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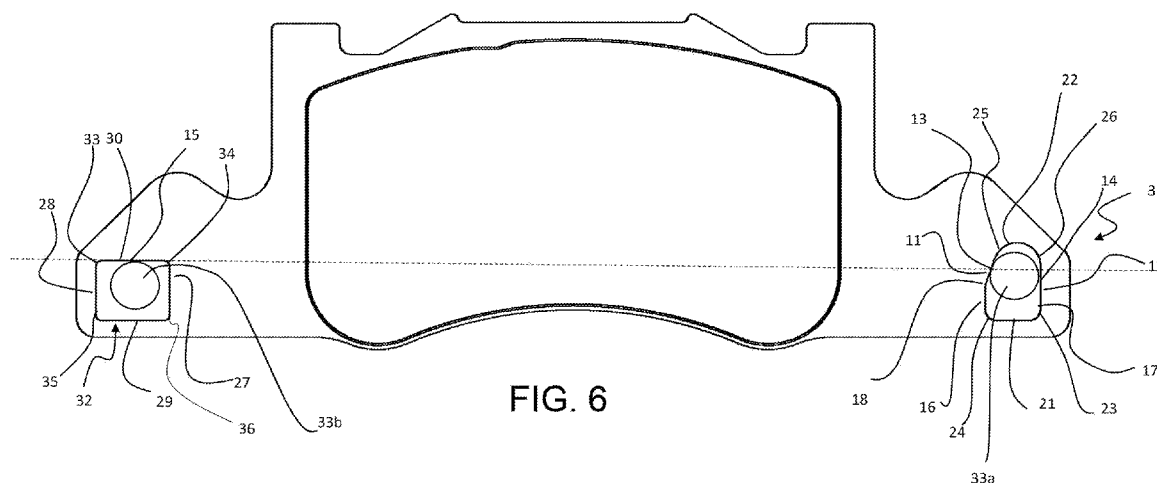


FIG. 6

(57) **Abstract:** A pad and pin assembly for a brake caliper comprising at least one brake pad and at least one first pin (33a), wherein a plate has a main extension along the radial direction and the tangential direction, said pad being provided with at least a first slot (31), wherein said first slot (31) comprises a first slot edge adapted to accommodate, with clearance, said first pin (33a), wherein said first slot edge defines a first slot profile in the plane defined by the plate, wherein said first slot profile forms a closed path, wherein said first slot profile comprises at least one tangentially inner and radially outer side of first slot, or first side (11) of first slot, and one tangentially outer and radially outer side of first slot, or second side (12) of first slot, along which said first pin (33a) slides, wherein said first side of first slot (11) and said second side of first slot (12) converge with each other and are opposite with respect to said tangential direction, wherein said assembly has a braking release configuration wherein said first pin (33a) is abutted against said first slot profile and simultaneously contacts at least two support points of first slot, or first support point (13) of first slot and second support point (14) of first slot, opposite to each other with respect to said tangential direction, said at least two support points of first slot (13, 14) being arranged respectively on said first side of first slot (11) and on said second side of first slot (12), wherein said second side of first slot (12) is parallel to said radial direction.

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"Pad and pin assembly, brake pad, brake caliper, method"

DESCRIPTION

[0001]. Field of the invention

[0002]. The object of the present invention is a pad and pin assembly for a brake caliper, and a brake pad for a brake pin, as well as a brake pin.

[0003]. In particular, the present invention relates to a pad adapted to be mounted with clearance on at least one pin provided in the brake caliper.

[0004]. Further, the object of the present invention is a method for positioning said pad on said at least one pin, once the braking action has been released.

[0005]. Background art

[0006]. In a disc brake, an axial direction is defined about which a brake disc rotates, a radial direction is defined, substantially orthogonal to said axial direction, and a tangential or circumferential direction is defined, orthogonal both to said axial direction and to said radial direction, substantially forming a system of cylindrical coordinates.

[0007]. Known brake calipers are generally equipped with pads adapted to engage a braking band of the brake disc associable with the brake caliper to cause the slowing of the vehicle on which the brake caliper is installed. The pads may be supported by pins, connected to the body of the brake caliper, and can therefore comprise eyelets, into which the pins are inserted with clearance, so as to

enable to pads to slide along them, when subjected to the action of relevant thrust means.

[0008]. According to a known type of pads, the pins also have the function of transmitting the braking force to the brake caliper itself, rather than enabling the pad to abut with a flank thereof on the body of the brake caliper for discharging such braking action.

[0009]. The plate of such type of pads comprises a pair of lateral ears, which extend laterally in the tangential direction, in which the eyelets are made intended for accommodating the pins. Usually said lateral ears are made on a radially internal portion of the plate.

[0010]. The eyelets usually have a square shape with rounded or beveled corners. The pins that support the pads instead usually have a circular section cylindrical shape. The distance and size of the eyelets and pins are chosen so that, during the braking action, the pad is placed in traction and transmits the braking force to the pin located on the inlet side of the brake disc, in the space between the pads, whereas the pin arranged on the outlet side of the disc creates a radial support.

[0011]. Some kinds of pads of this type and the respective pins are known for example from documents **EP2318729** and **EP2746612** by the same Applicant.

[0012]. By adopting such kinds of pads of the known type, it has been found that for every release of the braking action, the brake pad can assume a plurality of rest configurations in which the pad rests on the pins. In particular, according to the load and radial and tangential movement history of the pad during the braking actions,

once the braking action has been released the brake pad and pins are in slightly different mutual resting positions along said circumferential or tangential direction.

[0013]. Therefore, in such pad and pin assemblies of the known type, the brake pad can have different positions at the start of a generic braking action, and therefore, the movements and accelerations of the pad and related impacts or beats of the pad against the pins have an intensity that depends on the load history of the previous braking actions, making it difficult to adopt targeted countermeasures that limit as much as possible the spread of vibrations that can excite natural frequencies of the braking system or a component thereof, generating annoying vibrations and noise.

[0014]. Further, such differences in the resting positions upon the release of the braking action, are accentuated by variations in the construction tolerances of the pin and the eyelets, and variations in their dimensions depending on temperature, making it even more complex to define targeted countermeasures to the triggering of vibrations and whistling in the braking system.

[0015]. Therefore, the requirement emerges to make brake pads and pins that have secure points of contact that are repeatable whenever the pad is in a resting position.

[0016]. Further, there is a strongly perceived need to construct a pad, and pad and pin assemblies, which enable kinematics of the pad to be obtained from the moment of the release of the braking action to the moment of the resting position which can be repeated safely regardless of the construction tolerances of the slots or eyelets of

the pads and pins and the thermal variations of their dimensions so as to reduce as much as possible any differences in resting adjustment positions between the pins and pads.

[0017]. Therefore, the problem underlying the present invention is to devise a pad and pin assembly, a brake pad, a brake caliper, and a method of positioning the pad during the release of a braking action which have structural and functional features such as to satisfy the aforementioned requirements and, at the same time, solve the drawbacks mentioned with reference to the prior art and satisfy the aforesaid felt needs.

[0018]. Solution

[0019]. The present invention sets out to provide a pad and pin assembly, a brake pad, a brake caliper, and a method of positioning a pad at the end of a braking action.

[0020]. This and other objects and advantages are achieved by an assembly according to claim **1**, as well as by a brake pad according to claim **9**, as well as by a brake caliper according to claim **11**, as well as by a method according to claim **12**.

[0021]. Some advantageous embodiments are the subject of the dependent claims.

[0022]. From the analysis of this solution it has emerged how the proposed solution enables a secure and repeatable contact to be created between pins and pad minimizing any deviations in the tangential direction of the pads during the release of the braking action in a superior way with respect to solutions of the prior art.

[0023]. Further, the solutions proposed enable pad kinematics to be

achieved on returning to the resting position which are predictable regardless of the previous history of the braking actions.

[0024]. Furthermore, thanks to the solutions proposed it is possible to guarantee greater uniformity in the tangential movements of the pad during each braking action.

[0025]. Furthermore, thanks to the solutions proposed it is possible to have more contained movements of the pad, further limiting the onset of noise or whistling phenomena.

[0026]. Furthermore, thanks to the solutions proposed, thanks to the provision of two substantially rectilinear and converging slot sides, it is possible to position, in the resting position, the pad on the pins safely and repeatably regardless of the dimensions of the pin and the dimensions of the eyelet or slot.

[0027]. Furthermore, thanks to the solutions proposed, thanks to two first slot sides tangentially opposite each other and converging in a radially outer point, and thanks to a first slot side substantially parallel to a tangential or horizontal direction, it is possible to guide said pad safely and repeatably in a univocal resting position, compensating at the same time for the construction tolerances of pins and slots and variations thereof as a function of temperature.

[0028]. Drawings

[0029]. Further features and advantages of the pad and pin assembly, the pad and the brake caliper will be apparent from the following description of its preferred embodiments, given by way of non-limiting examples, with reference to the accompanying figures, in which:

- [0030]. - figure 1 is an axonometric view of a brake caliper, according to one embodiment;
- [0031]. - figure 2 is a side view of a portion of a disc brake, according to one embodiment;
- [0032]. - figure 3 is a section shown along a longitudinal plane of a brake caliper, according to one embodiment;
- [0033]. - figure 4 is an axonometric view which shows a pad, according to one embodiment;
- [0034]. - figure 5 is a front view diagram of an assembly comprising a pad and two pins, according to one embodiment, in non-braking conditions, showing a first symmetrical slot;
- [0035]. - figure 6 is a front view diagram of an assembly comprising a pad and two pins, according to one embodiment, in non-braking conditions, showing a first asymmetrical slot;
- [0036]. - figure 7 shows a detail of the assembly of figure 5, in particular it shows a symmetrical slot;
- [0037]. - figure 8 shows a detail of the assembly of figure 6, in particular it shows an asymmetrical slot;
- [0038]. - figure 9 shows a detail of the assembly of figure 6, in particular it shows a rectangular slot;
- [0039]. - figure 10 shows a graph representing the tangential position of a brake pad of the known type during a series of two braking actions in the forwards running direction and two braking actions in reverse in succession;
- [0040]. - figure 11 shows a graph representing the tangential position of a brake pad according to the present invention which

adopts at least one symmetrical slot of figure 5 during a series of two braking actions in the forwards running direction and two braking actions in reverse in succession;

[0041]. - figure 12 shows a graph representing the tangential position of a brake pad according to the present invention which adopts at least one asymmetrical slot of figure 6 during a series of two braking actions in the forwards running direction and two braking actions in reverse in succession;

[0042]. - figure 13 shows the first symmetrical slot of the pad of figure 5, illustrating the balance of the forces exchanged between the first pin and the first symmetrical slot when the pad is in the resting or brake release configuration;

[0043]. - figure 14 shows the first asymmetrical slot of the pad of figure 6, illustrating the balance of the forces exchanged between the first pin and the first asymmetrical slot when the pad is in the resting or brake release configuration;

[0044]. - figure 15 and figure 16 show the forces exchanged between the first symmetrical slot of the pad of figure 5 and the first pin in a braking configuration, respectively in a braking configuration in the reverse direction and in a braking configuration in the forwards running direction;

[0045]. - figure 17 and figure 18 show the forces exchanged between the first asymmetrical slot of the pad of figure 6 and the first pin in a braking configuration, respectively in a braking configuration in the reverse direction and in a braking configuration in the forwards running direction.

[0046]. Description of some preferred embodiments

[0047]. According to a general embodiment, a pad and pin assembly 1 for a brake caliper 8 is provided.

[0048]. Said brake caliper 8 comprises a caliper body 9 adapted to be arranged straddling a brake disc 4.

[0049]. Said pad and pin assembly 1 defines an axial direction A-A coincident or parallel to the rotation axis of the brake disc 4, a radial direction R-R orthogonal to the axial direction A-A, and a tangential or circumferential direction T-T orthogonal both to the axial direction A-A and to the radial direction R-R.

[0050]. Said assembly 1 comprises at least one brake pad 2 and at least a first pin 33a.

[0051]. According to one embodiment, said assembly comprises at least a second pin 33b.

[0052]. Said brake pad 2 is adapted to abut against a braking band 5 of the brake disc 4.

[0053]. Said pad 2 comprises at least one plate 6 and at least one friction material 7 supported by said plate 6.

[0054]. Said plate 6 has prevalent extension along the radial R-R and tangential T-T directions.

[0055]. Said pad 2 is provided with at least a first slot 31.

[0056]. In accordance with an embodiment, said pad 2 is provided with at least a second slot 32.

[0057]. Said first slot 31 comprises a first slot edge 37 adapted to accommodate, with clearance, said first pin 33a.

[0058]. In accordance with an embodiment, said second slot 32 comprises a second slot edge 38.

[0059]. In accordance with an embodiment said second slot edge is adapted to accommodate, with clearance, said second pin 33b.

[0060]. Said first slot edge 37 defines a first slot profile 10 in the plane R-T defined by the plate 6.

[0061]. In accordance with an embodiment, said second slot edge 38 defines a second slot profile 20 in the plane R-T defined in the plate 6.

[0062]. Said first slot profile 10 forms a closed path.

[0063]. In accordance with an embodiment, said second slot profile 20 forms a respective closed path.

[0064]. Said first slot profile 10 comprises at least one tangentially inner and radially outer side of first slot, or first side 11 of first slot, and one tangentially outer and radially outer side of first slot, or second side 12 of first slot, along which said first pin 33a slides.

