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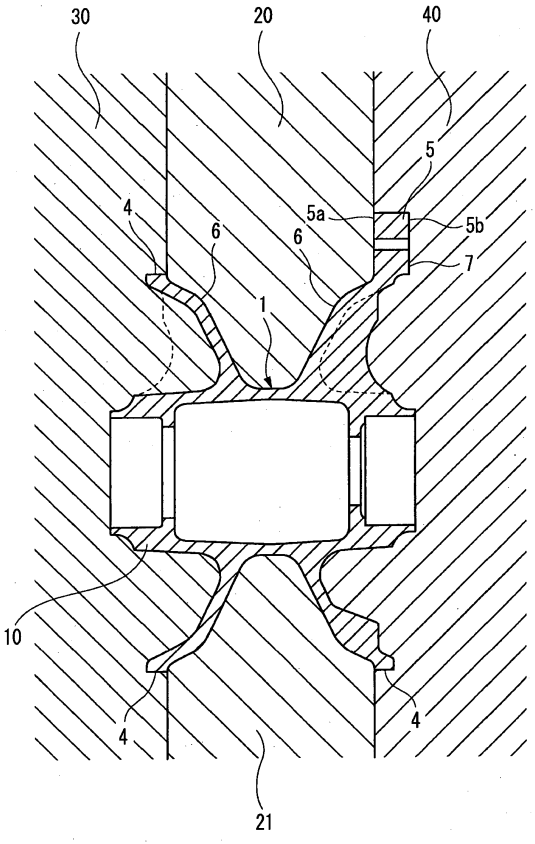
(54) Hub manufacturing method and wheel provided with the hub

(57) A hub manufacturing method that reduces the inclination of a rear surface of a disk mounting portion and a wheel provided with the hub are provided.

A hub (10) manufacturing method and a wheel (60) provided with the hub (10) are provided. When the hub (10) is manufactured which has a tubular portion (1) through which an axle passes, flanges (2, 3) extending from both ends of the tubular portion (1) toward the outside in a radial direction of the tubular portion, and a plurality of brake disk mounting portions (5) projecting from respective outer circumferential edges of the flanges (2, 3) toward the outside in a flange-radial direction, a fixed mold (30) and a movable mold (40) are used to form from respective axle-directional lateral surfaces of the outer circumferential edges of the flanges (2, 3) to corresponding lateral surfaces on the respective brake disk mounting portion (5) sides. In addition, slide molds (20, 21) which slidably move along the radial direction of the tubular portion are used to form from a tubular portion outer circumferential surface (1a) of the hub (10) through respective radial inner circumferential surfaces (6, 6) of the flanges (2, 3) to corresponding rear surfaces (5a) of the brake disk mounting portions (5). The respective parting lines (PL) of the slide molds (20, 21) are each allowed to be located at a rear surface (5a) of the brake disk mounting portion (5).

FIG. 4



EP 2 447 088 A1

Description

[0001] The present invention relates to a method of manufacturing a hub used for a tire of a motorcycle or the like and a wheel provided with the hub.

[0002] A conventional wheel using spokes has a structure in which a brake disk is mounted to the outer circumference of a hub through which an axle passes. In the structure, there is known a hub structure as shown in e.g. Fig. 12 in which brake disk mounting portions 105 project in a hub-radial-external direction from a hub 100. In a method of manufacturing a portion corresponding to this hub structure, as shown in Fig. 13, for example, a fixed mold 97 and a movable mold 99 of a forming mold are structured to extend to respective positions corresponding to the rear surfaces of the brake disk mounting portions 105. In addition, the whole, on the inner circumferential side, of the hub 100 is formed by slide molds 98. Incidentally, the slide molds 98 are configured to be movable leftward and rightward with parting lines PL put therebetween.

[0003] The manufacturing method described above can make the brake disk mounting portions 105 compact. However, in the conventional structure as illustrated in Figs. 12 and 13, the rear surface of the brake disk mounting portion 105 needs draft for the slide mold 98. Therefore, the rear surface of the brake disk mounting portion 105 has been cut for adjustment by machining. Such cutting work poses problems with its large load and with a high processing cost.

On the other hand, in the case of no cutting work and the like, a portion where the extending direction of the brake disk mounting portion 105 and the drawing direction of the slide mold 98 have a large crossing angle is as below. For example, as shown in Fig. 14, a thickness difference ($t1 > t2$) is large at a position along the slide direction, so that the thickness of the brake disk mounting portion 105 is tilted. Therefore, it becomes difficult to ensure strength. In order to ensure the sufficient strength, it may be intended to ensure the sufficient thickness of the brake disk mounting portion 105. In such a case, it is necessary to increase the thickness of the brake disk mounting portion 105. This leads to a problem with the increased weight and size of the hub 100.

[0004] The present invention has been made in view of the situations described above and aims to provide a hub manufacturing method that can reduce the inclination of the rear surface of a brake disk mounting portion in the hub manufacturing method in which the hub is formed by a fixed mold, a movable mold and slide molds and the inside of flanges of the hub is formed by the slide molds, and to provide a wheel provided with the hub.

[0005] To achieve the above object, the invention according to claim 1 is characterized in that in a method of manufacturing a hub, in which when the hub is manufactured, the hub having a tubular portion through which an axle passes, flanges extending from both ends of the tubular portion toward the outside in a radial direction of the tubular portion, and a plurality of brake disk mounting portions projecting from respective outer circumferential edges of the flanges toward the outside in a flange-radial direction, a fixed mold and a movable mold are used to form from respective axle-directional lateral surfaces of the outer circumferential edges of the flanges to corresponding lateral surfaces on the respective brake disk mounting portion sides, and slide molds which slidably move along the radial direction of the tubular portion are used to form from a tubular portion outer circumferential surface of the hub through respective radial inner circumferential surfaces of the flanges to corresponding rear surfaces of the brake disk mounting portions, respective parting lines of the slide molds are each located at a rear surface of the brake disk mounting portion.

[0006] The invention according to claim 2 is characterized in that, in addition to the configuration recited in claim 1, when the hub provided with five of the brake disk mounting portions are manufactured, the parting lines PL of the slide molds are each allowed to be located at the rear surface of an arbitrary brake disk mounting portion and at an rear surface of one of two brake mounting portions most remote from the arbitrary brake disk mounting portion.

[0007] The invention according to claim 3 is characterized in that, in addition to the configuration recited in claim 1 or 2, when the hub having the brake disk mounting portions on both the flanges is manufactured, the parting lines of the slide molds are shaped to have the same line-arrangement on the front as that on the back as viewed from an axial direction.

[0008] The invention according to claim 4 is characterized in that a wheel provided with a hub having a tubular portion through which an axle passes, flanges extending from both ends of the tubular portion toward the outside in a radial direction of the tubular portion, and a plurality of brake disk mounting portions projecting from respective outer circumferential edges of the flanges toward the outside in a flange-radial direction,

a fixed mold and a movable mold are used to form from respective axle-directional lateral surfaces of the outer circumferential edges of the flanges to corresponding lateral surfaces on the respective brake disk mounting portion sides, slide molds which slidably move along the radial direction of the tubular portion form from a tubular portion outer circumferential surface of the hub through respective radial inner circumferential surfaces of the flanges to corresponding rear surfaces of the brake disk mounting portions is formed by the slide molds, and respective parting lines of the slide molds are each located at a rear surface of the brake disk mounting portion.

[0009] The invention according to claim 5 is characterized in that, in addition to the configuration of claim 4, the hub is provided with five of the brake disk mounting portions, and is formed by a forming mold in which the parting lines of the slide molds are each allowed to be located at the rear surface of an arbitrary brake disk mounting portion and at an rear surface of one of two brake mount-

ing portions most remote from the arbitrary brake disk mounting portion.

[0010] The invention according to claim 6 is characterized in that, in addition to the configuration of claim 4 or 5, the brake disk mounting portions are provided on both the flanges, and the hub is formed by using a forming mold in which the parting lines of the slide molds are shaped to have the same line-arrangement on the front as that on the back as viewed from an axial direction.

[Effect of the Invention]

[0011] According to the invention of claim 1, the brake disk mounting portion can be formed to have a small outer diameter. In addition, since the parting lines of the slide molds are each provided on the rear surface of the arbitrary brake disk mounting portion; therefore, the length of the inclined portion, due to the draft, of the brake disk mounting portion can be reduced. As a result, effective thinning can be intended and weight saving can be achieved while ensuring sufficient strength.

