assembly (100), according to the preceding claim, wherein said first housing third portion diameter (Dp3) is equal to said second housing diameter (Ds);

and/or wherein said first housing second wall radially inner edge (37) has a diameter equal to said first housing third portion

diameter (Dp3);

and/or wherein said first housing second wall (35) is connected to said first housing first wall (34) with a second radius of connection (R2);

and/or wherein said first housing second wall radially outer edge (36) has a diameter equal to said first housing first portion diameter (Dp1), and wherein said first housing second wall radially inner edge (37) has a diameter smaller than said first housing first portion diameter (Dp1);

and/or wherein said first housing second wall (35) is a circular crown which defines a first housing shoulder or is a tapered crown which defines an inner chamfer of first housing;

and/or wherein said first housing fourth wall first edge (42) has a diameter equal to said first housing first portion diameter (Dp1), and wherein said first housing fourth wall radially inner edge (43) has a diameter greater than said first housing first portion diameter (Dp1);

wherein said first housing fourth wall (41) also develops in a radial direction (R-R) and is a conical crown which defines a first housing outer chamfer which facilitates the insertion of said pin (1) in said first housing (29), or said first housing fourth wall (41) is cylindrical and has a fourth portion of first housing diameter (Dp4) greater than said first housing first portion diameter (Dp1).

7. A brake caliper (27) comprising an assembly (100) according to

any one of the claims from 1 to 6 and at least a brake pad (23a, 23b) supported by each supporting pin (1).

8. A pin assembly comprising a supporting pin (1) for brake pads and an elastic element (6) adapted to cooperate with a caliper body (28) comprising a first elongated element (45) and a second elongated element (45), wherein said first elongated element (44) comprises at least a caliper body first housing (29) and said second elongated element (45) comprises at least a caliper body second housing (30), wherein said caliper body first housing (29) and said caliper body second housing (30) each have a housing axis (G-G), wherein said caliper body first housing (29) comprises in succession at least a first housing first portion (31), a first housing abutment portion (32) and a first housing third portion (38), said caliper body first housing (29) having a prevalently longitudinal extension and having a caliper body first housing diameter (D_p), and said caliper body second housing (30) having a prevalently longitudinal extension and having a caliper body second housing diameter (D_s), wherein said supporting pin (1) comprises a pin body (2) which develops along a pin axis (X-X) between a proximal pin end (3) and a distal pin end (4), wherein said pin axis (X-X) defines an axial direction (A-A), either coincident with or parallel to said pin axis (X-X), and a radial direction (R-R) transverse to said axial direction (A-A), wherein said pin body (2) is adapted to fit into said caliper body first housing (29) and said caliper body second housing (30),

wherein said pin axis (X-X) is parallel and coincident with each housing axis (G-G),

wherein said pin body (2) comprises in succession at least a pin annular housing (5) for elastic element and a pin shank (19) of a prevailing longitudinal extension,

wherein said pin shank (19) has a pin shank diameter (Dg),

- wherein said elastic element (6) is fitted on said pin body (2) and arranged in said pin annular housing (5), wherein said elastic element (6) can be accommodated in said first housing first portion (31), wherein said elastic element (6) is adapted to abut said first housing abutment portion (38), wherein said elastic element (6) comprises an elastic element outer diameter (De),

wherein said pin shank diameter (Dg) measured in any cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension is either smaller than or equal to said caliper body second housing diameter (Ds) measured in any cross-section with respect to said housing axis (G-G) of said caliper body second housing (30) along its longitudinal extension and to said caliper body first housing diameter (Dp) measured in any cross-section with respect to said housing axis (G-G) of said first housing third portion (32),

wherein said elastic element outer diameter (De) measured in at least a cross-section with respect to said pin axis (X-X) of said elastic element (6) is greater than said shank diameter (Dg) measured in any cross-section with respect to said pin axis (X-X) of pin said shank (19) along its longitudinal extension.

9. A caliper body (28) of a brake caliper (27) adapted to cooperate with a pin assembly according to the preceding claim, wherein said caliper body (28) comprises a first elongated element (44) and a second elongated element (45), wherein said first elongated element (44) comprises at least a caliper body first housing (29) and said second elongated element (45) comprises at least a caliper body second housing (30), wherein said caliper body first housing (29) and said caliper body second housing (30) each have a housing axis (G-G), wherein said caliper body first housing (29) comprises in succession at least a first housing first portion (31), a first housing abutment portion (32) and a first housing third portion (38), said caliper body first housing (29) having a prevalently longitudinal extension and having a caliper body first housing diameter (D_p), and said caliper body second housing (30) having a prevalently longitudinal extension and having a caliper body second housing diameter (D_s),

wherein said caliper body second housing diameter (D_s) measured in any cross-section with respect to said housing axis (G-G) of said caliper body second housing (30) along its longitudinal extension is either greater than or equal to said pin shank diameter (D_g) measured in any cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension,

wherein said caliper body first housing diameter (D_p) measured in any cross-section with respect to said housing axis (G-G) of said first housing third portion (32) is either greater than or equal to

said pin shank diameter (Dg) measured in any cross-section with respect to said pin axis (X-X) of said pin shank (19) along its longitudinal extension,

wherein said first housing diameter (Dp) measured in at least a cross-section with respect to said housing axis (G-G) of said first housing first portion (31) is equal to said elastic element outer diameter (De) measured in at least a cross-section with respect to said pin axis (X-X) of said elastic element (6),

and wherein said first housing diameter (Dp) measured in at least a cross-section with respect to said housing axis (G-G) of said first housing abutment portion (32) is smaller than said elastic element outer diameter (De) measured in at least a cross-section with respect to said pin axis (X-X) of said elastic element (6) so that said first housing abutment portion (32) axially abuts said elastic element (6) by defining a limit stop abutment of said supporting pin (1) in said caliper body (28).