[0065]. In accordance with an embodiment, said second slot profile 20 comprises at least a first side 30 of second slot.

[0066]. Advantageously, said first side 11 of first slot and said second side 12 of first slot are mutually convergent and opposite with respect to said tangential direction T-T.

[0067]. Said assembly 1 has a braking release configuration, in which said pad 2 is resting with respect to at least one first pin 33a.

[0068]. In accordance with an embodiment, in said braking release configuration, said pad 2 and said pins 33a, 33b are resting.

[0069]. Advantageously, in said braking release configuration, said first pin 33a is abutted against said first slot profile 10 and simultaneously contacts at least two support points of first slot, or first support point 13 of first slot and second support point 14 of first slot, opposite to each other with respect to said tangential direction T-T.

[0070]. Said at least two support points 13, 14 of first slot are arranged on said first side 11 of first slot and on said second side 12 of first slot, respectively.

[0071]. In accordance with an embodiment, in said braking release configuration, said brake pad is pushed against said first pin 33a with a radial force F_s , and said radial force F_s is counterbalanced by the constraining reactions F_1 and F_2 .

[0072]. In accordance with an embodiment, in said braking release configuration, said second pin 33b is abutting against said second slot profile 20 and contacts at least one support point 15 of second slot arranged on said first side 30 of second slot. In accordance with an embodiment, in said braking release configuration, said second pin 33b is abutting against said second slot profile 20 and contacts at least one support point 15 of second slot arranged on said first side 30 of second slot, preventing contacting other sides of said second slot 30.

[0073]. In accordance with an embodiment, said first side 11 of

first slot is inclined with respect to said tangential direction T-T passing through the first contact point 13 of first slot, by an angle ALFA of first side of first slot.

[0074]. In accordance with an embodiment, said angle ALFA of first side of first slot is comprised between 30° and 80° . In accordance with an embodiment, said angle ALFA of first side of first slot is comprised between 65° and 80° .

[0075]. In accordance with an embodiment, the extensions of said first side 11 of first slot and said second side 12 of first slot meet in a radially outer point with respect to said first slot profile 10, in particular in a radially outer point.

[0076]. In accordance with an embodiment in said braking release configuration, said at least one support point 15 of second slot and at least one of said two support points 13 of first slot are arranged aligned on the same tangential T-T or circumferential C-C direction.

[0077]. In accordance with an embodiment, in said braking release configuration, said at least one support point 15 of second slot and at least one of said two support points 13 of first slot are a same radial distance along said radial direction R-R with respect to said rotation axis of the brake disc 4.

[0078]. Thanks to the provision of at least three support points between said pins and said pad in the rest configuration, it is possible to define a position as univocal as possible for the pad to rest upon release of a braking action.

[0079]. Thanks to the provision of at least two support points, i.e.

at least the first support point 13 of first slot and at least one support point 15 of second slot, aligned tangentially to each other respectively on the first slot 31 and on the second slot 32, and thanks to the first side 11 of first slot and the second side 12 of first slot converging with each other it is possible to define a secure and stable rest position for the brake pad 2.

[0080]. In accordance with an embodiment, said first slot edge 37 extends along the axial direction A-A and said second slot edge 38 extends along the axial direction A-A.

[0081]. In accordance with an embodiment, said plate 6 comprises a radially inner edge 43 and a radially outer edge 44. In accordance with an embodiment, said plate 6 comprises a first flank 41 and a second flank 42, located at opposite tangential ends of the plate 6. In accordance with an embodiment, said plate 6 further comprises at least a first lateral ear 51 which extends from said first flank 41 at least in the tangential direction T-T and at least a second lateral ear 52 which extends from said second flank 42 at least in the tangential direction T-T. Said first lateral ear 51 is provided with at least said first slot 31.

[0082]. In accordance with an embodiment, said second lateral ear 52 is provided with at least said second slot 32, so that said plate comprises at least two slots 31, 32.

[0083]. In accordance with an embodiment, said second lateral ear 52 is a guide ear, without a slot, configured to be inserted with clearance into a niche obtained in the caliper body, so that said

second lateral ear 52 slides in said niche. Said second lateral ear 52 comprises a first side of second lateral ear delimiting said second lateral ear 52 in the radially outer direction, wherein said first side of second lateral ear, in said braking release configuration, contact said niche in at least one support point 15 of lateral ear. In accordance with an embodiment, said at least one support point 15 of lateral ear and at least one of said two support points 13 of first slot are arranged aligned on the same tangential T-T or circumferential C-C direction. In accordance with an embodiment, in said braking release configuration, said at least one support point 15 of lateral ear and at least one of said two support points 13 of first slot are arranged at a same radial distance along said radial direction R-R with respect to said rotation axis of the brake disc 4.

[0084]. In accordance with an embodiment, said first slot profile 10 comprises a tangentially inner and radially inner side of first slot, or third side 16 of first slot, joined to said first side 11 of first slot.

[0085]. In accordance with an embodiment, said first slot profile 10 comprises a tangentially outer and radially inner side of first slot, or fourth side 17 of first slot, joined to said second side 12 of first slot.

[0086]. In accordance with an embodiment, said third side 16 of first slot is arranged parallel to said radial direction R-R.

[0087]. In accordance with an embodiment, said fourth side 17 of first slot is parallel to said radial direction R-R.

[0088]. In accordance with an embodiment, said first side 11 of first slot is inclined with respect to said third side 16 of first slot, by an angle comprised between 20° and 70° .

[0089]. In accordance with an embodiment, said first slot profile 10 comprises a radially inner side of first slot, or fifth side 21 of first slot, on which said first pin 33a slides.

[0090]. In accordance with an embodiment, said fifth side 21 of first slot is parallel to the tangential direction T-T passing simultaneously through said at least one support point 15 of second slot and said first support point 13 of first slot.

[0091]. In accordance with an embodiment, said fifth 21 of first slot is indirectly joined to said first side 11 of first slot and to said second side 12 of first slot.

[0092]. In accordance with an embodiment, said first slot profile 10 comprises a radially outer side of first slot, or sixth side 22 of first slot, which joins said first side 11 of first slot to said second side 12 of first slot, wherein said first pin 33a and said first slot 31 have such a size that said first pin 33a is always spaced apart from said sixth side 22 of first slot.

[0093]. In accordance with an embodiment, said first pin 33a has a diameter D_p comprised between 6 and 12mm. In accordance with an embodiment, said second pin 33b has a diameter D_p comprised between 6 and 12mm.

[0094]. In accordance with an embodiment, when it is in contact simultaneously with said at least two support points 13, 14 of first

slot, said first pin 33a is at a minimum tangential distance D of first pin from said third side 16 of first slot.

[0095]. Said minimum tangential distance of first pin D means the distance between the third side 16 of first slot and the vertical tangent to the first pin parallel to the radial direction R-R.

[0096]. In accordance with an embodiment, said minimum tangential distance D of first pin is less than 1 mm.

[0097]. In accordance with an embodiment, said tangential distance D of first pin is comprised between 0.10 mm and 0.80 mm, preferably comprised between 0.20 mm and 0.35 mm. In accordance with an embodiment, said tangential distance D of first pin is comprised between 1/100 and 1/20, preferably between 1/60 and 1/30, of the dimension of said pin diameter Dp.

[0098]. Thanks to the provision of said minimum tangential distance D of first pin between said first pin 33a and said third side 16 of first slot, in a braking condition in the reverse direction said first pin 33a runs along said first side 11 of first slot abutting against said third side 16 of first slot and against said first side 11 of first slot, avoiding discharging a braking force on said caliper body by said first flank 41 or said second flank 42 of said plate 6.

[0099]. In accordance with an embodiment, said minimum tangential distance D of first pin is configured to abut against said brake pad 2 with said third side 16 of first slot and with said first side 11 of first slot against said first pin 33a in a reverse running braking condition, avoiding discharging a braking force along said tangential

direction T-T on said caliper body by said first flank 41 or said second flank 42.

[00100]. In accordance with an embodiment, said assembly 1 has a braking configuration running forwards or a braking configuration in the reverse direction, wherein said pad 2 is subject to a braking action.

[00101]. In accordance with an embodiment, in said forwards braking configuration or a braking configuration in the reverse direction, said pad 2 avoids discharging the braking force on said caliper body, by said first flank 41 or said second flank of said plate 6.

[00102]. In accordance with an embodiment, in said braking configuration in the reverse direction, said first pin 33a is at a reverse running braking distance D' from said first side 12 of first slot or from said fourth side 17 of first slot.

[00103]. The reverse running braking distance D' means the distance between the tangent to said first pin 33a parallel to said radial direction R-R and said second side 12 of first slot or from said fourth side 17 of first slot, when said assembly is in the reverse running braking configuration.

[00104]. In accordance with an embodiment, in said braking configuration in the forward direction, said first pin 33a is at a forward running braking distance D'' from said third side 16 of first slot.

[00105]. The forward running braking distance D'' means the distance between the tangent to said first pin 33a parallel to said radial

direction R-R and said third side 16 of first slot, when said assembly is in the forward running braking configuration.

[00106]. In accordance with an embodiment, said forward running braking distance D'' is equal to said reverse running distance D' . In accordance with an embodiment, said forward running braking distance D'' and said reverse running distance D' are equal to the minimum tangential distance D of first pin.

[00107]. In accordance with an embodiment, said reverse running braking distance D' and said forward running distance D'' are equal to double the minimum tangential distance D .

[00108]. In accordance with an embodiment, in said reverse running braking configuration and in said forward running braking configuration, said first slot 31 abuts against said first pin 33a in at least two braking contact points, a first braking contact point and a second braking contact point.

[00109]. In accordance with an embodiment, in said reverse running braking configuration, said first braking contact point lies on said first side 11 of first slot and said second braking contact point lies on said third side 16 of first slot, discharging a first reverse running force $Fr1$ and a second reverse running force $Fr2$, respectively.

[00110]. In accordance with an embodiment, in said forward running braking configuration, said first braking contact point lies on said second side 12 of first slot and said second braking contact point lies on said fourth side 17 of first slot, discharging a first forward

running force $Ff1$ and a second forward running force $Ff2$, respectively.

[00111]. In accordance with an embodiment, in said forward running braking configuration, said first braking contact point lies on said first side 11 of first slot and said second braking contact point lies on said second side 12 of first slot, discharging a first forward running force $Ff1$ and a second forward running force $Ff2$, respectively.

[00112]. In accordance with an embodiment, in said forward running braking configuration or in said reverse running braking configuration, said second pin 33b is abutting against said second slot profile 20 and contacts at least one support point 15 of second slot arranged on said first side 30 of second slot.

[00113]. In accordance with an embodiment, in said forward running braking configuration or in said reverse running braking configuration, said second pin 33b is abutting against said second slot profile 20 and contacts at least one support point 15 of second slot arranged on said first side 30 of second slot, avoiding contact with other sides of said second slot 30.

[00114]. In accordance with an embodiment, when it is in contact simultaneously with said at least two support points 13, 14 of first slot, said first pin 33a is at a minimum radial distance H of first pin from said fifth side 21 of first slot.

[00115]. Minimum radial distance H of pin means the distance between the horizontal tangent to the pin parallel to the tangential direction

T-T and the fifth side 21 of first slot.

[00116]. In accordance with an embodiment, said radial distance H of first pin is comprised between 0.30 mm and 2.65 mm, preferably comprised between 1.00 mm and 1.50 mm.

[00117]. In accordance with an embodiment, said radial distance H of first pin is comprised between $1/80$ and $1/2$, preferably between $1/10$ and $1/6$, of the dimension of said pin diameter Dp.

[00118]. In accordance with an embodiment, said first pin 33a has a diameter Dp of first pin and said first slot 31 has a plurality of joining diameters Di of first slot which join the first close ones of said sides 11, 12, 16, 17, 21, 22 of first slot, wherein each joining diameter Di of first slot is less than said diameter Dp of first pin.

[00119]. In accordance with an embodiment, said second pin 33b has a diameter Dp of first pin and said second slot 32 has a plurality of joining diameters Di of second slot which join the first close ones of said sides 27, 28, 29, 30 of first slot, wherein each joining diameter Di of second slot is less than said diameter Dp of first pin.

[00120]. In accordance with an embodiment, said first slot profile 10 comprises a tangentially inner arc of first slot, or first arc 18 of first slot, which joins said third side 16 of first slot to said first side 11 of first slot.

[00121]. In accordance with an embodiment, said first slot profile 10 comprises a radially inner and tangentially inner arc of first slot, or third arc 23 of first slot, which joins said tangentially inner and radially inner side 16 of first slot to said radially inner

side 21 of first slot.

[00122]. In accordance with an embodiment, wherein said first slot profile 10 comprises a radially inner and tangentially outer arc of first slot, or fourth arc 24 of first slot, which joins said tangentially outer and radially inner side 17 of first slot to said radially inner side 21 of first slot.

[00123]. In accordance with an embodiment, said first slot profile 10 is symmetrical with respect to an axis A-A of symmetry of first slot parallel to said radial direction R-R.

[00124]. In accordance with an embodiment, said axis of symmetry of first slot A-A is substantially parallel to a median axis m-m adapted to divide the pad 2 into two portions of a substantially equal extension in the tangential direction T-T.

[00125]. In accordance with an embodiment, said second side 12 of first slot and said first side 11 of first slot are specular.