[0012] According to the invention of claim 2, even if the five brake disk mounting portion are provided, the line-arrangement of the parting line can be made effective to reduce the length of the inclined portion of the board thickness of the brake disk mounting portion as much as possible.

[0013] According to the invention of claim 3, even if the brake disk mounting portion is provided on both the left and right flanges, the inclination of the board thickness of each of both the left and right disk mounting portions can be suppressed. The parting lines are shaped to have the same line-arrangement on the front as that on the back; therefore, the left and right slide molds having the same shape can be used.

[0014] According to the invention of claim 4, the brake disk mounting portion is formed to have a small diameter. In addition, the parting lines of the slide molds are each provided at the rear surface of the arbitrary brake disk mounting portion. Therefore, the wheel can be provided that is provided with the hub in which the inclined portion, due to the draft, of the brake disk mounting portion is small in length.

[0015] According to the invention of claim 5, even if the five brake disk mounting portions are provided, the wheel can be provided that is provided with the hub in which the inclined portion of the board-thickness of the brake disk mounting portion is small in length.

[0016] According to the invention of claim 6, even if the brake disk mounting portion is provided on both the left and right sides, the wheel can be provided that is provided with the hub in which the inclined portion of the board-thickness of the brake disk mounting portion is small in length. In addition, the hub can be provided that is manufactured by the forming mold in which the parting lines of the slide molds are shaped to have the same line-arrangement as viewed from both end faces of the hub and the left and right slide molds having the same shape are used.

[0017]

Fig. 1 is a left lateral view illustrating a front tire portion of a motorcycle using a wheel provided with a hub according to the present invention.

Fig. 2 is a perspective view illustrating the hub according to the present invention.

Fig. 3 is a front view illustrating the hub according to the present invention.

Fig. 4 is a schematic cross-sectional view illustrating a forming mold used to manufacture the hub according to the present invention.

Fig. 5 is a lateral view illustrating the hub according to the present invention.

Fig. 6 is a schematic cross-sectional view taken along line B-B in Fig. 5.

Fig. 7 is a schematic cross-sectional view taken along line A-A in Fig. 5.

Fig. 8 is a left lateral view illustrating the wheel according to the present invention.

Fig. 9 is a partial cross-sectional view of the wheel illustrated in Fig. 8.

Fig. 10 is an enlarged view of a C-portion illustrated in Fig. 9.

Fig. 11 is a right lateral view illustrating a rear tire portion of the motorcycle according to the present invention.

Fig. 12 is a lateral view of a conventional hub.

Fig. 13 is a schematic cross-sectional view illustrating a forming mold used to manufacturing a conventional hub illustrated in Fig. 12.

Fig. 14 is a cross-sectional view taken along arrows D-D in Fig. 12.

[0018] One embodiment of the present invention will hereinafter be described in detail with reference to the drawings.

A hub manufacturing method according to the present embodiment is described with reference to Figs. 4 to 7. A schematic configuration of a hub and of a wheel is first described with reference to Figs. 1 to 3.

[0019] Referring to Fig. 1, a hub 10 according to the present embodiment is rotatably held by a front fork 71 of e.g. a motorcycle via an axle 90 to constitute the central

portion of a front tire FW.

Referring to Fig. 2, the configuration of the hub 10 in the embodiment is divided broadly into a tubular portion 1 through which the axle 90 is passed; flanges 2, 3 extending toward the outside in the radial direction of the tubular portion from both the ends of the tubular portion 1; and a plurality of brake disk mounting portions 5 projecting from the outer circumferential edges of the flanges 2, 3 toward the outside in the radial direction of the flange.

A number of spoke-receiving holes 9 are formed in the flanges 2, 3. In addition, rim side spoke-receiving holes 62 (see Fig. 9) are formed in a rim 61 to which a tire rubber portion 81 is mounted. Both ends of spokes are passed through and supported by the spoke-receiving holes 9 and the rim side spoke-receiving holes 62. In this way, a wheel 60 is configured.

[0020] Referring to Figs. 2 and 3, the hub 10 has the flanges 2, 3 provided on both the corresponding sides of the tubular portion 1 and provides external appearance like e.g. a Japanese hand drum. Four ribs 1b extending in the axle direction are provided on the outer circumferential surface 1a of the tubular portion 1, thereby intending to increase the strength of both the flanges 2, 3. The spoke-receiving holes 9 are formed in each of both the flanges 2, 3 over its whole circumference at positions close to the outer circumferential edge thereof and at predetermined intervals. Five brake disk mounting portions 5 are provided which project from the corresponding outer circumferential edges of both the flanges 2, 3 toward the outside in the radial direction of the hub. The brake disk mounting portions 5 are formed with respective screw holes 8. Thus, the brake disk 50 can be secured to its front surface 5b side.

[0021] A front side lateral surface 7 of each of both the flanges 2, 3 has such a structure that the whole shape of the flange dents toward the inside of the hub. In addition, the front side lateral surface 7 is provided with external surface ribs 7a extending in the radial direction from the tubular portion 1 side toward the corresponding brake disk mounting portions 5.

As described above, the hub 10 is such that each of both the flanges 2, 3 has a curved structure such as a bowl-like structure and a structure having the outer surface ribs 7a and the ribs 1b. Thus, the hub 10 is intended to reduce weight and to increase strength.

[0022] A description is given of a method of manufacturing the hub 10 according to the present embodiment. As illustrated in e.g. Fig. 4, in the present embodiment, a mold used to manufacture the hub 10 includes a fixed mold 30 and a movable mold 40 used to form external side lateral surfaces 7 of the hub 10 and slide molds 20, 21 used to form the internal portion of the hub 10. From the axial-directional lateral surfaces 4 constituting the corresponding respective outer circumferential edges of both the flanges 2, 3 to corresponding lateral surfaces on the respective sides where the brake disk mounting portions 5 are mounted are formed by the fixed mold 30 and the movable mold 40. In addition, from the tubular portion outer circumferential surface 1a being the inside of the hub 10 through respective radial inner circumferential surfaces 6 of both the flanges 2, 3 to corresponding rear surfaces 5a of the brake disk mounting portions 5 is formed by the slide molds 20, 21 which slidably move along the radial direction of the tubular portion.

Incidentally, the internal surface of the hub 10 through which the axle 90 passes is the same as the conventional one; therefore, its illustration and explanation are omitted.

[0023] When the hub 10 is to be formed, for example, an aluminum alloy is first poured into a cavity defined by the fixed mold 30, the movable mold 40 and the slide molds 20, 21 mentioned above and by other predetermined members to form the hub 10 having a desired shape (the state shown in Fig. 4).

Thereafter, the slide molds 20, 21 are slidably moved along the radial direction of the hub and then the movable mold 40 is moved to be opened. In this way, the hub 10 illustrated in Fig. 2 can be taken out.

[0024] The slide molds 20, 21 in the present embodiment have respective parting lines PL schematically illustrated in Fig. 5 and are set in between the flanges 2, 3 of the hub 10. Specifically, if being looked at from the axial direction of the hub 10, the parting lines PL are seen to have a parting line PL1 (indicated with a two-dot chain line) on the right side and a parting line PL2 (indicated with a chain line) on the left side. (If being looked at from one side, the two lines are not seen at the same time but only one parting line on one side is seen.)

What is important in the present embodiment is that the parting lines PL (PL1, PL2) of the slide molds 20, 21 are located at the rear surfaces 5a of the brake disk mounting portions 5.

[0025] The parting line PL is described in further detail. A description is first given of line-arrangement of the parting line PL1 (indicated with the two-dot chain line) extending from top right to bottom right in Fig. 5.

The parting line PL1 is composed of a mounting portion line PL1-1, an outer circumferential edge line PL1-2, a hub-radial line PL1-3, a tubular portion line PL1-4, a hub-radial line PL1-5, an outer circumferential edge line PL1-6, and a mounting portion line PL1-7. The mounting portion line PL1 extends in the hub-radial direction on the center of the rear surface 5a (e.g. on the rear surface side of the flange 3) of the brake disk mounting portion 5 on the top right side in the figure. The outer circumferential edge line PL1-2 is continued from the mounting portion line PL1-1 and extends in a tangential line of the outer circumferential edge. The hub-radial line PL1-3 is continued from the outer circumferential edge line PL1-2 and extends in the radial direction of the flange. The tubular portion line PL1-4 is continued from the hub-radial line PL1-3 and extends along the external front surface of the tubular portion 1. The hub-radial line PL1-5 is continued from the tubular portion line PL1-4 and extends along the radial direction of the flange. The outer circumferential edge line PL1-6 is continued from the hub-radial

line PL1-5 and extends along a tangential direction of the outer circumferential edge. The mounting portion line PL1-7 extend in the hub-diameter direction on the center of the rear surface 5a of the brake disk mounting portion 5 on the lower side in the figure and continuously extends from the external circumferential edge line PL1-6.