10. An assembly method of a pad supporting pin (1) in a caliper body (28) of a vehicle, wherein said method provides the following steps:

- providing a pad supporting pin comprising a pin body (2) developing along a pin axis (X-X) between a proximal pin end (3) and a distal pin end (4) and comprising at least a pin annular housing (5) and pin shank (19) in succession,
- providing an elastic element (6) and fitting it on said pin body (2) at said annular housing (5),
- providing a caliper body (28) of a brake caliper (27), wherein

said caliper body (28) comprises a first elongated element (44) and a second elongated element (45), wherein said first elongated element (44) comprises at least a caliper body first housing (29) and said second elongated element (45) comprises at least a caliper body second housing (30), wherein said caliper body first housing (29) and said caliper body second housing (30) each have a housing axis (G-G) parallel and coincident with said pin axis (X-X), wherein said caliper body first housing (29) comprises in succession at least a first housing first portion (31), a first housing abutment portion (32) and a first housing third portion (38),

- inserting said pin (1) in said caliper body (28) for a first insertion stretch,

wherein in said first insertion stretch said pin distal end (4) slides through the caliper body first housing (29) in the direction of said caliper body second housing (30) until it enters into said caliper body second housing (30), and wherein at the end of said first insertion stretch said pin annular housing (5) and said elastic element (6) are positioned at a mouth of said caliper body first housing (29),

- inserting said pin (1) into said caliper body (28) for a second insertion stretch by applying a force to said pin proximal end (3) in the direction of said pin distal end (4), wherein in said second insertion stretch said pin distal end (4) slides inside said caliper body second housing (30) and said elastic element (6) slides inside said first housing first portion (31) until said elastic element (6) axially abuts said first housing abutment portion (32) defining a

limit stop abutment of said pin (2) inside said caliper body (28), preventing the pin body (2) from axially abutting the pin body surfaces (28) which develop in a radial direction (R-R).

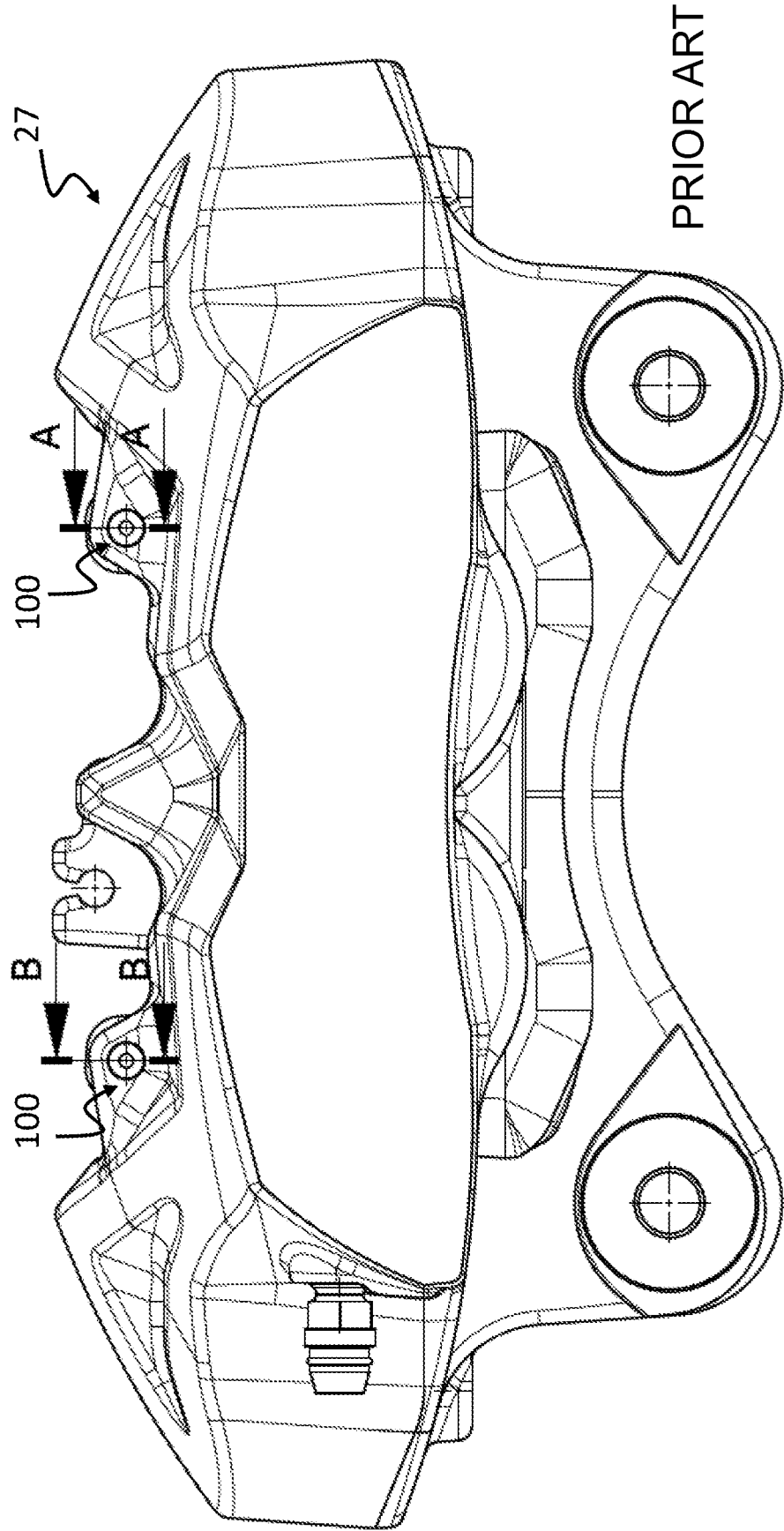
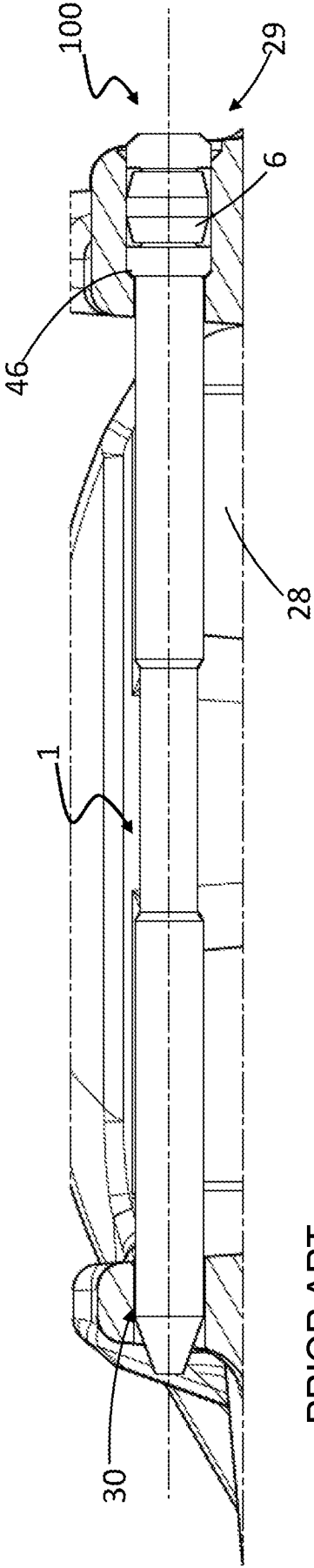
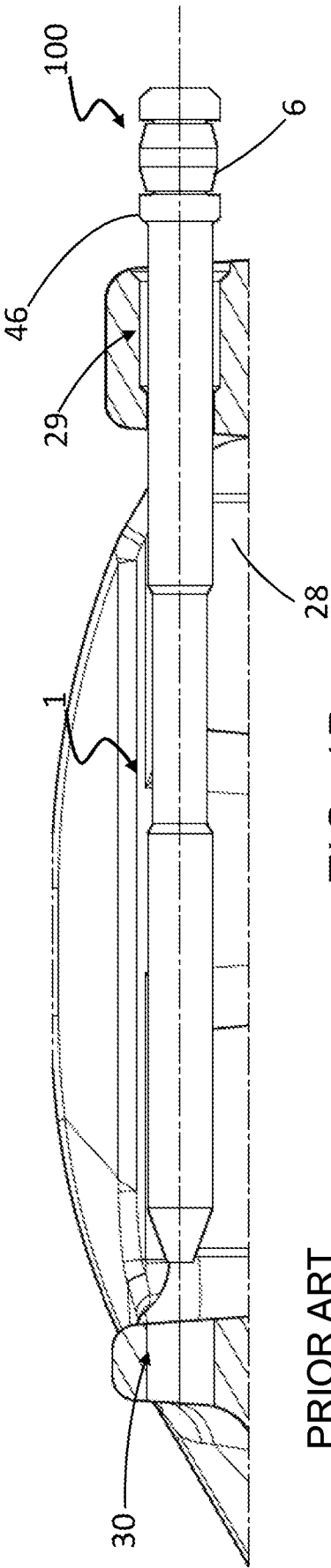