[00126]. In accordance with an embodiment, said first support point 13 of first slot and said second support point 14 of first slot are aligned at a same tangential direction T-T passing through said first support point 13 of first slot, said second support point 14 of first slot and said at least one support point 15 of second slot.

[00127]. In accordance with an embodiment, said second support point 14 of first slot and said first support point 13 of first slot are at the same radial distance from said fifth side 21 of first slot.

[00128]. In accordance with an embodiment, said first slot profile 10 comprises a tangentially outer arc of first slot or second arc 19

of first slot, which joins said fourth side 17 of first slot to said second side 12 of first slot.

[00129]. Advantageously, thanks to said first side 11 of first slot and said second side 12 of first slot, both inclined by said angle ALFA of first slot, allow said first pin 33a to be wedged between said first side 11 of first slot and said second side 12 of first slot ensuring a secure position for said first pin 33a.

[00130]. Thanks to said first symmetrical slot 31, said brake pad 2 has a symmetrical kinetic behavior tangentially both in braking release in reverse and braking release running forwards.

[00131]. According to an embodiment, said first slot 31 is asymmetrical. In accordance with an embodiment, said first slot profile 10 is asymmetrical with respect to any axis A-A of first slot parallel to said radial direction R-R.

[00132]. In accordance with an embodiment, said second side 12 of first slot is parallel to said radial direction R-R.

[00133]. In accordance with an embodiment, said second support point 14 of first slot is at a radial distance from said fifth side 21 of first slot which is less than the radial distance between said first support point 13 of first slot and said fifth side 21 of first slot.

[00134]. In accordance with an embodiment, said second side 12 of first slot extends along a vertical direction V-V substantially parallel to a median axis m-m adapted to divide the pad 2 into two portions of a substantially equal extension in the tangential direction T-T.

[00135]. Thanks to said second side 12 of first slot parallel to said radial direction R-R and thanks to said first side 11 of first slot which is inclined enabling said first pin 33a to be wedged into said first slot 31, it is possible to reduce the tangential movement of said brake pad 2 during braking in the forward direction with respect to the tangential movement during braking in the reverse direction.

[00136]. Thanks to said second side 12 of first slot parallel to said radial direction R-R, in the event of braking when running in the forward direction, the first pin 33a is already in contact with said second side 12 of first slot, thus reducing pin beating events upon the beating of said first pin 33a when it abuts against said first side 11 of first slot, contacting said first support point 13 of first slot.

[00137]. The difference in kinematic behavior between a pad according to the present invention and a typical pad can be observed from a comparison between figure 10 and figures 11 and 12, showing the tangential movements of the pad following two braking actions in the forward direction and two braking actions in the reverse direction.

[00138]. The difference in kinematic behavior of the brake pad 2 according to whether it is provided with a first symmetrical or asymmetrical slot as previously described can be observed from the comparison between figures 11 and 12.

[00139]. According to an embodiment, said second slot 20 is specular to said first slot 10.

[00140]. According to an embodiment, said brake pad 2 is

axisymmetric.

[00141]. In accordance with an embodiment, said first side 30 of second slot is directed parallel to said tangential direction T-T passing through said at least one support point 15 of second slot so as to slide the second pin 33b on said first side 30 of second slot up to abutting in said support point 15 of second slot when said first pin 33a abuts said first slot profile 10 and contacts said first support point 13 of first slot and said second support point 14 of first slot.

[00142]. In accordance with an embodiment, said second slot 32 is rectangular with beveled corners.

[00143]. In accordance with an embodiment, said second slot profile 20 has at least four sides 27, 28, 29, 30 of second slot.

[00144]. In accordance with an embodiment, said four sides 27, 28, 29, 30 of second slot comprise a tangentially inner side 27 of second slot, a tangentially outer side 28 of second slot, a radially inner side 29 of second slot, a radially outer side 30 of second slot.

[00145]. In accordance with an embodiment, said second slot profile 20 has at least four arcs 33, 34, 35, 36 of second slot which join said four sides 27, 28, 29, 30 of second slot,

[00146]. In accordance with an embodiment, said second slot profile 20 and said second pin 33b have such a size that said second pin 33b slides on each side 27, 28, 29, 30 of said second slot 32, avoiding to contact each of said arcs 33, 34, 35, 36 of second slot.

[00147]. Advantageously, the provision of a second rectangular slot

32 associated with said first slot 31 having at least two sides 11, 12 opposite each other along said tangential direction T-T and converging, enable a guided movement of said brake pad 2 on said second pin 33b and said first pin 33a.

[00148]. The present invention also concerns a brake pad 2 for said brake caliper 8, wherein said brake caliper 8 comprises a caliper body 9 adapted to be arranged straddling a brake disc 4.

[00149]. Said pad 2 defining an axial direction A-A coincident or parallel to the rotation axis of the brake disc 4, a radial direction R-R, orthogonal to the axial direction A-A, and a tangential or circumferential direction T-T orthogonal both to the axial direction A-A and to the radial direction R-R.

[00150]. Said brake pad 2 is adapted to abut against a braking band 5 of the brake disc 4, wherein said pad 2 comprises at least one plate 6 and at least one friction material 7 supported by said plate 6; wherein said plate 6 has a main extension along the radial direction R-R and the tangential direction T-T.

[00151]. Said pad 2 being provided with at least a first slot 31.

[00152]. In accordance with an embodiment, said pad 2 is provided with a guide element.

[00153]. In accordance with an embodiment, said guide element is a second slot 32.

[00154]. In accordance with an embodiment, said guide element is a second ear 52 of said pad 2 configured to guide said pad.

[00155]. Said first slot 31 comprises a first slot edge 37 adapted

to accommodate, with clearance, a first pin 33a mounted on the caliper body 9.

[00156]. In accordance with an embodiment, said guide element defines a guide element profile in the plane R-T defined by the plate 6.

[00157]. In accordance with an embodiment, said second slot 32 comprises a second slot edge 38 adapted to accommodate, with clearance, a second pin 33b mounted on the caliper body 9.

[00158]. Said first slot edge 37 defines a first slot profile 10 in the plane R-T defined by the plate 6.

[00159]. In accordance with an embodiment, said second slot edge 38 defines a second slot profile 20 in the plane R-T defined in the plate 6.

[00160]. In accordance with an embodiment, said guide element profile is said second slot profile 20.

[00161]. In accordance with an embodiment, said guide element profile is the profile that peripherally delimits said second ear 52.

[00162]. Said first slot profile 10 forms a closed profile.

[00163]. In accordance with an embodiment, said second slot profile 20 forms a respective closed path.

[00164]. Said first slot profile 10 comprises at least one tangentially inner and radially outer side of first slot, or first side 11 of first slot, and one tangentially outer and radially outer side of first slot, or second side 12 of first slot, converging with each other and, along which said first pin 33a slides.

[00165]. Said first side 11 of first slot and second side 12 of first

slot constitute/define an equivalent of a hinge wherein said first pin 33a is abutted when resting in a braking release profile and simultaneously contacts at least two support points of first slot, or first support point 13 of first slot and second support point 14 of first slot arranged respectively on said first side 11 of first slot and on said second side 12 of first slot.

[00166]. In accordance with an embodiment, said guide element profile comprises a first side of guide element which constitutes/defines a sliding block along which a second pin 33b or a wall of the caliper body slides until abutting in said braking release configuration in at least one support point of guide element arranged on said first side of guide element.

[00167]. In accordance with an embodiment, said second slot profile 20 comprises a first side 30 of second slot, wherein said first side of guide element is said first side 30 of second slot. In accordance with an embodiment, said first side 30 of second slot constitutes a sliding block along which said second pin 33b slides up to abutting in said braking release configuration in at least one support point 15 of second slot arranged on said first side 30 of second slot.

[00168]. In accordance with an embodiment, said second lateral ear 52 comprises a first side of second lateral ear delimiting said second lateral ear 52 in the radially outer direction, wherein said first side of guide element is said first side of second ear. In accordance with an embodiment, said wall of caliper body is a part that delimits a niche obtained in the caliper body, in which said second ear 52

slides. In accordance with an embodiment, said first side of second lateral ear constitutes a sliding block along which said caliper body wall slides up to abutting in said braking release configuration in at least one support point arranged on said first side of second lateral ear.

[00169]. In accordance with an embodiment, said brake pad 2 is a pad of a pad and pin assembly 1 according to one of the embodiments previously described.

[00170]. The present invention further relates to a brake caliper 8 for a disc brake 3 of a vehicle.

[00171]. Said disc brake 3 defining an axial direction A-A coincident or parallel to the rotation axis of the brake disc 4, a radial direction R-R orthogonal to the axial direction A-A, and a tangential or circumferential direction T-T orthogonal both to the axial direction A-A and to the radial direction R-R.

[00172]. Said brake caliper 8 comprises at least one assembly 1 as previously described according to the present invention, or at least one brake pad 2 as previously described according to the present invention and at least two pins 33a, 33b, a caliper body 9. Said at least two pins 33a, 33b are connected to the caliper body and are adapted to overhangingly protrude from said caliper body 9 towards the braking band 5 of an associable brake disc 4.

[00173]. The present invention also concerns a method of positioning a brake pad 2 during the release of the braking action.

[00174]. Said method comprises the steps of:

i- providing at least one assembly 1 according to any one of claims 1 to 9, or at least one brake pad 2 according to claim 9, and at least a first pin 33a, 33b;

ii- fitting said at least a first slot 31, 32 on said at least one pin 33a, 33b provided in an associable caliper body 9;

wherein once a braking action which moves the brake pad 2 away from the brake disc 4 is released, said method provides the further step of:

iii- wedging the first pin 33a between said first side 11 of first slot and said second side 12 of first slot by sliding said first pin 33a on said first side 11 of first slot or on said second side 12 of first slot up to abutting while simultaneously contacting at least two tangentially opposite support points 13, 14 of first slot arranged on said first side 11 of first slot and on said second side 12 of first slot, respectively.

[00175]. In accordance with an operating mode, the step ii-envisages fitting said second slot 32 onto a second pin 33b provided in an associable caliper body 9.

[00176]. In accordance with an operating mode, said method envisages the further step of:

iv-parallel to step iii-, moving the second pin 33b along said first side 30 of second slot while abutting it in at least one support point 15 of second slot.

LIST OF REFERENCE SYMBOLS

- 1 Pad and pin assembly
- 2 pad
- 3 disc brake
- 5 4 brake disc
- 5 braking band
- 6 plate
- 7 friction material
- 8 brake caliper
- 10 9 caliper body
- 10 first slot profile
- 11 tangentially inner and radially outer side of first slot or first side of first slot
- 12 tangentially outer and radially outer side of first slot or second side of first slot
- 15 13 first support point of first slot
- 14 second support point of first slot
- 15 support point of second slot
- 16 tangentially inner and radially inner side of first slot or third side of first slot
- 20 17 tangentially outer and radially inner side of first slot or fourth side of first slot
- 18 tangentially inner arc of first slot or first arc of first slot
- 19 tangentially outer arc of first slot second arc of first slot
- 25 20 second slot profile
- 21 radially inner side of first slot or fifth side of first slot
- 22 radially outer side of first slot or sixth side of first slot
- 23 radially inner and tangentially inner arc of first slot or third arc of first slot
- 30 24 radially inner and tangentially outer arc of first slot or fourth arc of first slot
- 25 radially outer and tangentially inner arc of first slot or fifth arc of first slot

- 26 radially outer and tangentially outer arc of first slot or sixth arc of first slot
- 27 tangentially inner side of second slot or fourth side of second slot
- 5 28 tangentially outer side of second slot or third side of second slot
- 29 radially inner side of second slot or second side of second slot
- 30 radially outer side of second slot or first side of second slot
- 31 first slot
- 10 32 second slot
- 33 radially outer and tangentially outer arc of second slot or first arc of second slot
- 34 radially outer and tangentially inner arc of second slot or second arc of second slot
- 15 35 radially inner and tangentially outer arc of second slot or third arc of second slot
- 36 radially inner and tangentially inner arc of second slot or fourth arc of second slot
- 41 first flank
- 20 42 second flank
- 43 radially inner edge
- 44 radially outer edge
- 51 first lateral ear
- 52 second lateral ear
- 25
- A-A axial direction
- T-T circumferential or tangential direction
- R-R radial direction
- m-m median axis of pad
- 30 ALFA angle of first side of first slot or angle of inclination of first slot
- Dp pin diameter
- Di plurality of joining diameters of first slot
- Dt plurality of joining diameters of second slot
- 35 D tangential distance of first pin

H minimum radial distance of first pin

CLAIMS

1. A pad and pin assembly (1) for a brake caliper (8), wherein said brake caliper (8) comprises a caliper body (9) adapted to be arranged straddling a brake disc (4),

5 said assembly (1) defining an axial direction (A-A) coincident or parallel to the rotation axis of the brake disc (4), a radial direction (R-R) orthogonal to the axial direction (A-A), and a tangential or circumferential direction (T-T) orthogonal both to the axial direction (A-A) and to the radial direction (R-R);

10 wherein said assembly (1) comprises at least one brake pad (2) and at least a first pin (33a),

 wherein said brake pad (2) is adapted to abut against a braking band (5) of the brake disc (4), wherein said pad (2) comprises at least one plate (6) and at least one friction material (7) supported by said plate (6); wherein said plate (6) has a main extension along the radial direction (R-R) and the tangential direction (T-T);

15 said pad (2) being provided with at least a first slot (31), wherein said first slot (31) comprises a first slot edge (37) adapted to accommodate said first pin (33a) with clearance,

20 wherein said first slot edge (37) defines a first slot profile (10) in the plane (R-T) defined by the plate (6),

 wherein said first slot profile (10) forms a closed path,

 wherein said first slot profile (10) comprises at least one tangentially inner and radially outer side of first slot, or first side (11) of first slot, and one tangentially outer and radially outer side of first slot, or second side (12) of first slot, along which

25

said first pin (33a) slides, wherein said first side of first slot (11) and said second side of first slot (12) converge with each other and are opposite with respect to said tangential direction (T-T), wherein said assembly (1) has a braking release configuration wherein
5 said first pin (33a) is abutted against said first slot profile (10) and simultaneously contacts at least two support points of first slot, or first support point (13) of first slot and second support point (14) of first slot, opposite to each other with respect to said tangential direction (T-T), said at least two support points of first
10 slot (13, 14) being arranged respectively on said first side of first slot (11) and on said second side of first slot (12), and wherein said second side of first slot (12) is parallel to said radial direction (R-R).