[0026] On the other hand, the parting line PL2 (indicated with the chain line) is composed of a mounting portion line PL2-1, an outer circumferential edge line PL2-2, a hub-radial line PL2-3, a tubular portion line PL2-4, a hub-radial line PL2-5, an outer circumferential edge line PL2-6, and a mounting portion line PL2-7. The mounting portion line PL2-1 extends in the hub-radial direction on the center of the rear surface 5a (the rear side of the front side 5b shown in the figure because of the rear surface of the flange 2 for example) of the brake disk mounting portion 5 on the top right side in the figure. The outer circumferential edge line PL2-2 is continued from the mounting portion line PL2-1 and extends in a tangential line of the outer circumferential edge. The hub-radial line PL2-3 (which is actually the same as the hub-radial line PL1-3) is continued from the outer circumferential edge line PL2-2 and extends in the radial direction of the flange. The tubular portion line PL2-4 is continued from the hub-radial line PL2-3 and extends along the external front surface of the tubular portion 1. The hub-radial line PL2-5 (which is actually the same as the hub-radial line PL1-5) is continued from the tubular portion line PL2-4 and extends along the radial direction of the flange. The outer circumferential edge line PL2-6 is continued from the hub-radial line PL2-5 and extends along a tangential direction of the outer circumferential edge. The mounting portion line PL2-7 extends in the hub-diameter direction on the center of the rear surface 5a of the disk mounting portion 5 on the lower side in the figure and continuously extends from the outer circumferential line PL2-6.

[0027] As described above, if it is assumed that also the rear side can be seen at the same time as viewed from the axle direction, the parting lines PL in the present embodiment are configured to be seen as if they were divided right and left in an area on the outside of the flange outer circumferential edge. This is because of the configuration as illustrated in Fig. 6; however, the parting lines PL1, PL2 are not separate from each other in reality.

[0028] More specifically, Fig. 6 illustrates the cross-section of a portion where the parting lines PL are seen as if they were divided. This structure has such a stepped structure that, for example, one slide mold 20 and the other slide mold 21 overlap with each other in their depth direction. With this stepped structure, in Fig. 6, the parting line PL1 corresponds to the rear surface 5a of the brake disk mounting portion 5 on the lower side; the parting line PL2 corresponds to the rear surface 5a of the brake disk mounting portion 5 on the upper side.

[0029] Since the parting lines PL are set as described above, as illustrated in Fig. 7, the rear surfaces 5a of the brake disk mounting portions 5 on the right and left sides in the width direction can be made to have almost the same draft (the inclination angle α). In addition, the length L of the inclination, due to the draft, of the brake disk mounting portion 5 can be reduced to almost half of the conventional one.

[0030] As illustrated in Figs. 6 and 7, the parting lines PL (PL1-1, PL1-7, PL2-1 and PL2-2) of the slide molds 20, 21 are each located on the rear side of the brake disk mounting portion 5. With such a configuration, the length of the inclined portion of the draft can be reduced; therefore, the strength balance of the brake disk mounting portion 5 can be made satisfactory.

[0031] In the present embodiment, the five brake disk mounting portions 5 are provided as illustrated in Fig. 5. In addition, the parting lines PL of the slide molds 20, 21 are each allowed to be located at the rear surface 5a of an arbitrary brake disk mounting portion 5 and at an rear surface 5a of one of the two brake mounting portions 5 most remote from such an arbitrary brake disk mounting portion 5. Therefore, even in such a configuration, the length of the slant portion of the board-thickness of the brake disk mounting portion 5 can be reduced effectively.

[0032] In the present embodiment, in the case where the hub 10 in which the brake disk mounting portions 5 are provided on both the flanges 2, 3 is manufactured, the respective parting lines PL of the slide molds 20, 21 are shaped to have the same line-arrangement when both the flanges 2, 3 are viewed from the axle direction. Therefore, even if the brake disks 50 are provided on both the left and right flanges, the inclinations of the board-thicknesses of both the left and right disk mounting portions 5 can be suppressed.

Additionally, the parting lines PL1, PL2 are shaped to have the same line-arrangement; therefore, the left and right slide molds 20, 21 which have the same shape can be used.

[0033] The wheel 60 provided with the hub 10 manufactured by the manufacturing method of the present embodiment is described with reference to Figs. 8 to 10.

As illustrated in e.g. Fig. 2, the hub 10 has lines P indicating traces where the parting lines PL are provided on the corresponding rear surfaces 5a of the brake disk mounting portions 5. The disk mounting portion 5 is formed to have a small diameter. In addition, the parting lines of the slide molds 20, 21 are provided on the corresponding rear surfaces 5a of the arbitrary brake disk mounting portions 5. Therefore, the hub 10 has the reduced length of the inclined portion, due to the draft, of the brake disk mounting portion 5.

[0034] Referring to Figs. 8 and 9, the wheel 60 is such that the hub 10 is connected to the rim 61 via spokes 51 and the brake disk 50 is fastened to the brake disk mounting portions 5 by means of five screws 88. The tire rubber portion 81 is attached to the outer circumference of the rim 61.

[0035] A description is given of the more detailed structure of the wheel 60. In the wheel 60, as illustrated in Fig. 9, both ends of spokes 51 are passed through and supported by the hub 10 side spoke-receiving holes 9 and

the rim side spoke-receiving holes 62 formed in the rim 61. A nipple 18 is attached to the spoke 51 on the hub 10 side and configured to be properly hooked by the spoke-receiving hole 9. On the other hand, a leading end portion 55, on the rim 61 side, of the rim 61 side is held in an appropriately bent manner by the rim side spoke-receiving hole 62. In other words, the leading end portion 55 on the rim 61 side faces the side wall of the tire 81. Therefore, this side wall can restrict the position of the leading end of the spoke.

[0036] A securing structure of the brake disk 50 in the present embodiment is illustrated in an enlarged manner in Fig. 10. A disk collar 15 is interposed between the brake disk mounting portion 5 and a screw 88. In addition, the disk collar 15 is appropriately bent to bury a screw head therein and to allow its outer circumferential flange portion to press the brake disk 50. The flange portion of the disk collar 15 internally presses the brake disk 50 via a plate spring 14. A pulsar ring 13 is secured to the lower side of the disk collar 15 via a washer 16 to allow for speed measurement.

[0037] A space S is defined between the disk collar 15 and the end edge of the brake disk 50, so that the brake disk 50 is hard to be bent even if it is thermally expanded.

[0038] The motorcycle in the present embodiment is configured to use a drive shaft as means for transmitting a drive force from an engine to the rear tire RW. Therefore, as illustrated in Fig. 11, a shaft case 95 housing the drive shaft is connected to the rear tire RW from the left side of the vehicle. In the case having such a configuration, it is difficult to supply air from an air supply air valve 17 to the rear tire RW from the side where the drive shaft is disposed. Therefore, air is supplied from the opposite side (the right side of the vehicle). Thus, the front and rear spokes 51, 51 most close to the air valve 17 are each connected from the rim 61 toward the hub 10 so as to be away from the air valve 17 without crossing each other.

[0039] The embodiment according to the present invention has been described thus far. However, the present invention is not limited to this. For example, the shape of the hub, the number of the brake disk mounting portions, and the line-arrangement of the parting line can be modified.

[0040]

1: Tubular portion

1a: Outer circumferential portion of the tubular portion

2, 3: Flange

4: Lateral surface in the axial direction

5: Brake disk mounting portion

5a: Rear surface

6: Inner circumferential surface in the radial direction

10: Hub

20, 21: Slide mold

30: Fixed mold

40: Movable mold

60: Wheel

PL: Parting line

Claims

1. A method of manufacturing a hub (10), in which when the hub (10) is manufactured, the hub (10) having a tubular portion (1) through which an axle (90) passes, flanges (2, 3) extending from both ends of the tubular portion (1) toward the outside in a radial direction of the tubular portion, and a plurality of brake disk mounting portions (5) projecting from respective outer circumferential edges of the flanges (2, 3) toward the outside in a flange-radial direction, a fixed mold (30) and a movable mold (40) are used to form from respective axle-directional lateral surfaces (4) of the outer circumferential edges of the flanges (2, 3) to corresponding lateral surfaces on the respective brake disk mounting portion (5) sides, and slide molds (20, 21) which slidably move along the radial direction of the tubular portion are used to form from a tubular portion outer circumferential surface (1a) of the hub 10 through respective radial inner circumferential surfaces (6) of the flanges (2, 3) to corresponding rear surfaces (5a) of the brake disk mounting portions (5),
wherein respective parting lines (PL) of the slide molds (20, 21) are each located at a rear surface (5a) of the brake disk mounting portion (5).