FIG. 1A



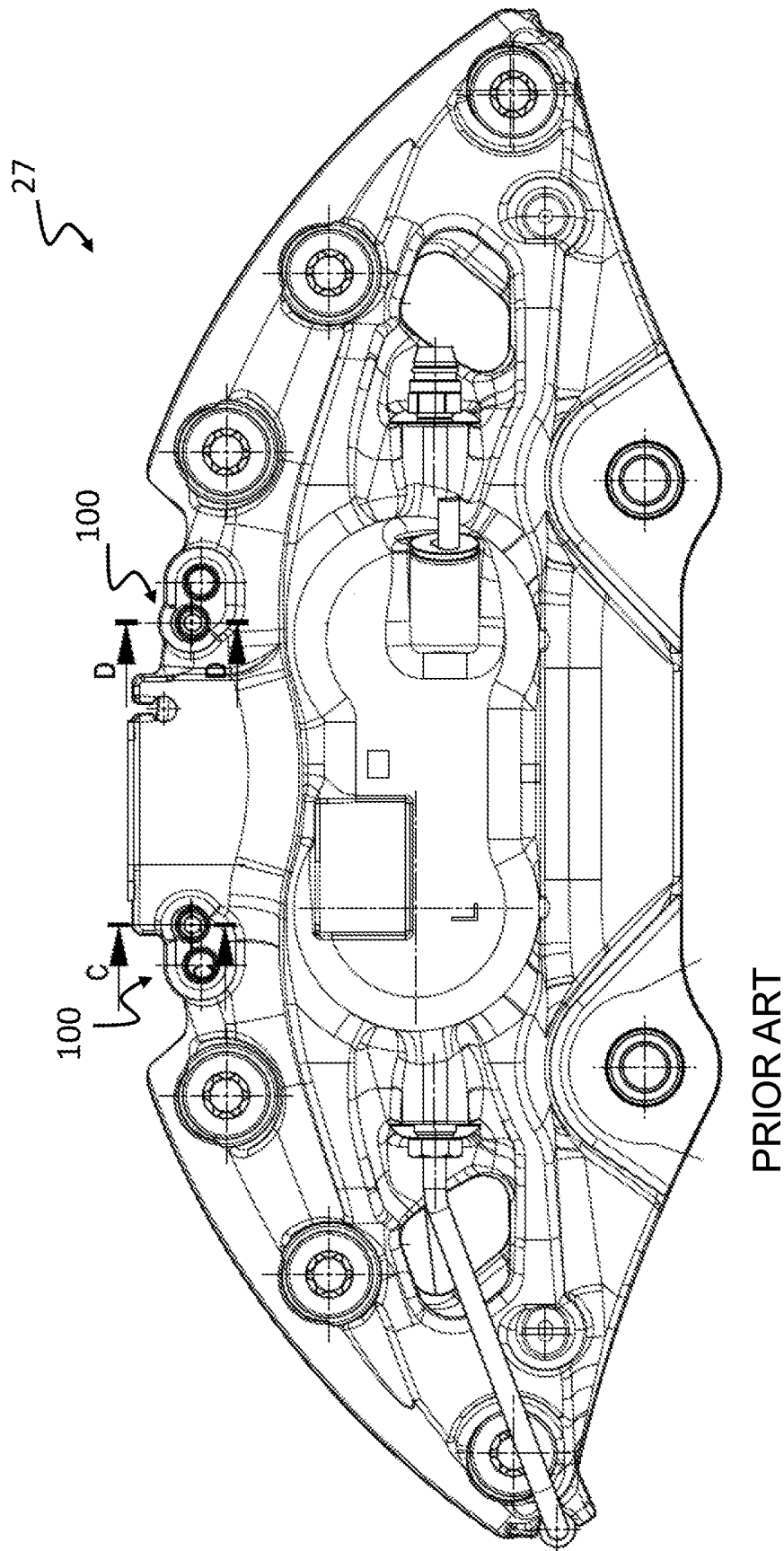
PRIOR ART

FIG. 1C



PRIOR ART

FIG. 1B



PRIOR ART

FIG. 2A