15 **2.** An assembly according to claim 1, wherein said assembly (1) comprises at least one second pin (33b), said pad (2) being provided with at least one second slot (32), wherein said second slot (32) comprises a second slot edge (38) adapted to accommodate with clearance said second pin (33b), wherein said second slot edge (38)
20 defines a second slot profile (20) in the plane (R-T) defined in the plate (6), wherein said second slot profile (20) forms a respective closed path, wherein said second slot profile (20) comprises at least one first side of second slot (30), and wherein, in said braking release configuration, said second pin (33b) abuts against said second
25 slot profile (20) and contacts at least one support point of second

slot (15) arranged on said first side of second slot (30).

3. An assembly according to claim 1 or 2,
wherein at least said first side (11) of first slot is inclined with
5 respect to said tangential direction (T-T) passing through the first
contact point (13) of first slot, by an angle (ALFA) of first side of
first slot, said angle (ALFA) of first side of first slot preferably
is between 30° and 80°,
and/or wherein the extensions of said first side (11) of first slot
10 and said second side (12) of first slot meet in a radially outer point
with respect to said first slot profile (10),
and/or wherein, in said braking release configuration, said at least
one support point (15) of second slot and at least one of said two
support points (13) of first slot are arranged aligned on the same
15 tangential or circumferential direction (T-T),
and/or wherein, in said braking release configuration, said at least
one support point (15) of second slot and at least one of said two
support points (13) of first slot are a same radial distance along
said radial direction (R-R) with respect to said rotation axis of the
20 brake disc (4).

4. An assembly according to any one of the preceding claims, wherein
said first slot profile (10) comprises a tangentially inner and
radially inner side of first slot, or third side (16) of first slot,
25 joined to said first side (11) of first slot,

and/or wherein said first slot profile (10) comprises a tangentially outer and radially inner side of first slot, or fourth side (17) of first slot, joined to said second side (12) of first slot, and/or wherein said third side (16) of first slot is arranged parallel to said radial direction (R-R),
and/or wherein said fourth side (17) of first slot is parallel to said radial direction (R-R);
and/or wherein said first side (11) of first slot is inclined with respect to said third side (16) of first slot, by an angle between 20° and 70°,
and/or wherein said first slot profile (10) comprises a radially inner side of first slot, or fifth side (21) of first slot, on which said first pin (33a) slides,
and/or wherein said fifth side (21) of first slot is parallel to the tangential direction (T-T) passing simultaneously through said at least one support point (15) of second slot and said first support point (13) of first slot,
and/or wherein said fifth side (21) of first slot is indirectly joined to said first side (11) of first slot and to said second side (12) of first slot,
and/or wherein said first slot profile (10) comprises a radially outer side of first slot, or sixth side (22) of first slot, which joins said first side (11) of first slot to said second side (12) of first slot, wherein said first pin (33a) and said first slot (31) have such a size that said first pin (33a) is always spaced apart from said sixth side

(22) of first slot.

5. An assembly according to claim 4, wherein when it is in contact simultaneously with said at least two support points (13, 14) of first slot, said first pin (33a) is at a minimum tangential distance (D) of first pin from said third side (16) of first slot, preferably wherein said tangential distance (D) of first pin is comprised between 0.10 mm and 0.80 mm, preferably comprised between 0.20 mm and 0.35 mm.

10 6. An assembly according to claim 5, wherein said plate (6) comprises a first flank (41) and a second flank (42), located at opposite tangential ends of the plate (6), wherein said minimum tangential distance (D) of first pin is configured to abut against said brake pad (2) with said third side (16) of first slot and with said first side (11) of first slot against said first pin (33a) in a reverse running braking condition, avoiding discharging a braking force along said tangential direction (T-T) on said caliper body by said first flank (41) or said second flank (42).

20 7. An assembly according to any one of claims 4 to 6, wherein said second support point (14) of first slot is at a radial distance from said fifth side (21) of first slot which is less than the radial distance between said first support point (13) of first slot and said fifth side (21) of first slot,

25 and/or wherein, when it is in contact simultaneously with said at

least two support points (13, 14) of first slot, said first pin (33a) is at a minimum tangential distance (H) of first pin from said fifth side (21) of first slot, preferably wherein said tangential distance (H) of first pin is comprised between 0.30 mm and 2.65 mm, preferably
5 comprised between 1.00 mm and 1.50 mm

and/or wherein said first pin (33a) has a diameter (Dp) of first pin and said first slot (31) has a plurality of joining diameters (Di) of first slot which join the first close ones of said sides (11, 12, 16, 17, 21, 22) of first slot, wherein each joining diameters (Di) of
10 first slot is less than said diameter (Dp) of first pin,
and/or wherein said first slot profile (10) comprises a tangentially inner arc of first slot, or first arc (18) of first slot, which joins said third side (16) of first slot to said first side (11) of first slot;

15 and/or said first slot profile (10) comprises a radially inner and tangentially inner arc of first slot, or third arc (23) of first slot, which joins said tangentially inner and radially inner side (16) of first slot to said radially inner side (21) of first slot,
and/or wherein said first slot profile (10) comprises a radially inner
20 and tangentially outer arc of first slot, or fourth arc (24) of first slot, which joins said tangentially outer and radially inner side (17) of first slot to said radially inner side (21) of first slot.

8. An assembly according to any one of the preceding claims, wherein
25 said second slot (20) is specular to said first slot (10),

and/or wherein said brake pad is axisymmetric,
and/or wherein said first slot (31) is asymmetrical.

9. An assembly according to any one of preceding claims 1 to 7, wherein
5 said first side (30) of second slot is directed parallel to said
tangential direction (T-T) passing through said at least one support
point (15) of second slot so as to slide the second pin (33b) on said
side (30) of second slot up to abutting in said support point (15) of
second slot when said first pin (33a) abuts said first slot profile
10 (10) and contacts said first support point (13) of first slot and said
second support point (14) of first slot,
and/or wherein said second slot (32) is rectangular,
and/or wherein said second slot profile (20) has at least four sides
(27, 28, 29, 30) of second slot,
15 and/or wherein said four sides (27, 28, 29, 30,) of second slot
comprise a tangentially inner side (27) of second slot, a tangentially
outer side (28) of second slot, a radially inner side (29) of second
slot, a radially outer side (30) of second slot,
and/or wherein said second slot profile (20) has at least four arcs
20 (33, 34, 35, 36) of second slot which join said four sides (27, 28,
29, 30) of second slot,
and/or wherein said second slot profile (20) and said second pin (33b)
have such a size that said second pin (33b) slides on each side (27,
28, 29, 30) of said second slot (32), avoiding to contact each of said
25 arcs (33, 34, 35, 36) of second slot.

10. A brake pad (2) for a brake caliper (8), wherein said brake caliper (8) comprises a caliper body (9) adapted to be arranged straddling a brake disc (4),

5 said pad (2) defining an axial direction (A-A) coincident or parallel to the rotation axis of the brake disc (4), a radial direction (R-R) orthogonal to the axial direction (A-A), and a tangential or circumferential direction (T-T) orthogonal both to the axial direction (A-A) and to the radial direction (R-R);

10 wherein said brake pad (2) is adapted to abut against a braking band (5) of the brake disc (4), wherein said pad (2) comprises at least one plate (6) and at least one friction material (7) supported by said plate (5); wherein said plate (6) has a main extension along the radial direction (R-R) and the tangential direction (T-T);

15 said pad (5) being provided with at least a first slot (31), wherein said first slot (31) comprises a first slot edge (37) adapted to accommodate, with clearance, a first pin (33a) mounted on the caliper body (9),

20 wherein said first slot edge (37) defines a first slot profile (10) in the plane (R-T) defined by the plate (6), wherein said first slot profile (10) forms a closed path, wherein said first slot profile (10) comprises at least one tangentially inner and radially outer side of first slot, or first side (11) of first slot, and one tangentially outer and radially outer side of first slot, or second side (12) of first slot, which converge

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with each other and along which said first pin (33a) slides, which form the equivalent of a hinge wherein said first pin (33a) abuts resting in a braking release configuration and simultaneously contacts at least two support points of first slot, or first support point (13) of first slot and second support point (14) of first slot, arranged on said first side (11) of first slot and on said second side (12) of first slot, respectively, wherein said second side (12) of first slot is parallel to said radial direction (R-R).

10 **11.** A brake pad (2) according to the preceding claim, wherein said pad (5) is provided with at least one second slot (32), wherein said second slot (32) comprises a second slot edge (38) adapted to accommodate with clearance a second pin (33b) mounted on the caliper body (9), wherein said second slot edge (38) defines a second slot profile (20) in the plane (R-T) defined in the plate (6), wherein said
15 second slot profile (20) forms a respective closed path, wherein, in said braking release configuration, said second slot profile (20) comprises at least one first side of second slot (30) which constitutes a skid along which said second pin (33b) slides until abutting in said
20 braking release configuration in at least one support point of second slot (15) arranged on said first side of second slot (30), and/or wherein said brake pad (2) is a pad of a pad and pin assembly (1) according to any one of claims **1** to **9**.

25 **12.** A brake caliper (8) for disc brake (3) of a vehicle, wherein said

disc brake (3) defines an axial direction (A-A) coincident or parallel to the rotation axis of the brake disc (4), a radial direction (R-R) orthogonal to the axial direction (A-A), and a tangential or circumferential direction (T-T) orthogonal both to the axial direction (A-A) and to the radial direction (R-R), said brake caliper (8) comprises:

- at least one assembly (1) according to any one of claims **1** to **9**, or at least one brake pad (2) according to claim **10** or **11**, and at least one pin (33a, 33b),
- a caliper body (9),
- wherein said at least one pin (33a, 33b) is connected to the caliper body and is adapted to overhangingly protrude from said caliper body (9) towards the braking band (5) of an associable brake disc (4).

13. A method of positioning a pad (2) during the release of the braking action, comprising the following steps:

- i-providing at least one assembly (1) according to any one of claims **1** to **9**, or at least one brake pad (2) according to claim **10** or **11**, and at least a first pin (33a, 33b);
- ii-fitting said at least a first slot (31, 32) on said at least a first pin (33a, 33b) provided in an associable caliper body (9);

wherein once a braking action which moves the brake pad (2) away from the brake disc (4) is released, said method provides the further step

of:

iii-wedging the first pin (33a) between said first side (11) of first slot and said second side (12) of first slot by sliding said first pin (33a) on said first side (11) of first slot or on said second
5 side (12) of first slot up to abutting while simultaneously contacting at least two tangentially opposite support points (13, 14) of first slot arranged on said first side (11) of first slot and on said second side (12) of first slot, respectively.

10 **14.** A method of positioning a pad (2) during the release of the braking action according to the preceding claim, wherein step ii- provides fitting said second slot (32) on a second pin (33b) provided in an associable caliper body (9); and wherein said method comprises the further step of:

15 iv-parallel to step iii-, moving the second pin (33b) along said first side (30) of second slot while abutting it in at least one support point (15) of second slot.