2. The method of manufacturing a hub (10) according to claim 1,
wherein when the hub (10) provided with five of the brake disk mounting portions (5) are manufactured, the parting lines (PL) of the slide molds (20, 21) are each allowed to be located at the rear surface (5a) of an arbitrary brake disk mounting portion (5) and at an rear surface (5a) of one of two brake mounting portions (5) most remote from the arbitrary brake disk mounting portion (5).

3. The method of manufacturing a hub (10) according to claim 1 or 2,
wherein when the hub (10) having the brake disk mounting portions (5) on both the flanges (2, 3) is

manufactured, the parting lines (PL) of the slide molds (20, 21) are shaped to have the same line-arrangement on the front as that on the back as viewed from an axial direction.

4. A wheel (60) provided with a hub (10) having a tubular portion (1) through which an axle (90) passes, flanges (2, 3) extending from both ends of the tubular portion (1) toward the outside in a radial direction of the tubular portion, and a plurality of brake disk mounting portions (5) projecting from respective outer circumferential edges of the flanges (2, 3) toward the outside in a flange-radial direction,
wherein a fixed mold (30) and a movable mold (40) are used to form from respective axle-directional lateral surfaces (4) of the outer circumferential edges of the flanges (2, 3) to corresponding lateral surfaces on the respective brake disk mounting portions (5) sides, slide molds (20, 21) which slidably move along the radial direction of the tubular portion are used to form from a tubular portion outer circumferential surface (1a) of the hub 10 through respective radial inner circumferential surfaces (6) of the flanges (2, 3) to corresponding rear surfaces (5a) of the brake disk mounting portions (5), and respective parting lines (PL) of the slide molds (20, 21) are each located at a rear surface (5a) of the brake disk mounting portion (5).

5. The wheel (60) provided with a hub (10) according to claim 4,
wherein the hub (10) is provided with five of the brake disk mounting portions (5), and is formed by a forming mold in which the parting lines (PL) of the slide molds (20, 21) are each allowed to be located at the rear surface (5a) of an arbitrary brake disk mounting portion (5) and at an rear surface (5a) of one of two brake mounting portions (5) most remote from the arbitrary brake disk mounting portion (5).

6. The wheel (60) provided with a hub (10) according to claim 4 or 5,
wherein the brake disk mounting portions (5) are provided on both the flanges (2, 3), and the hub (10) is formed by using a forming mold in which the parting lines (PL) of the slide molds (20, 21) are shaped to have the same line-arrangement on the front as that on the back as viewed from an axial direction.