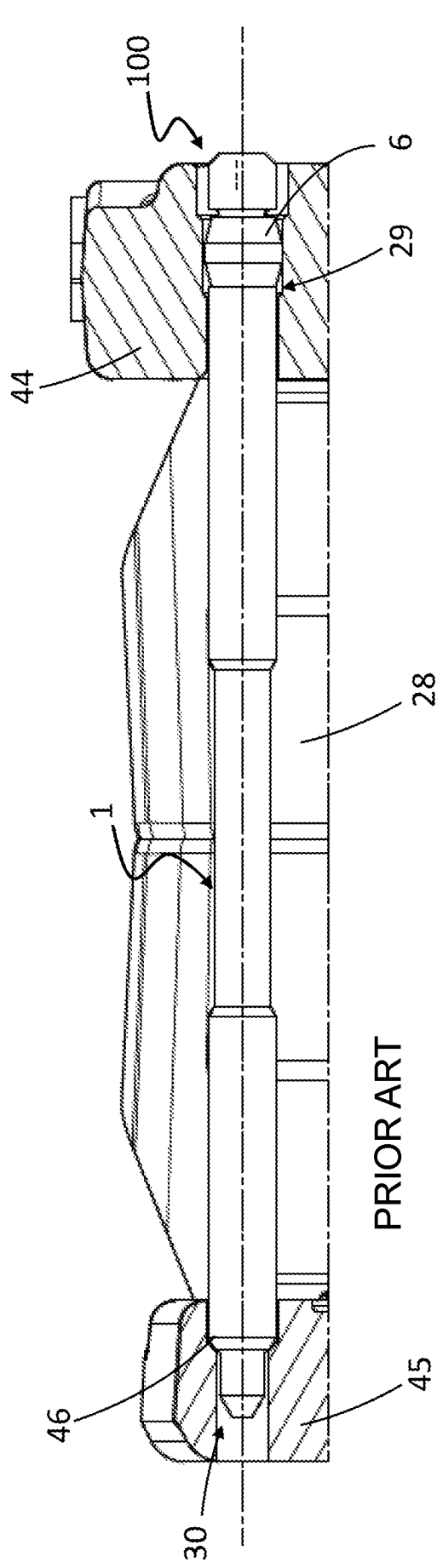


FIG. 2B

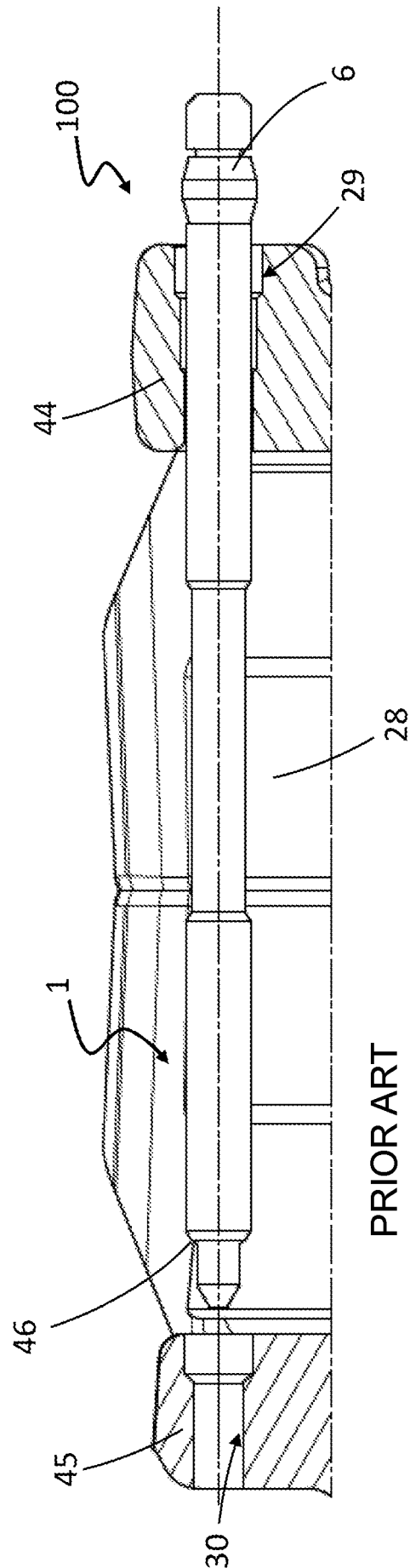


FIG. 2C

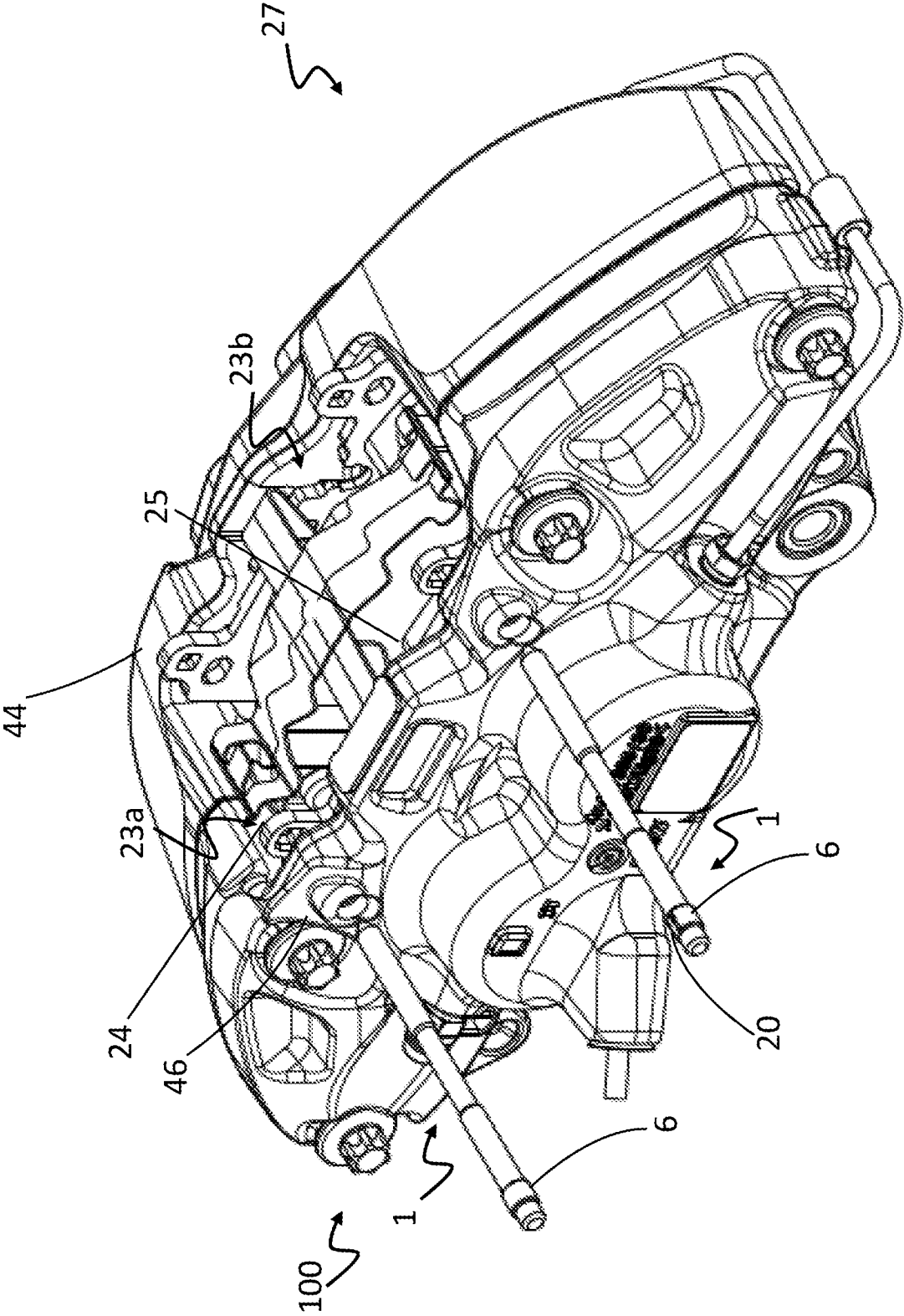