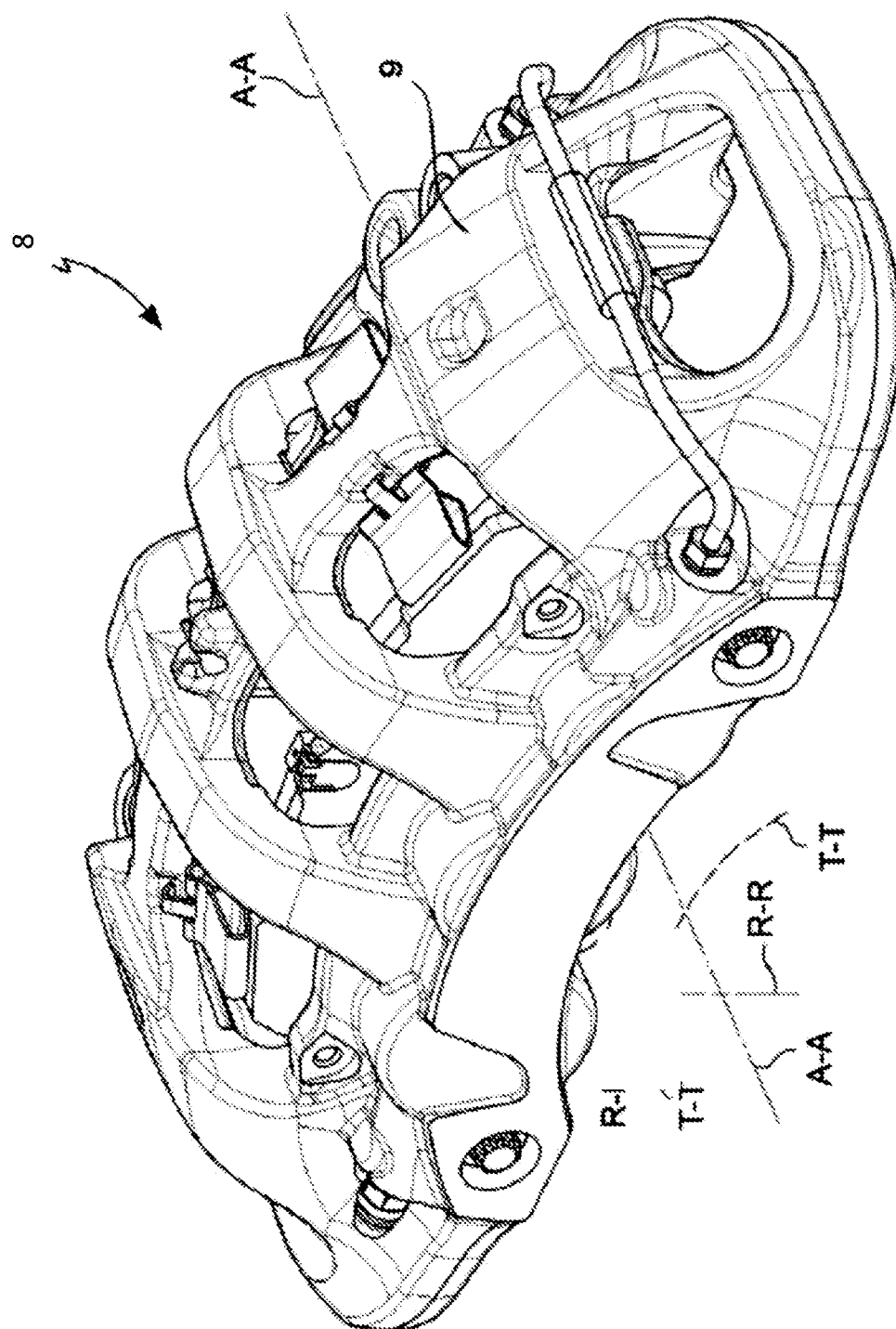


FIG. 1

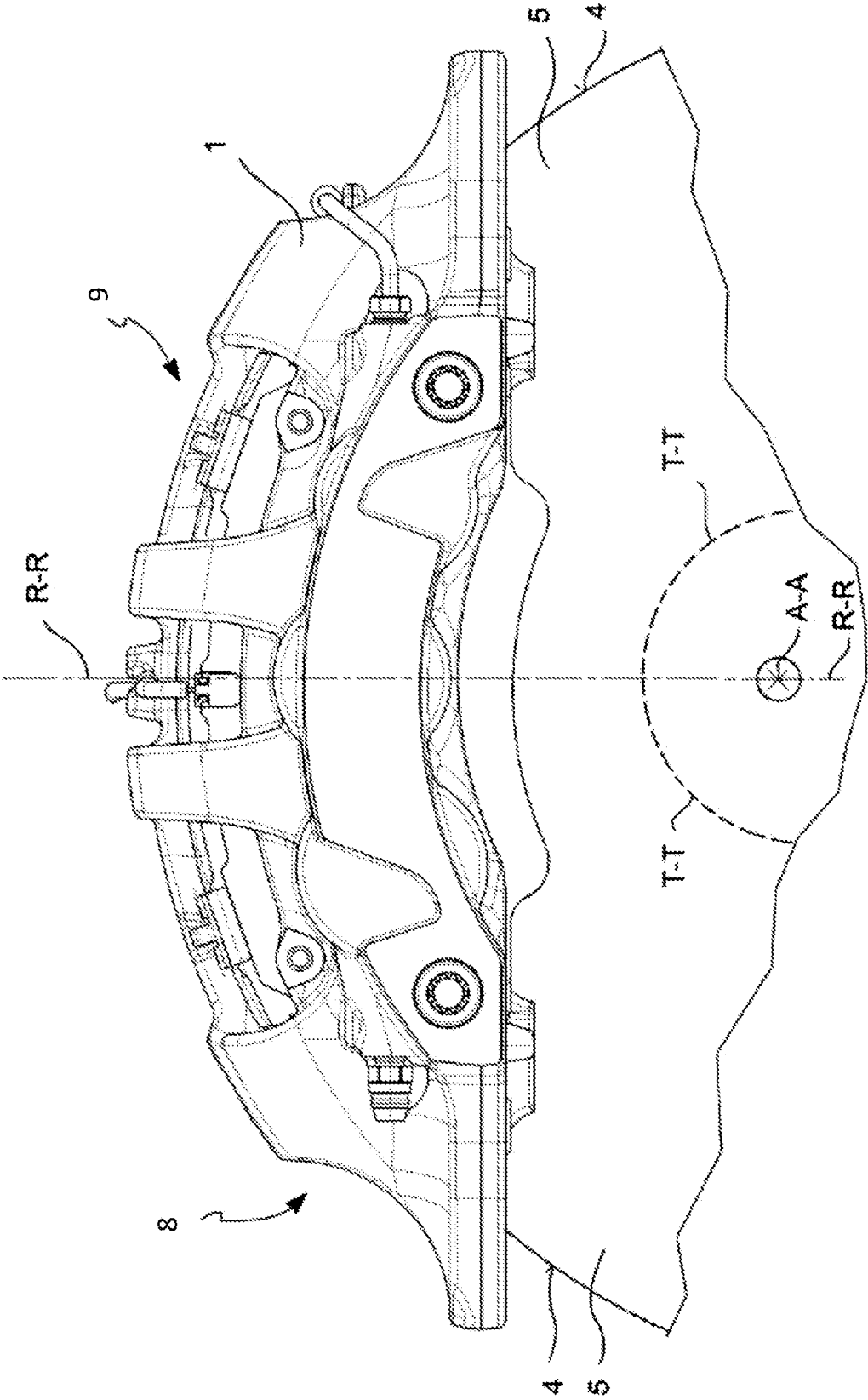


FIG. 2

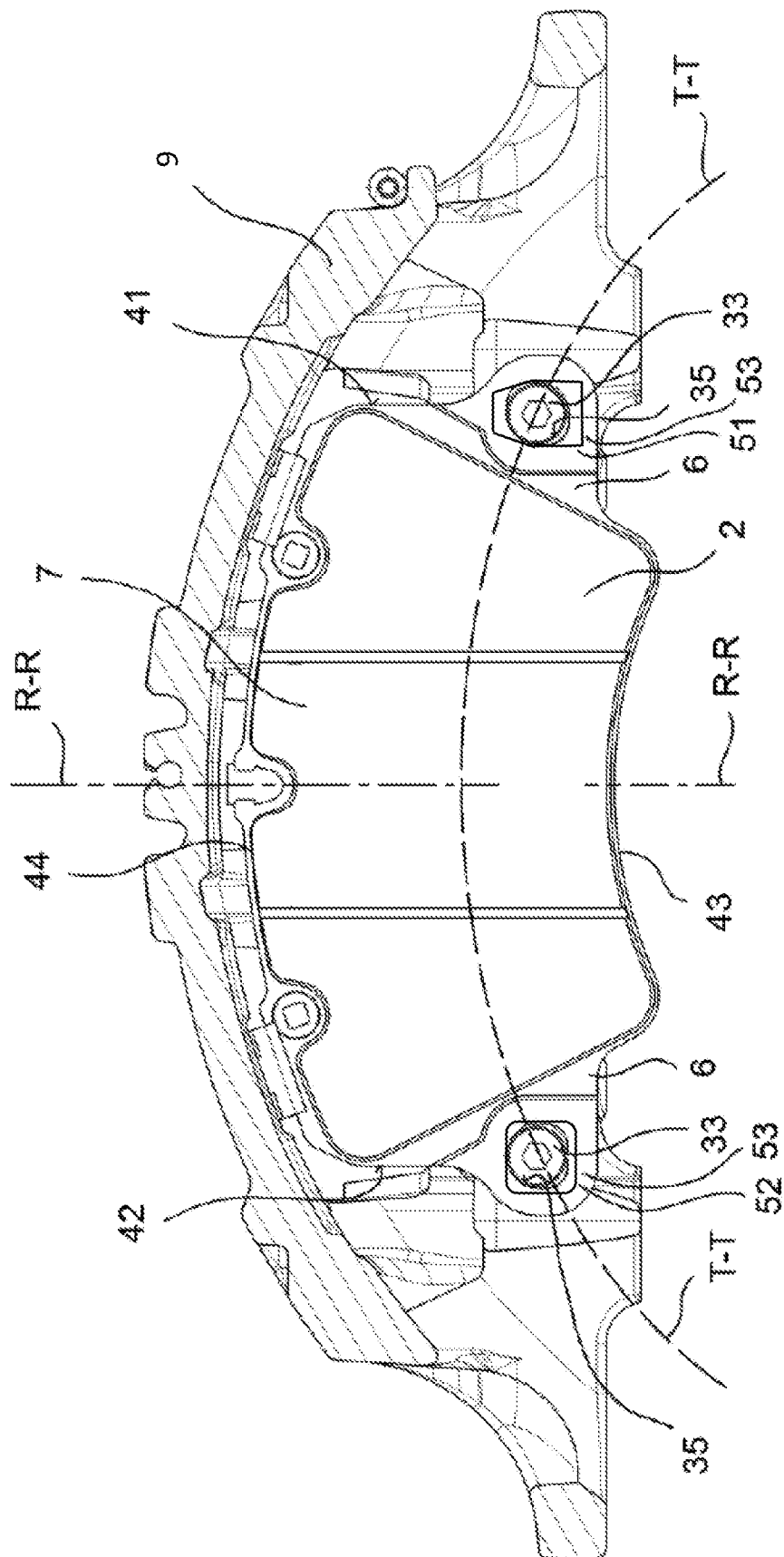


FIG. 3

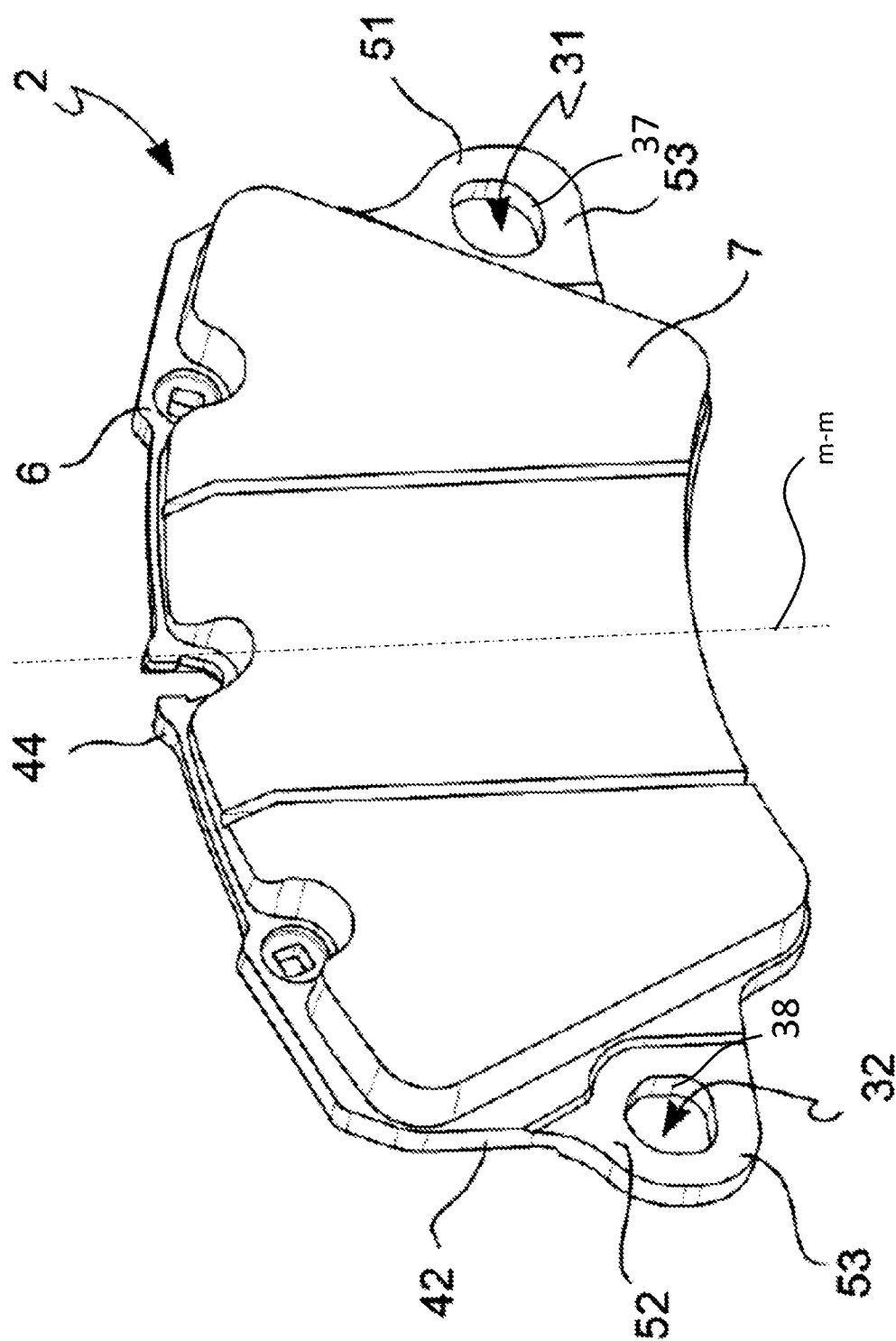