FIG. 1

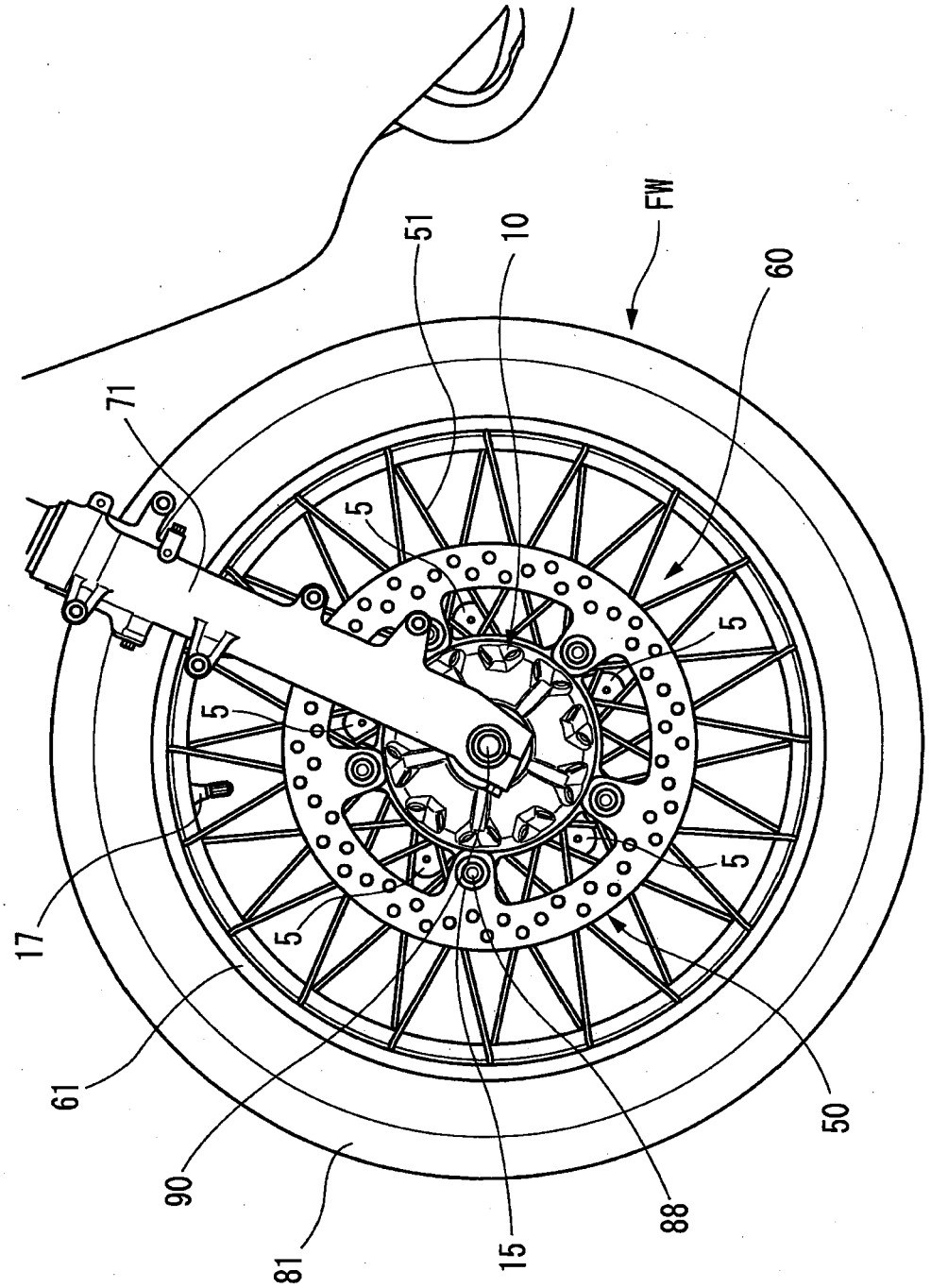


FIG. 2

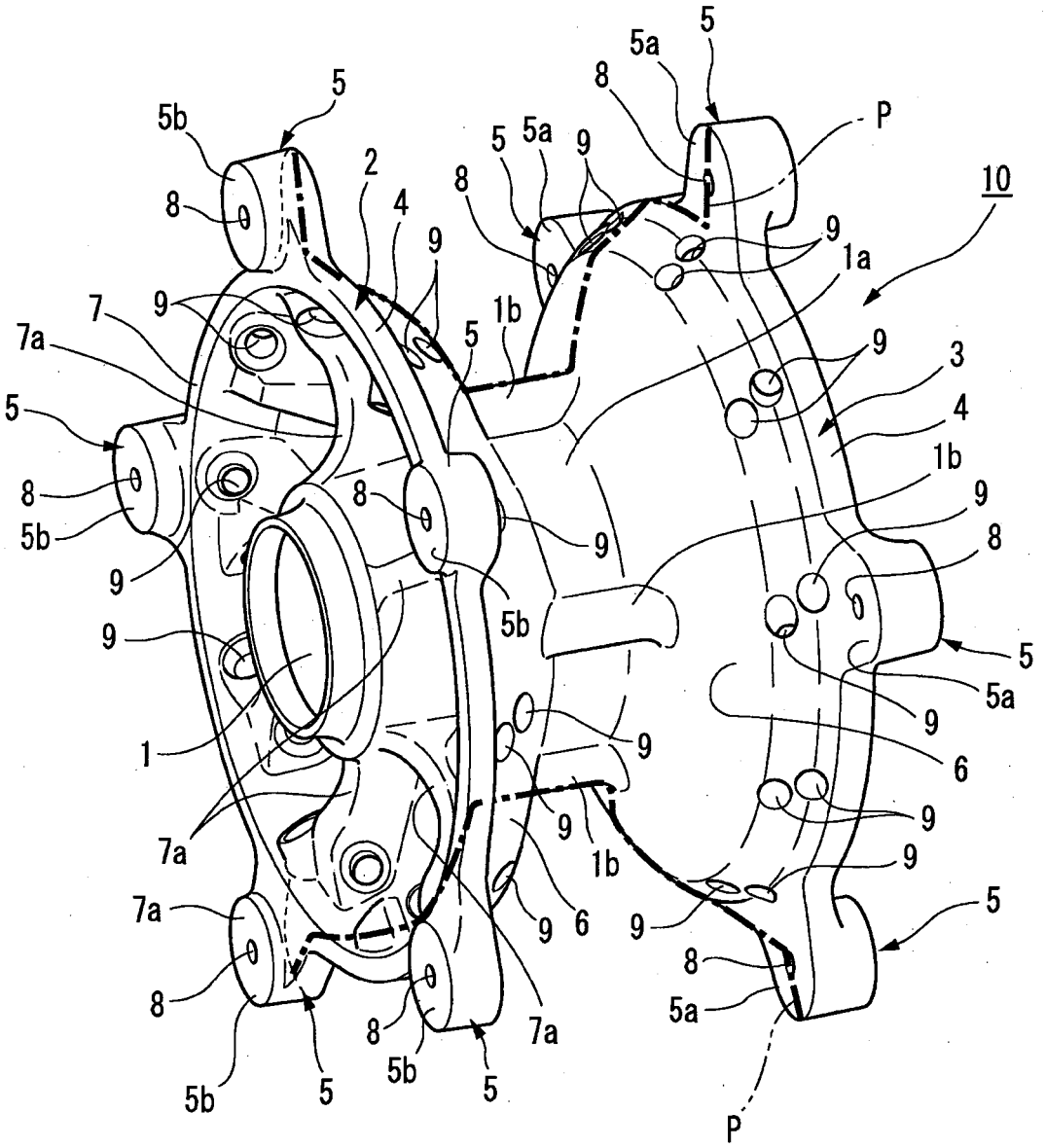


FIG. 3

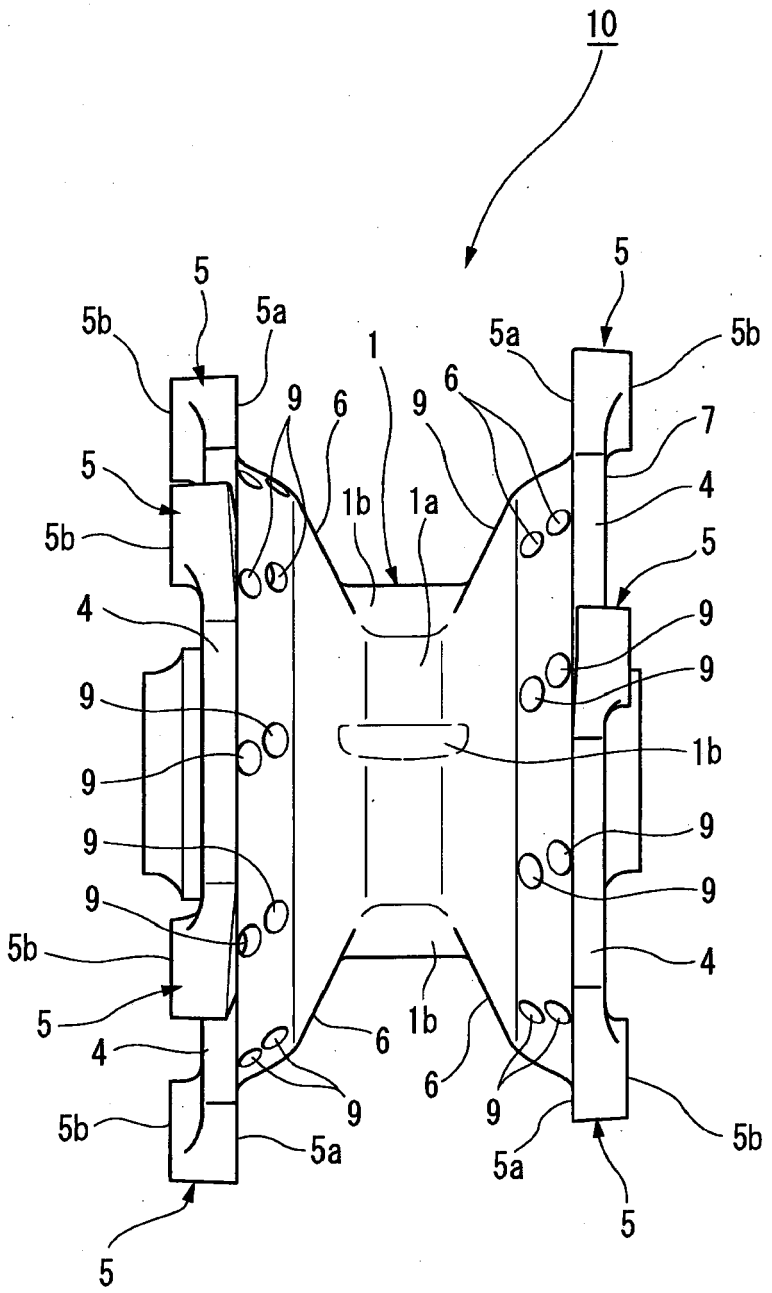

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FIG. 4

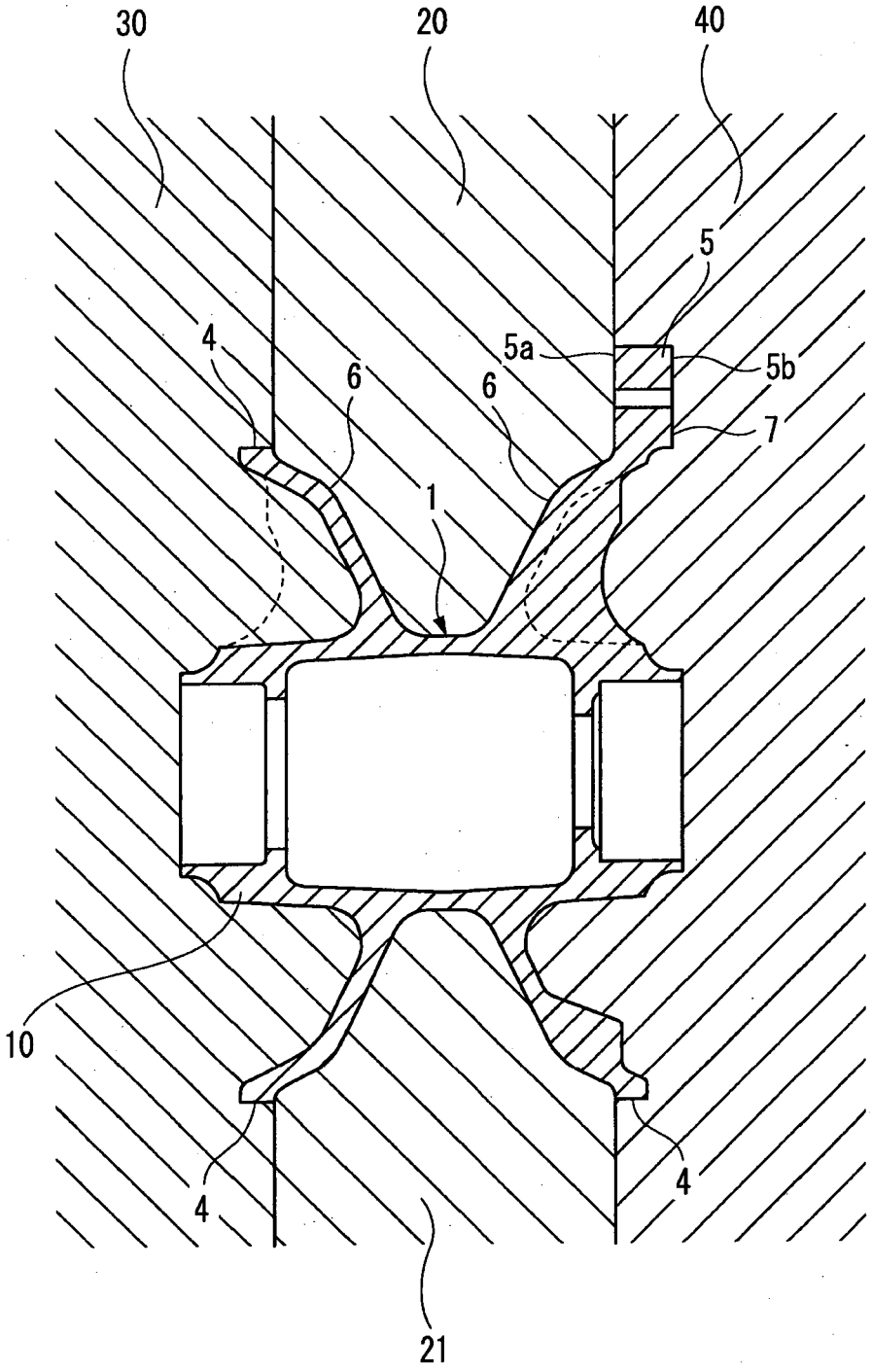