FIG. 3

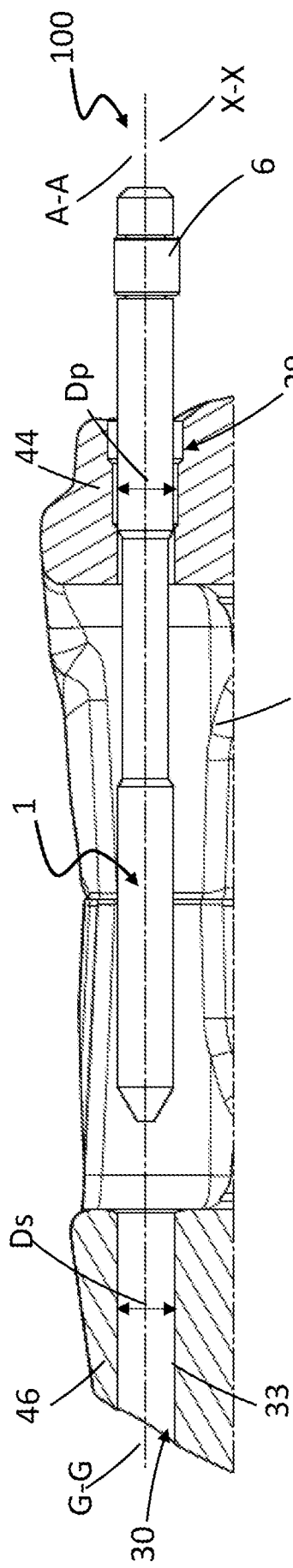


FIG. 4A

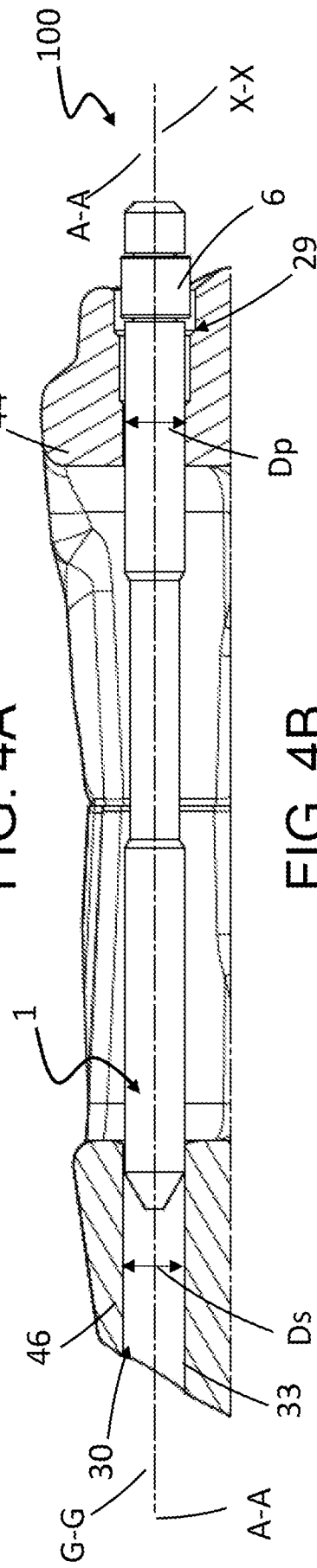


FIG. 4B