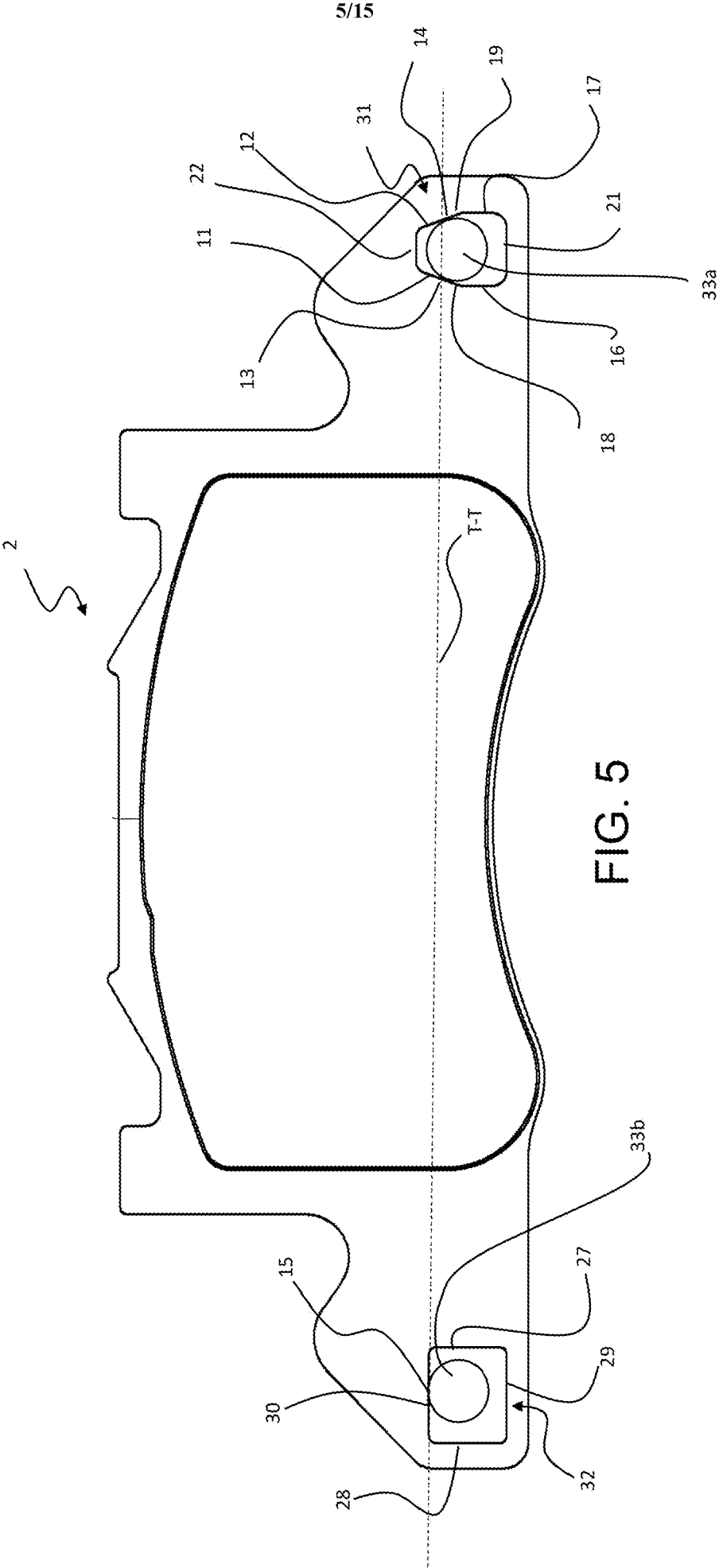
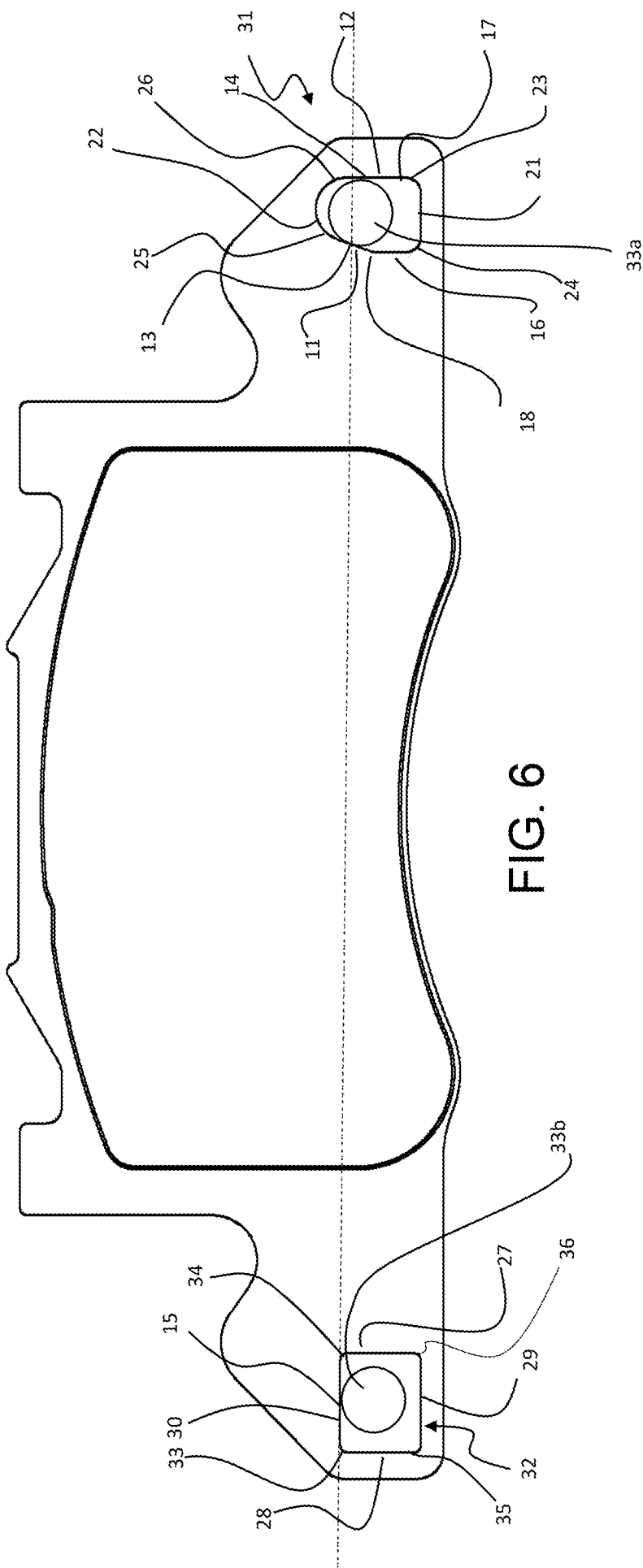


FIG. 4





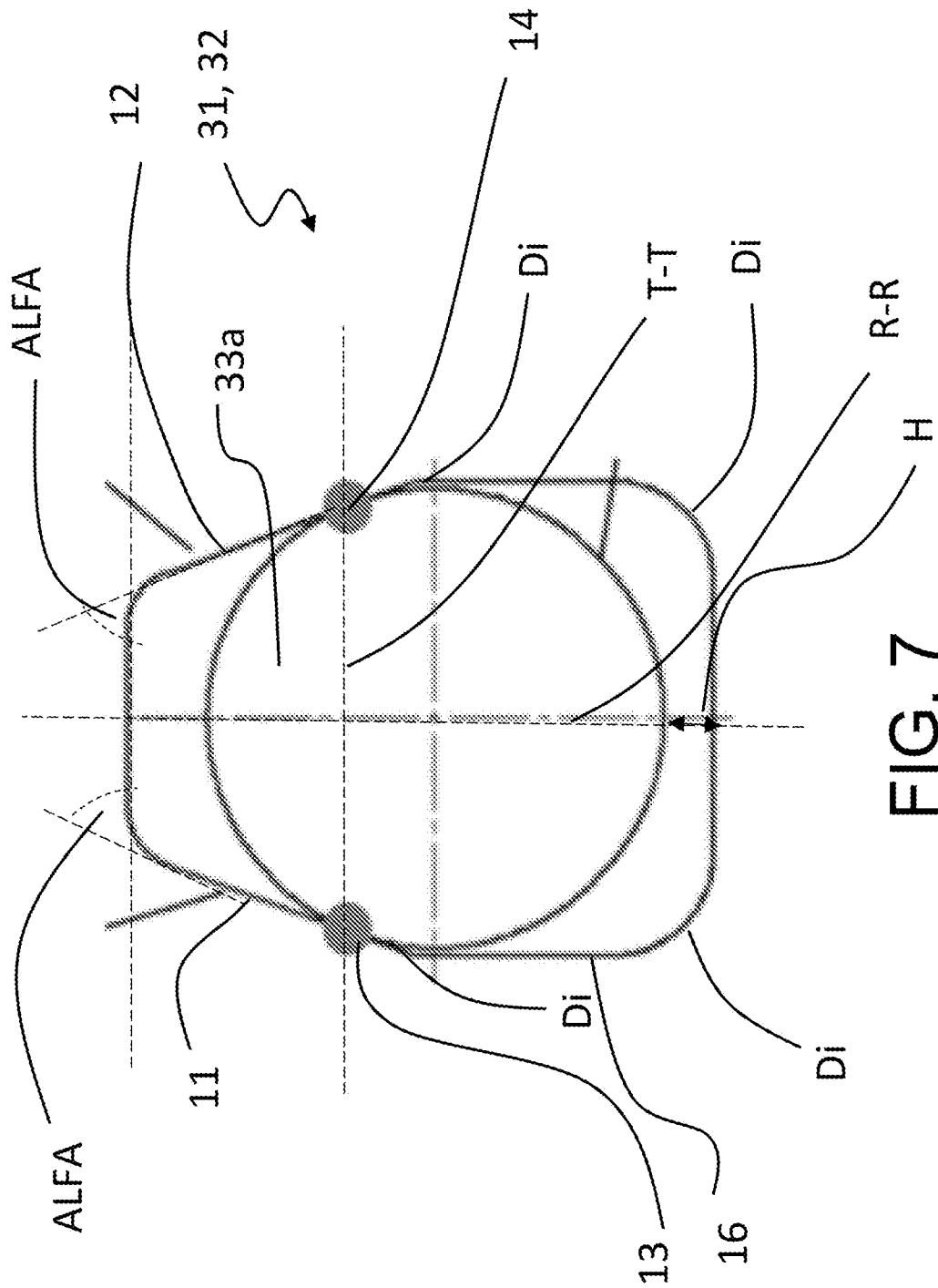
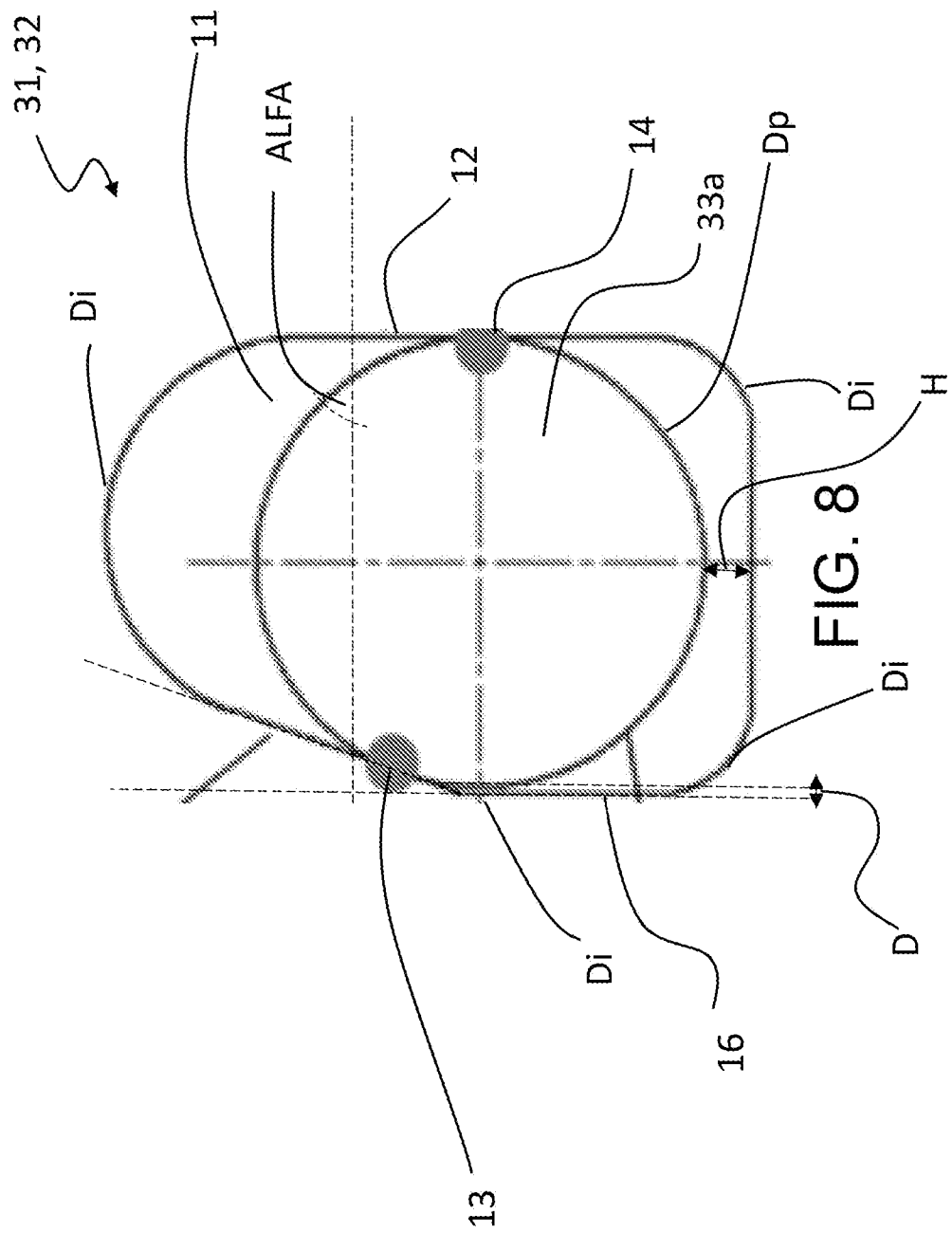
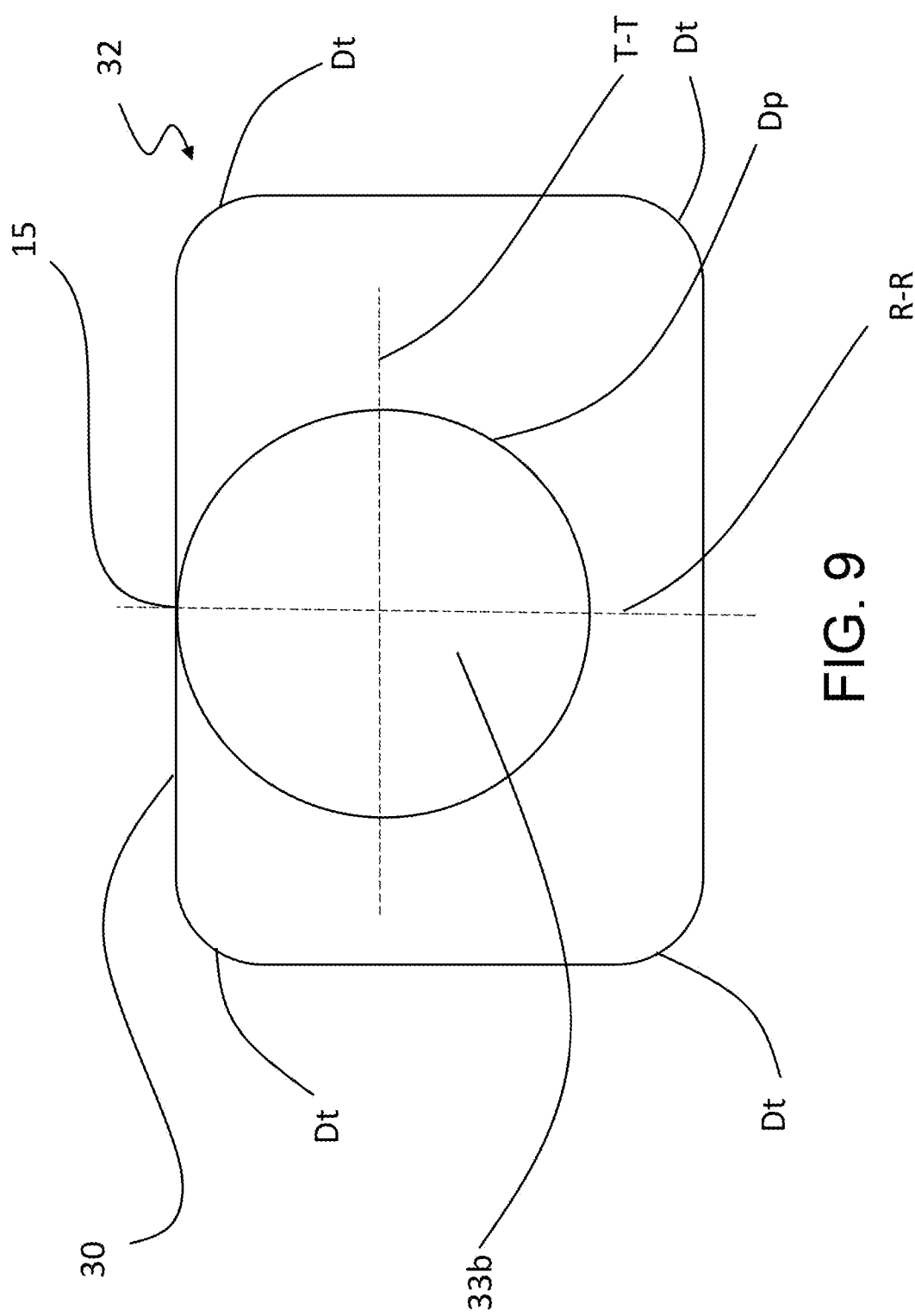