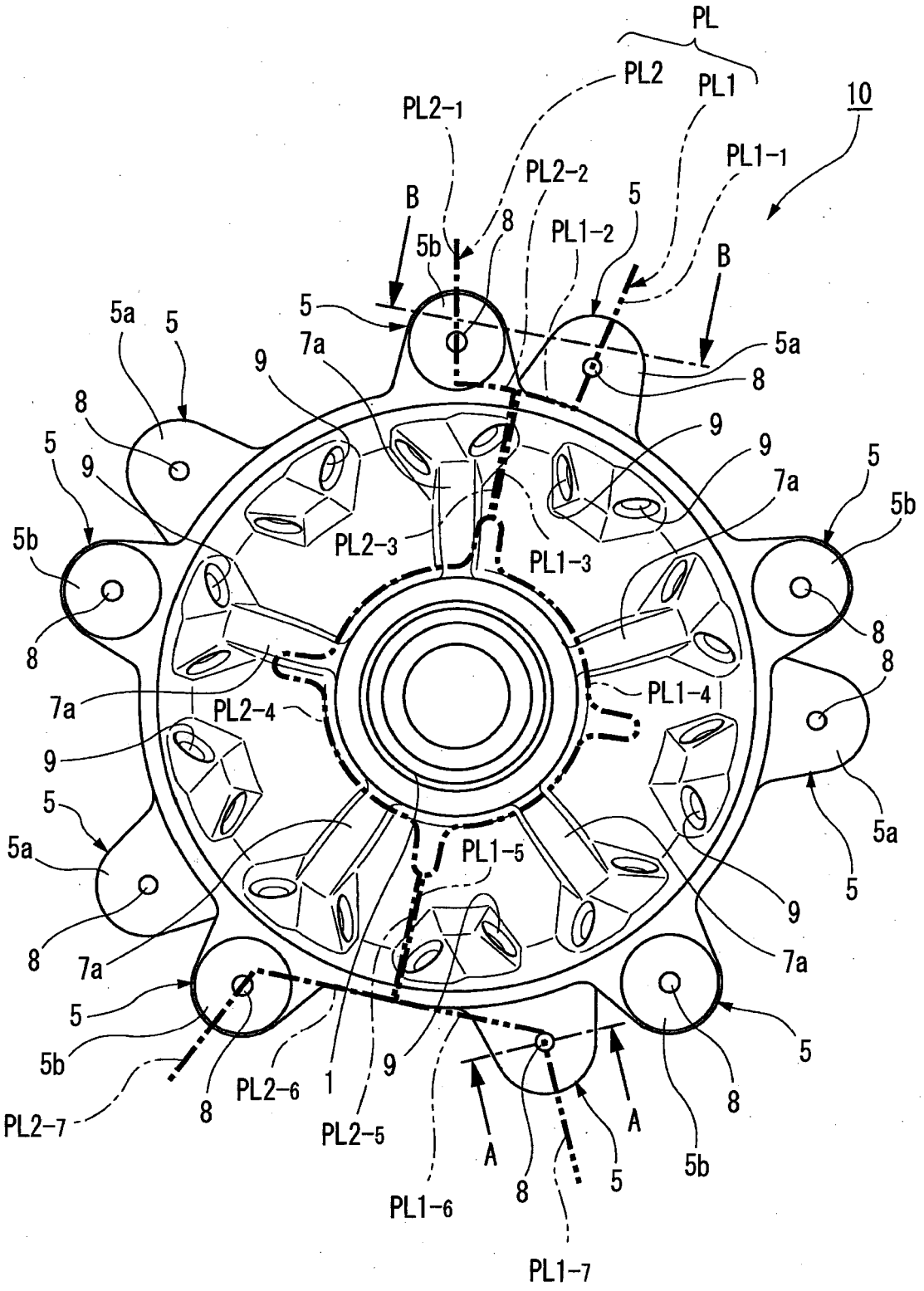


FIG. 5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PL1-3
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A
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PL1-7
PL2-7