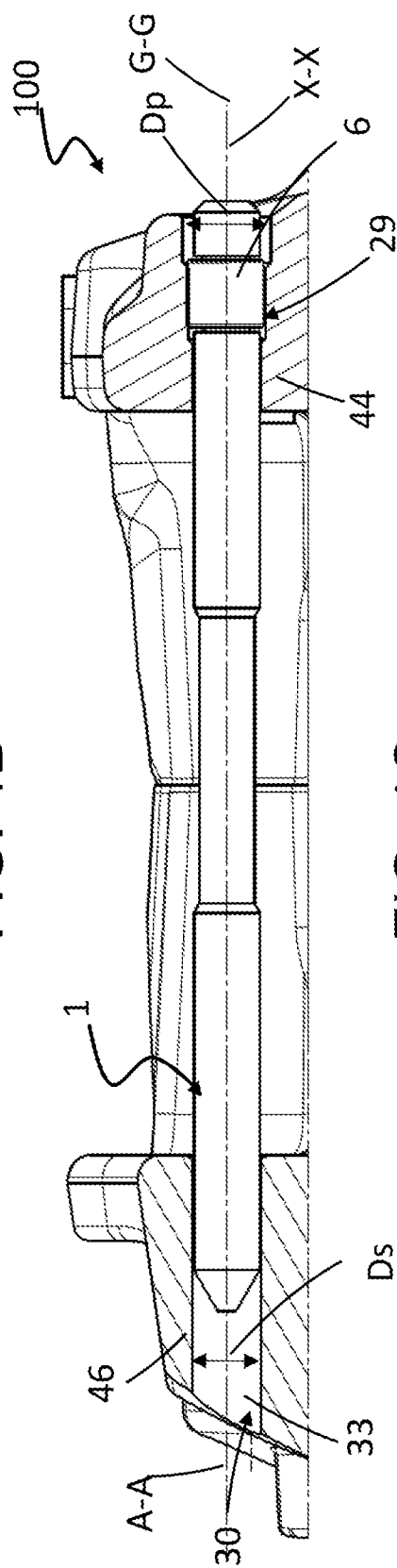


FIG. 4C

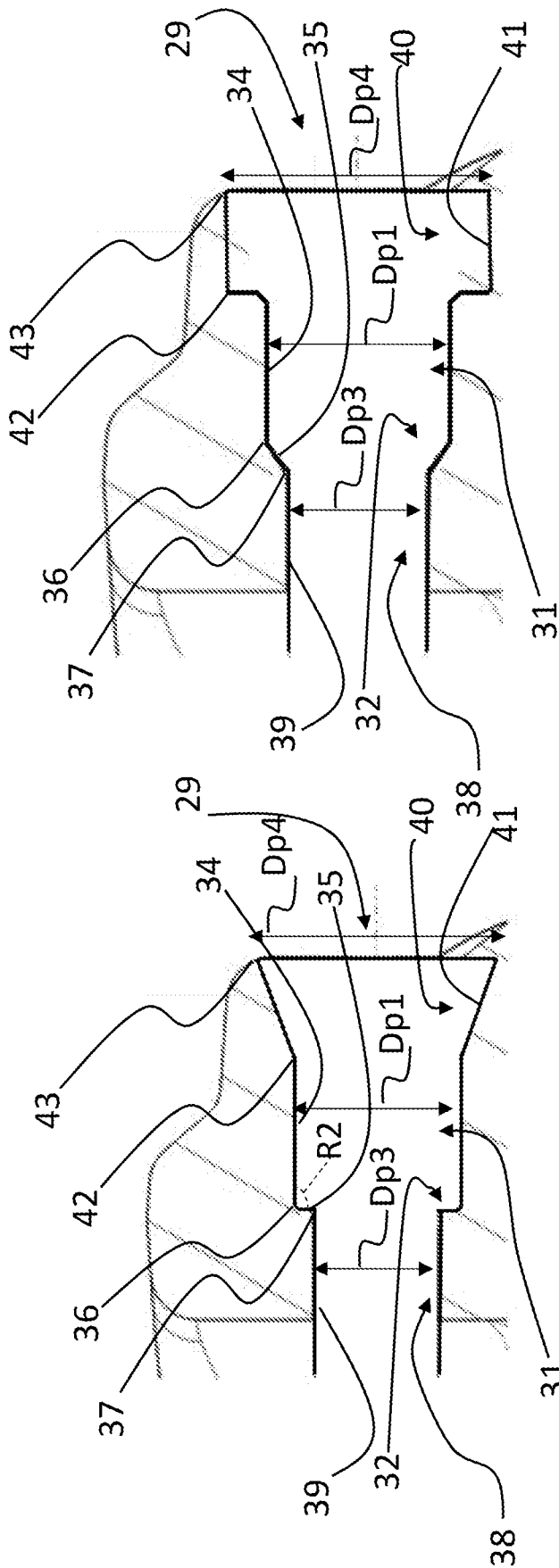
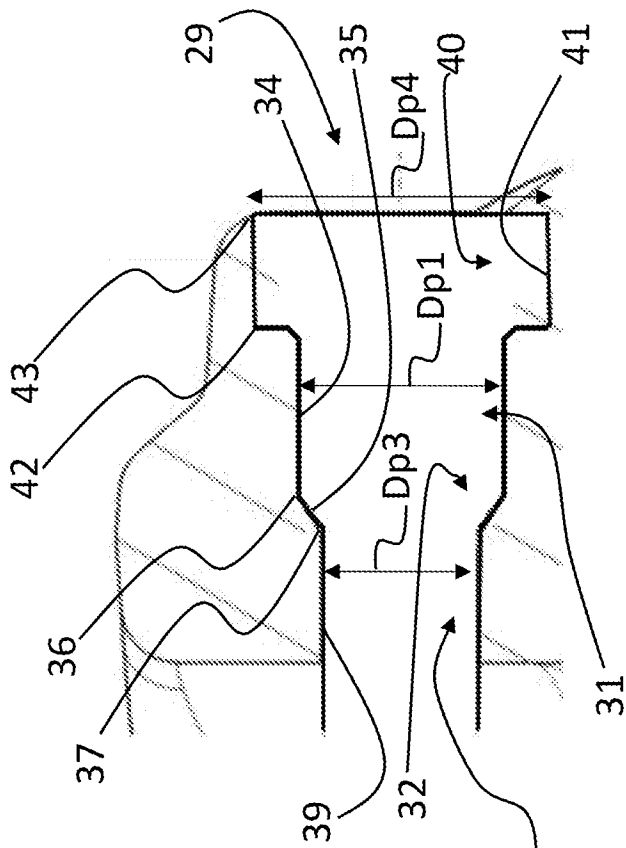