FIG. 7





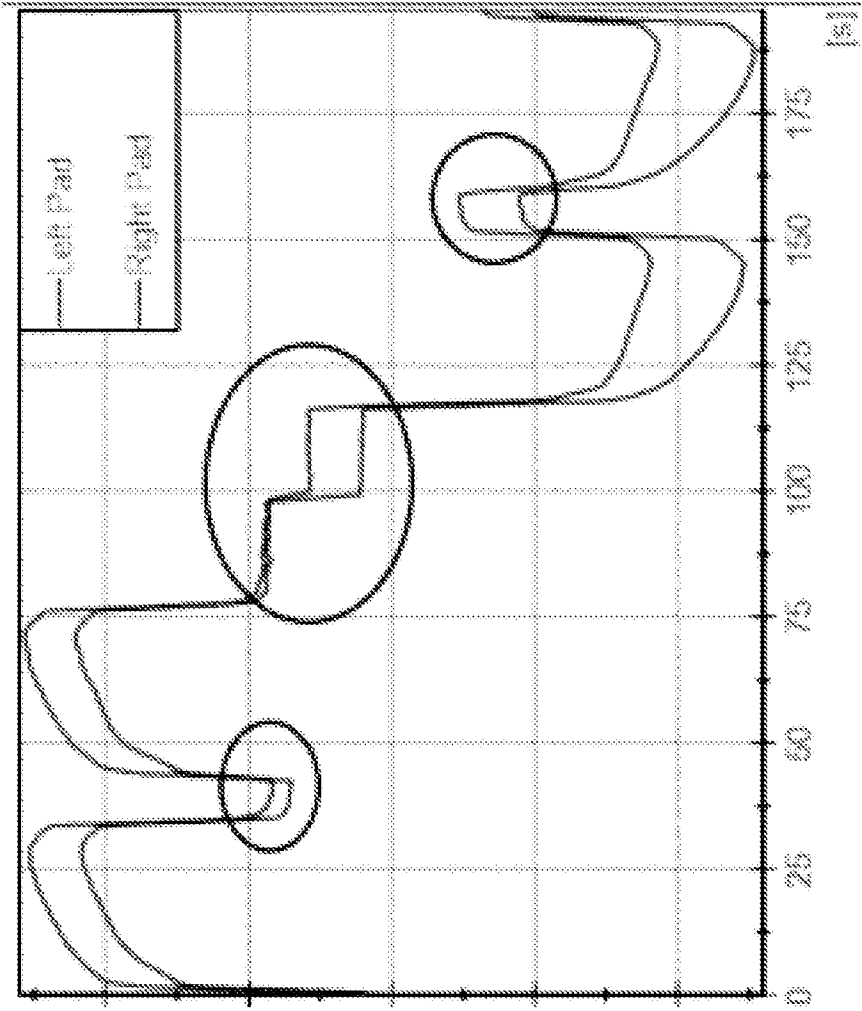


FIG. 10

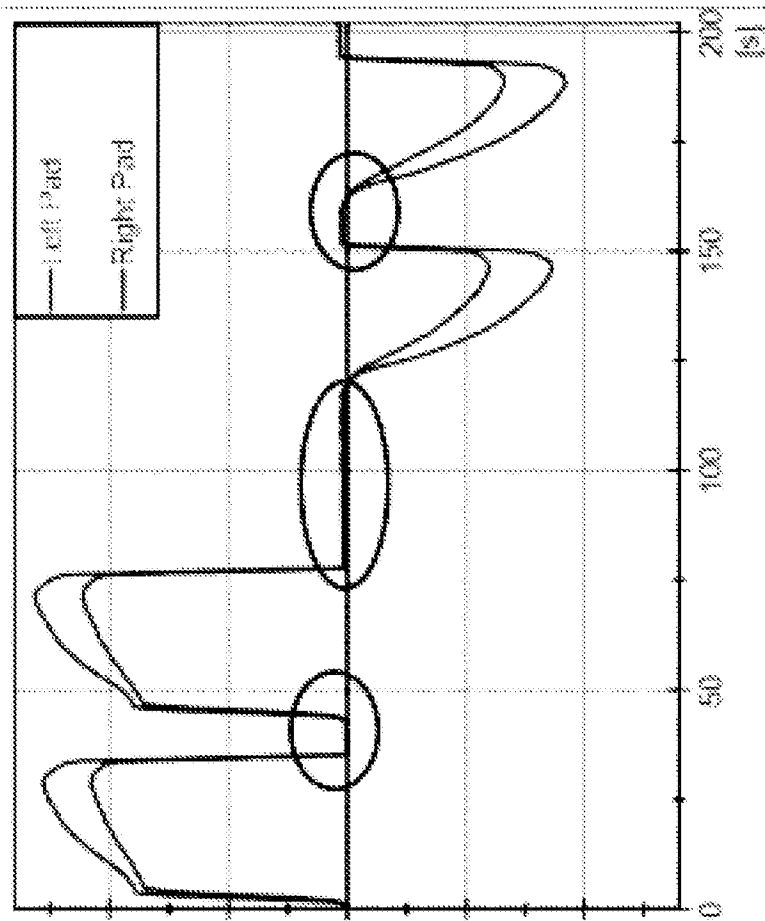


FIG. 11

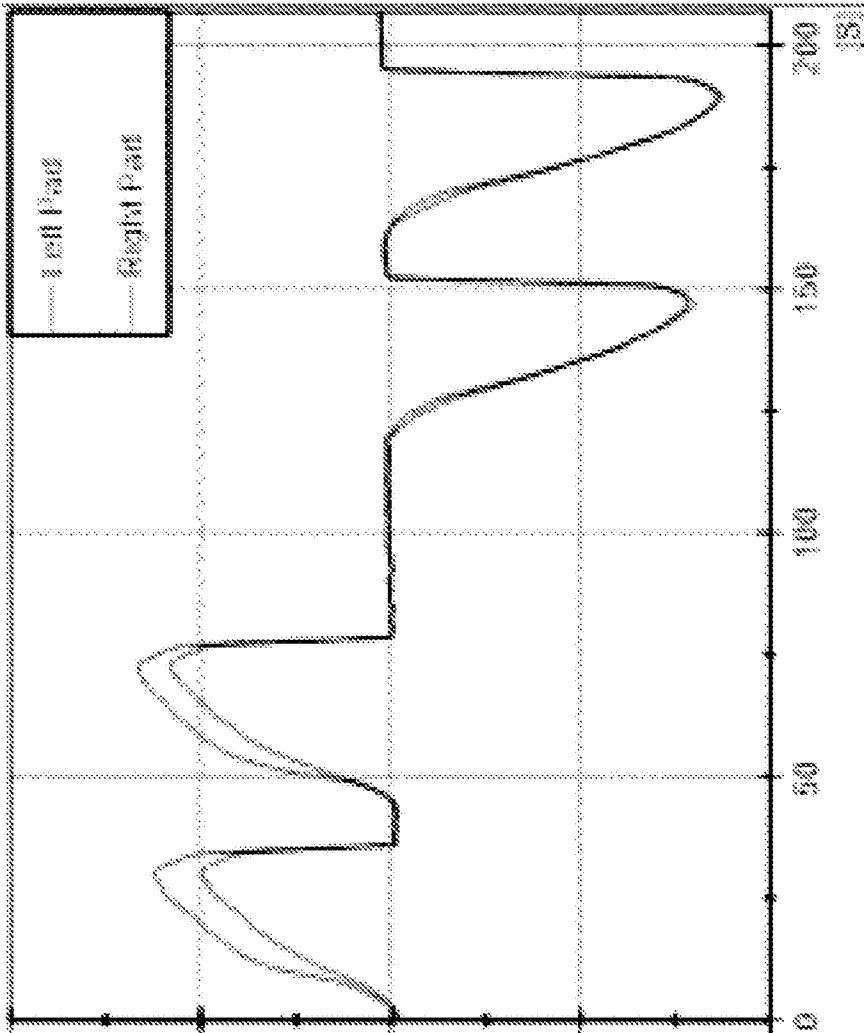
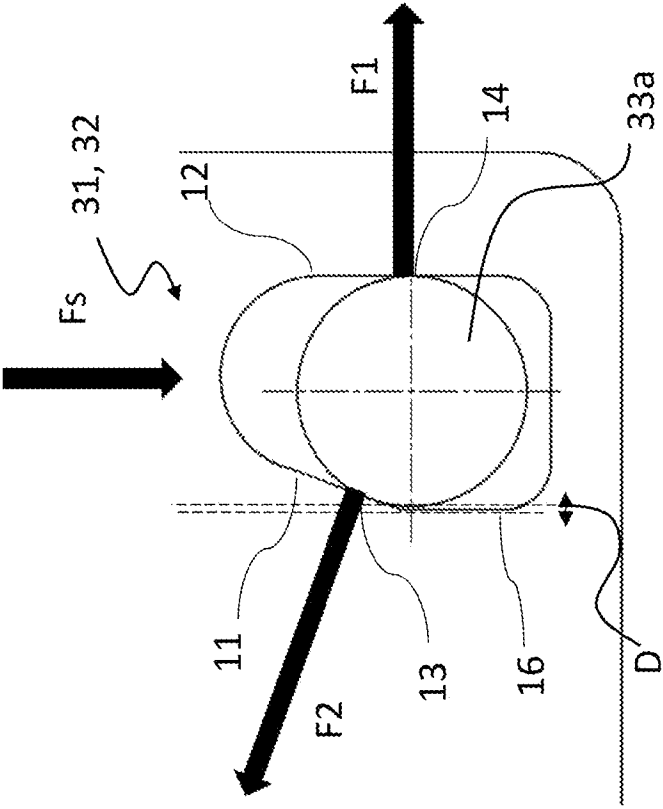
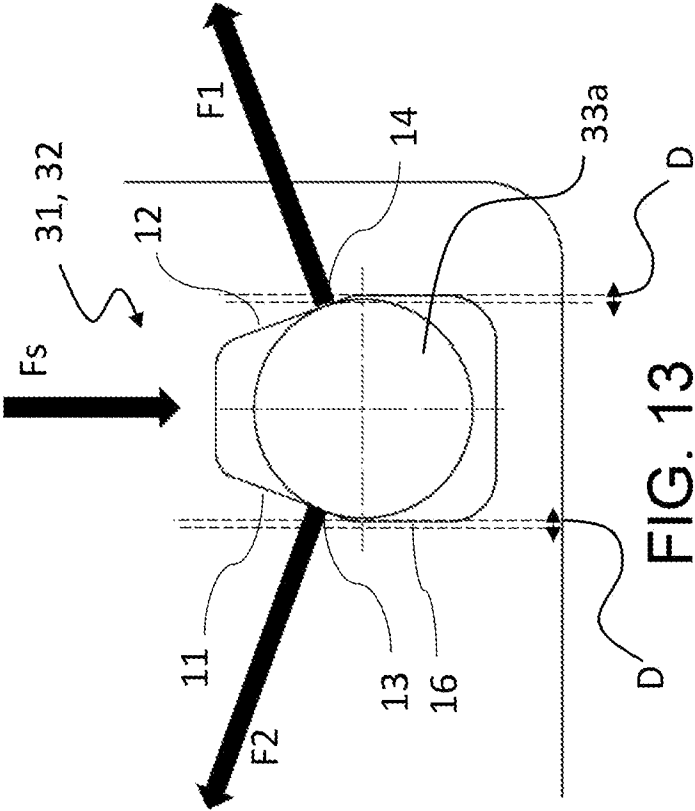


FIG. 12



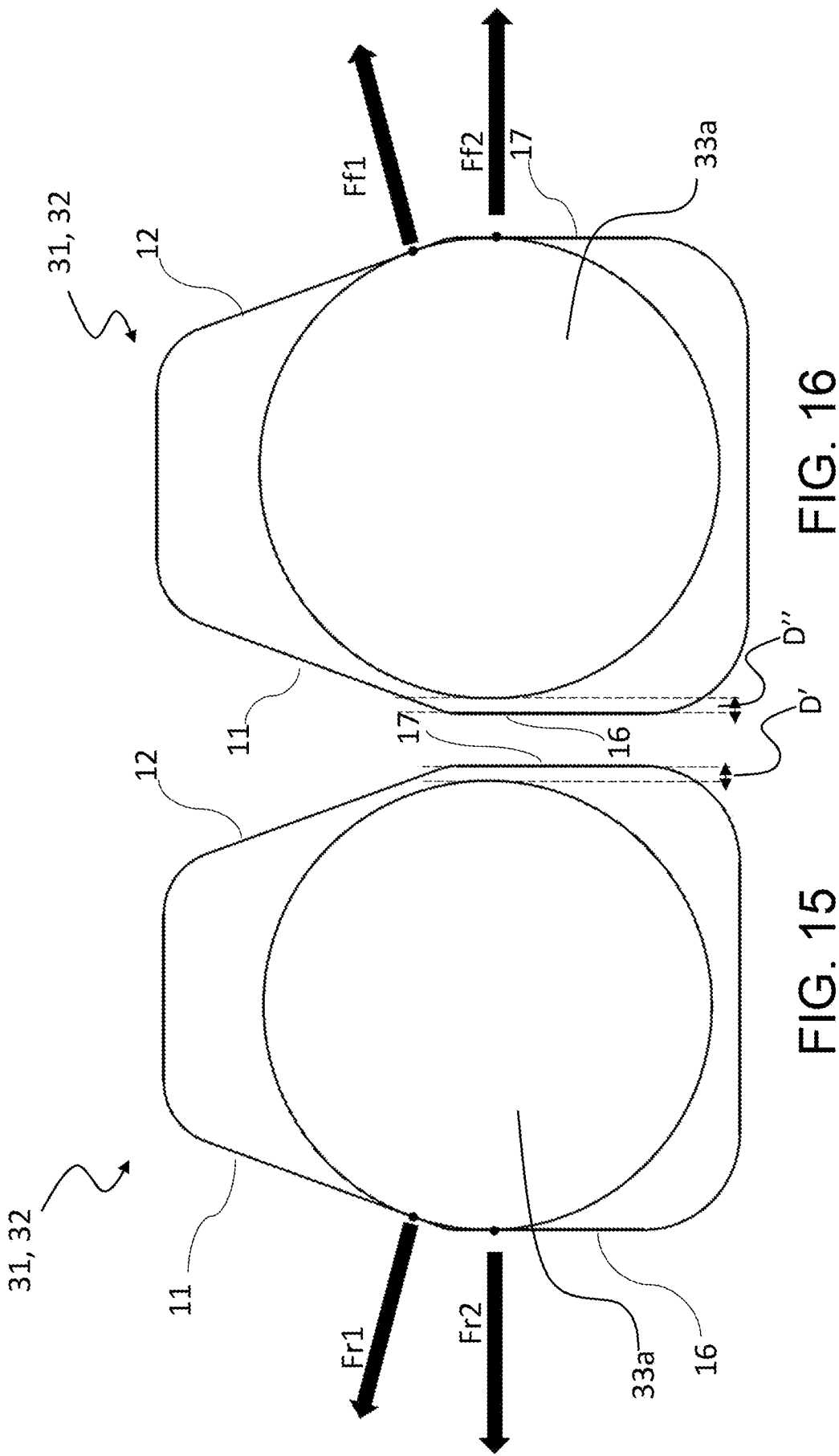


FIG. 16

FIG. 15

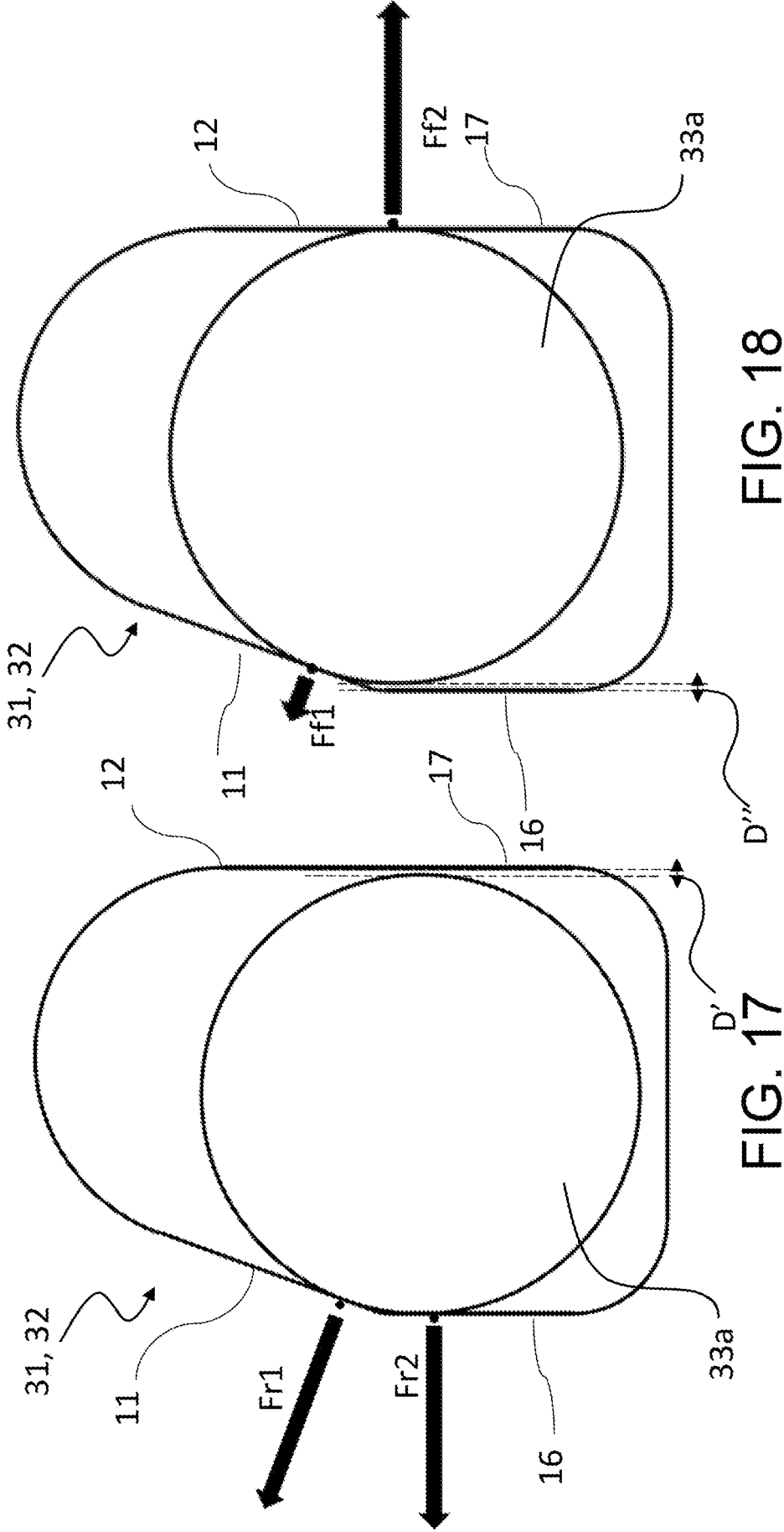


FIG. 18

FIG. 17

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2021/062011

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16D65/095 F16D65/00 F16D65/18
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.
A	DE 10 2019 000070 A1 (ZF ACTIVE SAFETY GMBH [DE]) 9 July 2020 (2020-07-09) paragraphs [0031], [0032]; figures -----	1-14
A	US 2017/284488 A1 (CRIPPA CRISTIAN [IT] ET AL) 5 October 2017 (2017-10-05) paragraph [0097] - paragraph [0108] -----	1-14
A	US 10 670 093 B2 (CONTINENTAL TEVES AG & CO OHG [DE]) 2 June 2020 (2020-06-02) column 6, line 48 - line 59; figures 7-9 -----	1-14
A	US 2012/043168 A1 (NARAYANAN V LAKSHMI [US] ET AL) 23 February 2012 (2012-02-23) paragraph [0049]; figure 13 -----	1-14

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Further documents are listed in the continuation of Box C.

☒

See patent family annex.

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Date of the actual completion of the international search

14 March 2022

Date of mailing of the international search report

11/04/2022

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Authorized officer

van Koten, Gert

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2021/062011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102019000070 A1	09-07-2020	NONE	
US 2017284488 A1	05-10-2017	CN 107269739 A	20-10-2017
		DE 102017205415 A1	19-10-2017
		US 2017284488 A1	05-10-2017
US 10670093 B2	02-06-2020	BR 112018001051 A2	11-09-2018
		CA 2996832 A1	09-03-2017
		CN 107850147 A	27-03-2018
		DE 102016209069 A1	02-03-2017
		DK 3344892 T3	13-01-2020
		EP 3344892 A1	11-07-2018
		ES 2759338 T3	08-05-2020
		JP 6670373 B2	18-03-2020
		JP 2018526594 A	13-09-2018
		KR 20180021128 A	28-02-2018
		PL 3344892 T3	18-05-2020
		RU 2018110653 A	02-10-2019
		US 2018195569 A1	12-07-2018
		WO 2017036802 A1	09-03-2017
US 2012043168 A1	23-02-2012	NONE	