FIG. 6

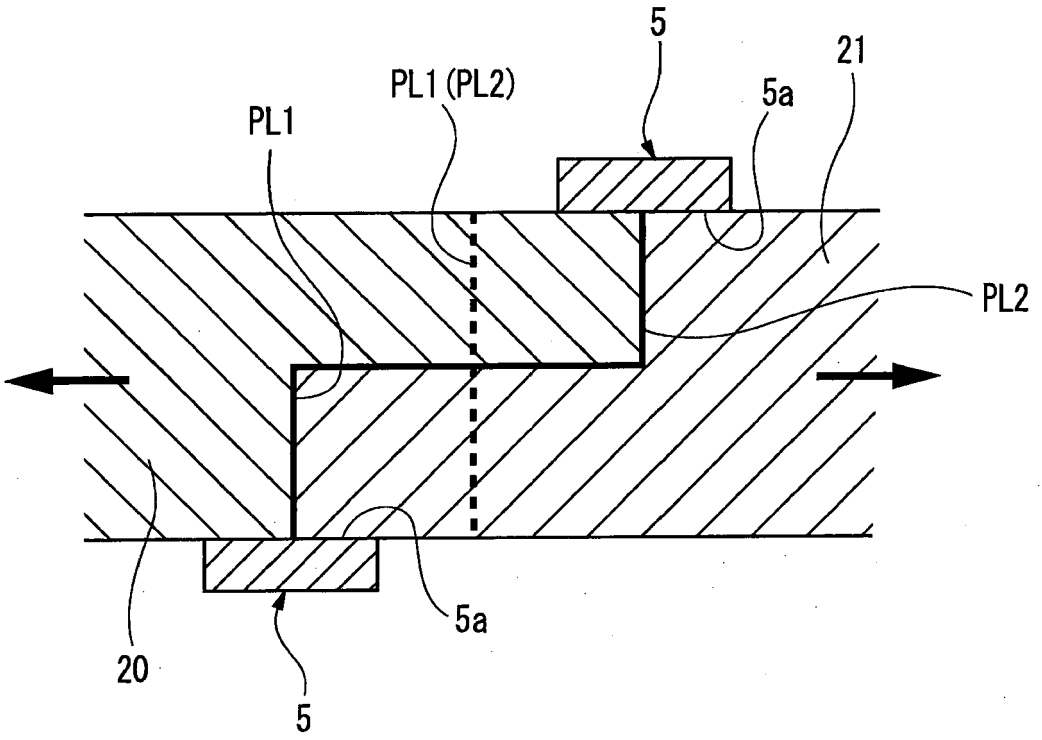


FIG. 7

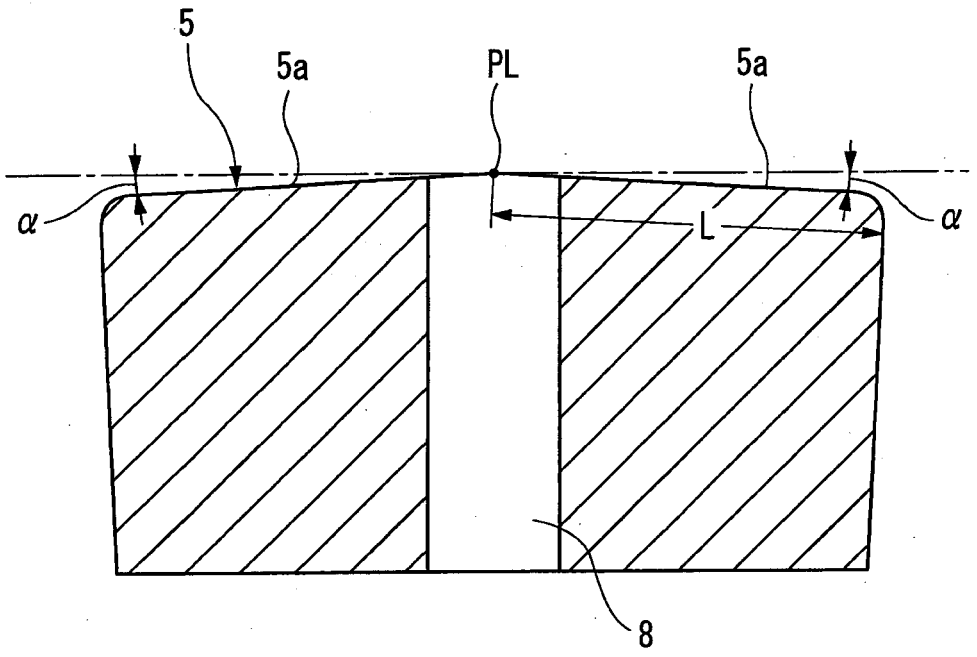


FIG. 8

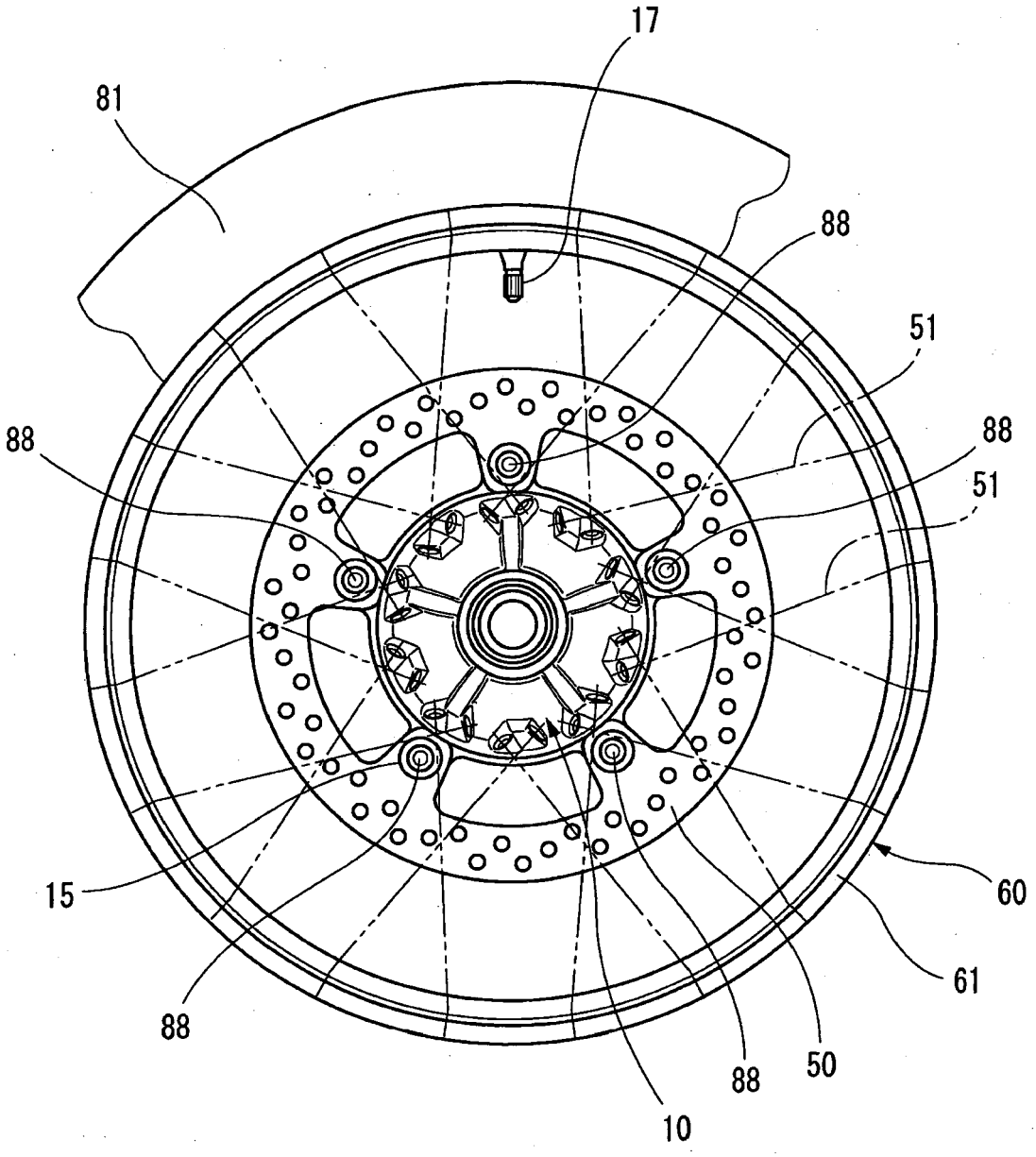


FIG. 9

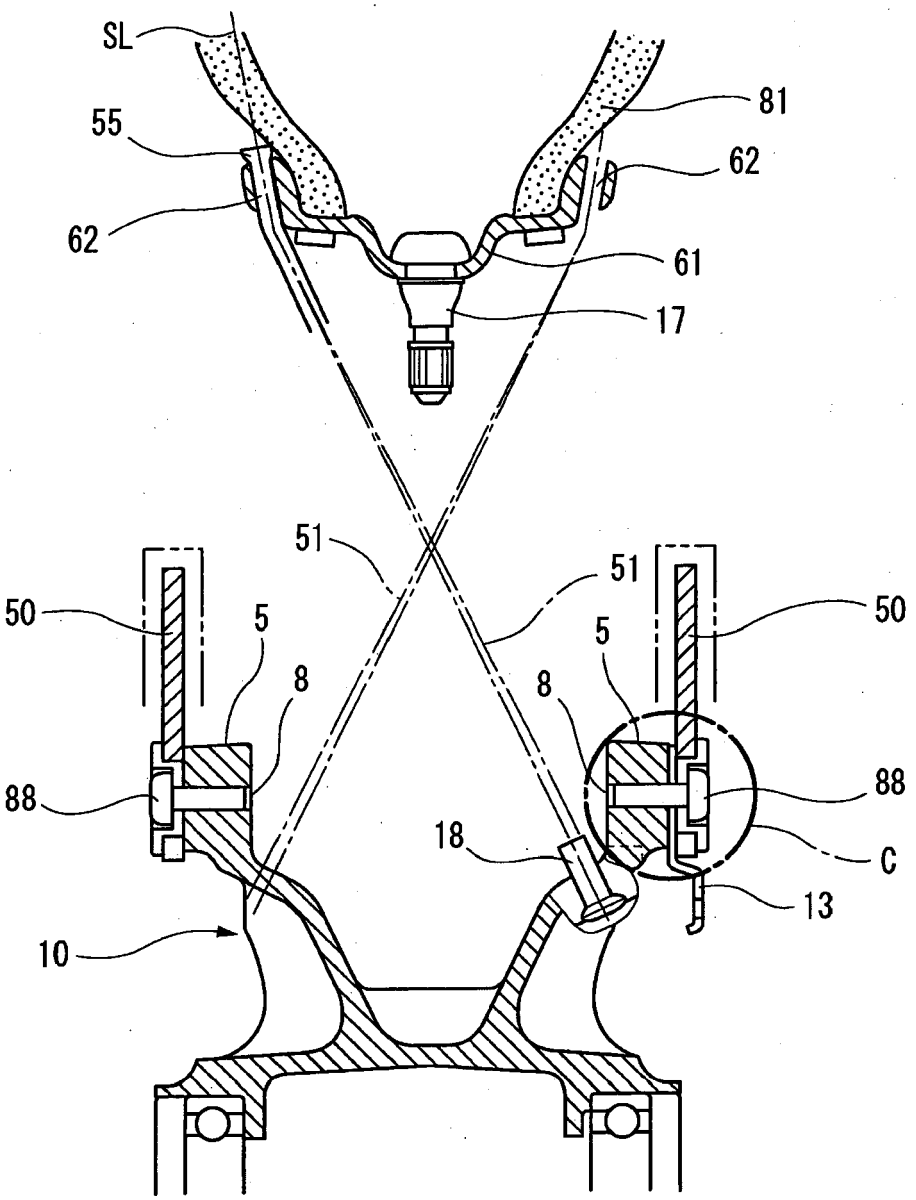