FIG. 5A



FB
G.
F

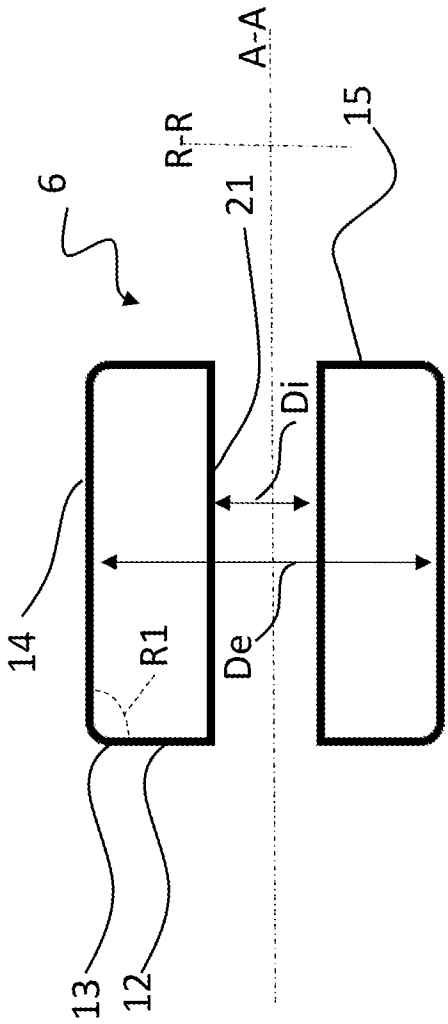


FIG. 6A

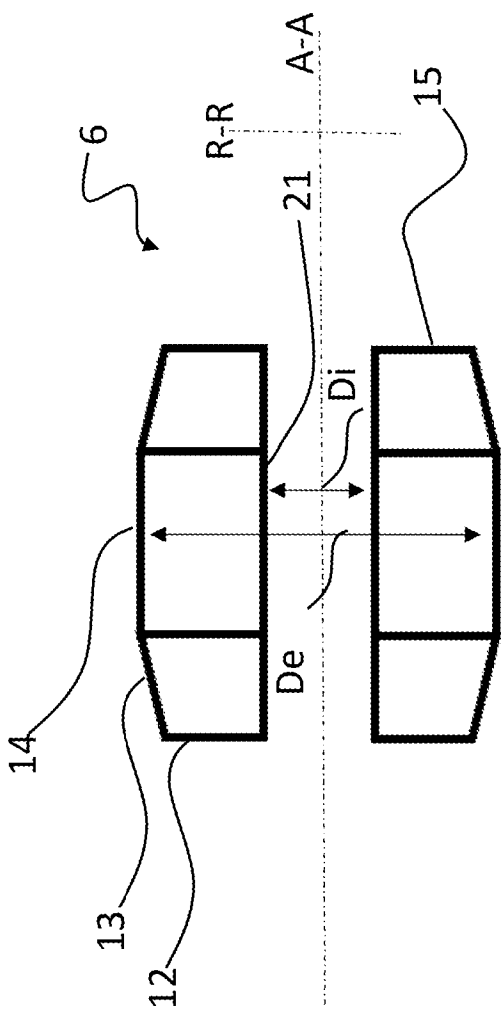


FIG. 6B

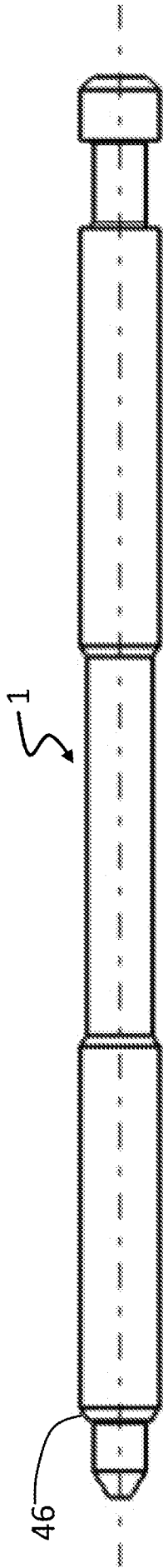


FIG. 7A

PRIOR ART

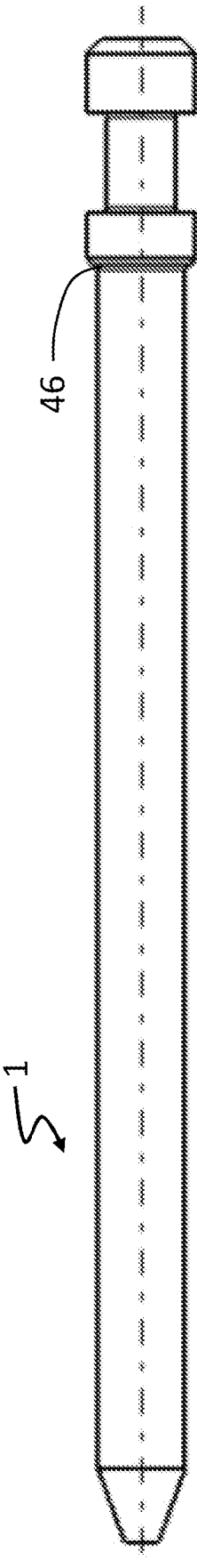


FIG. 7B

PRIOR ART

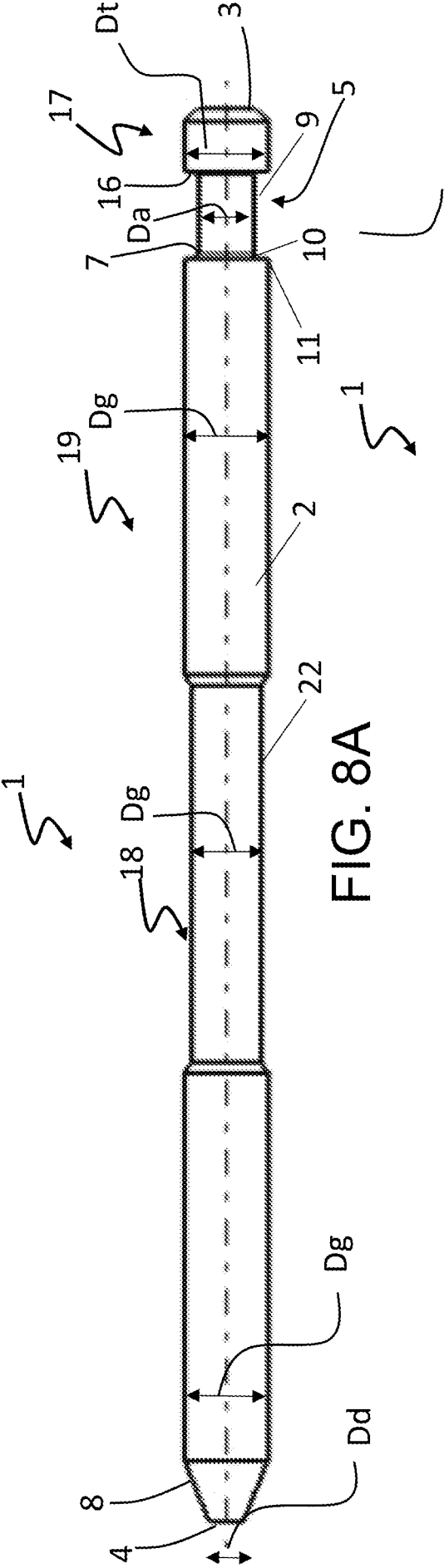


FIG. 8A

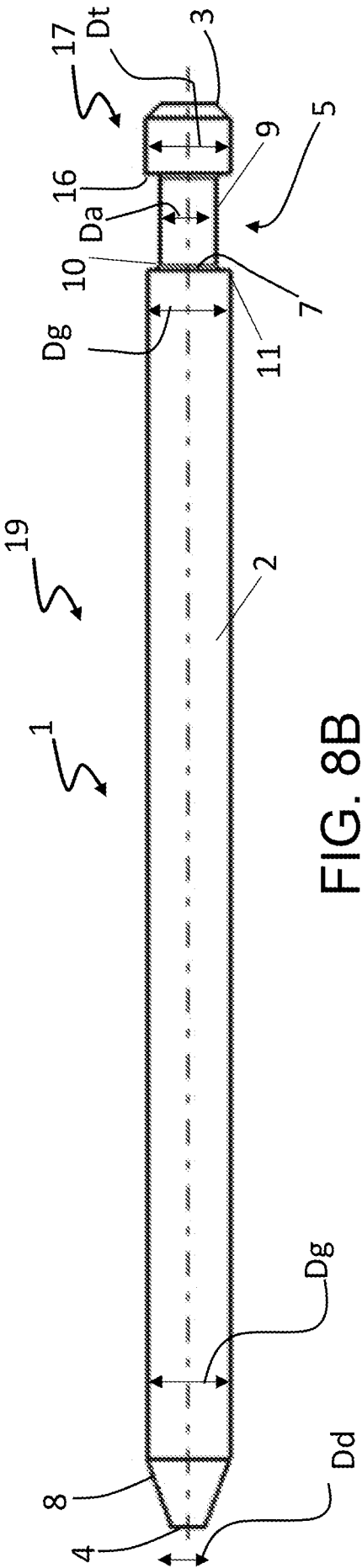


FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2021/060351

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16D65/00

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 425 520 A1 (FRENI BREMBO SPA [IT]) 9 June 2004 (2004-06-09) cited in the application	1, 2, 5-10
Y	the whole document -----	3, 4
Y	US 2019/353213 A1 (INOUE HAYURU [JP] ET AL) 21 November 2019 (2019-11-21) paragraphs [0042], [0047]; figures 4, 5 -----	3, 4
A	DE 10 2017 208575 A1 (FRENI BREMBO SPA [IT]) 23 November 2017 (2017-11-23) figure 3 -----	1-10
A	US 5 259 484 A (IDESAWA ISAO [JP] ET AL) 9 November 1993 (1993-11-09) column 4, line 22 - line 39; figure 4 ----- -/--	1-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 February 2022

Date of mailing of the international search report

18/02/2022

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Authorized officer

van Koten, Gert

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2021/060351

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2021/060351

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