FIG. 10

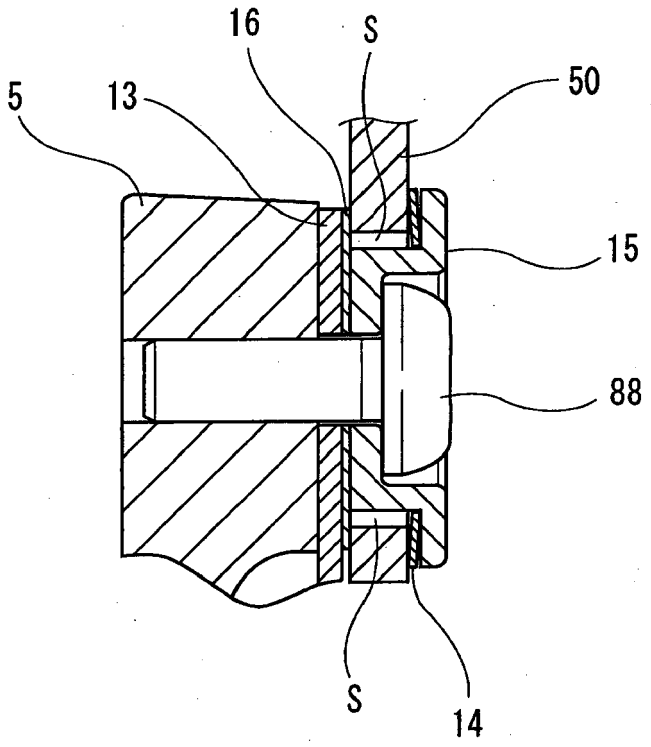


FIG. 11

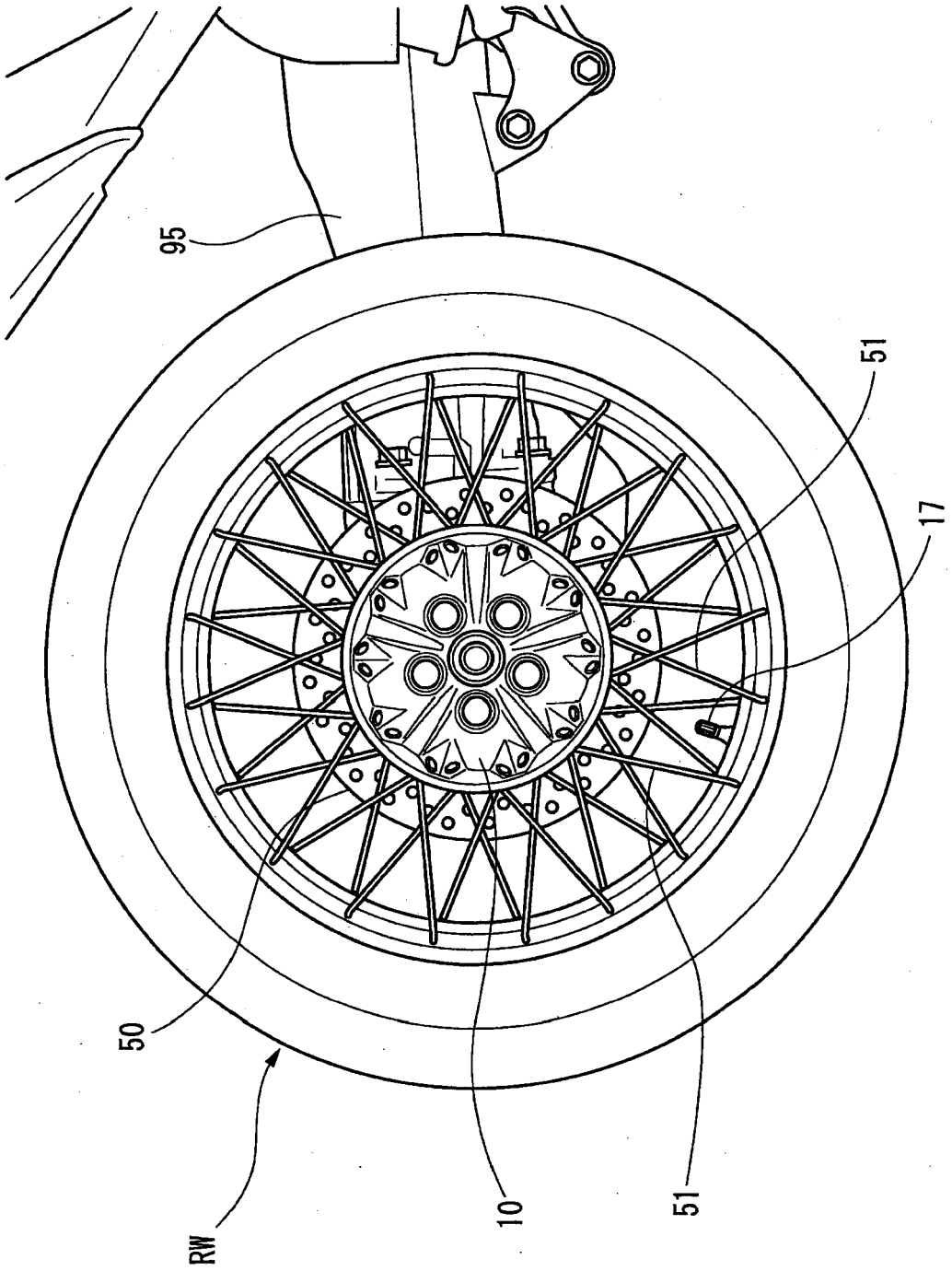


FIG. 12

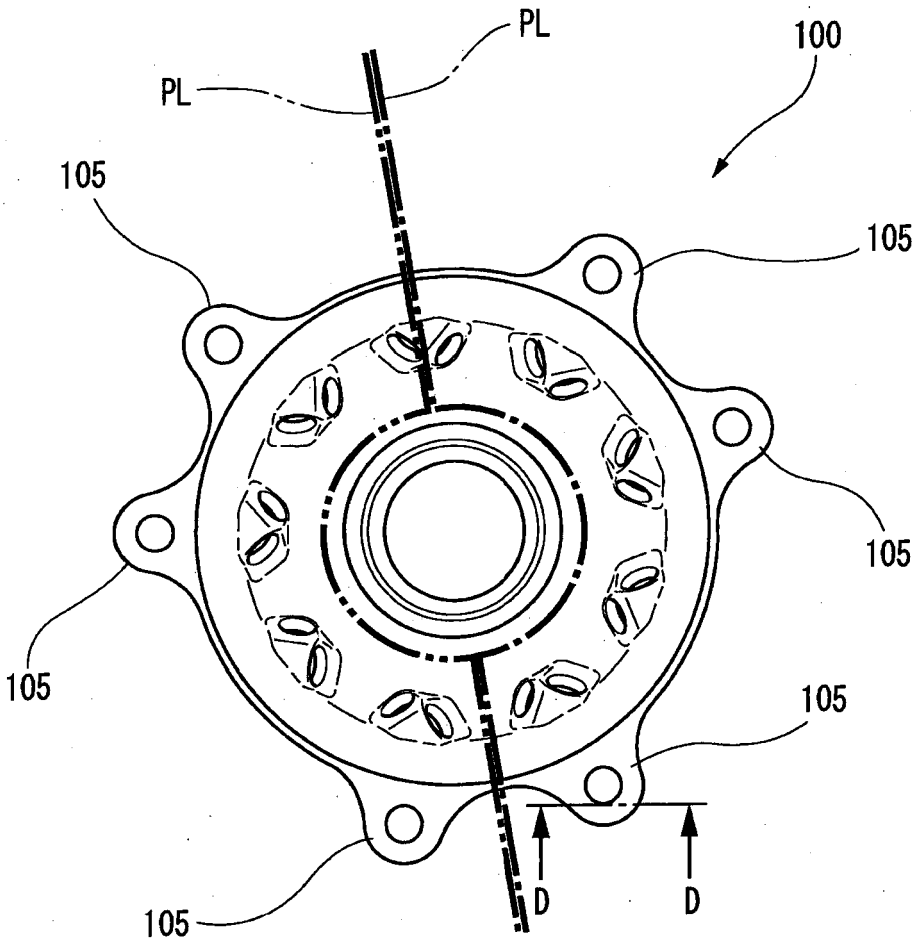


FIG. 13

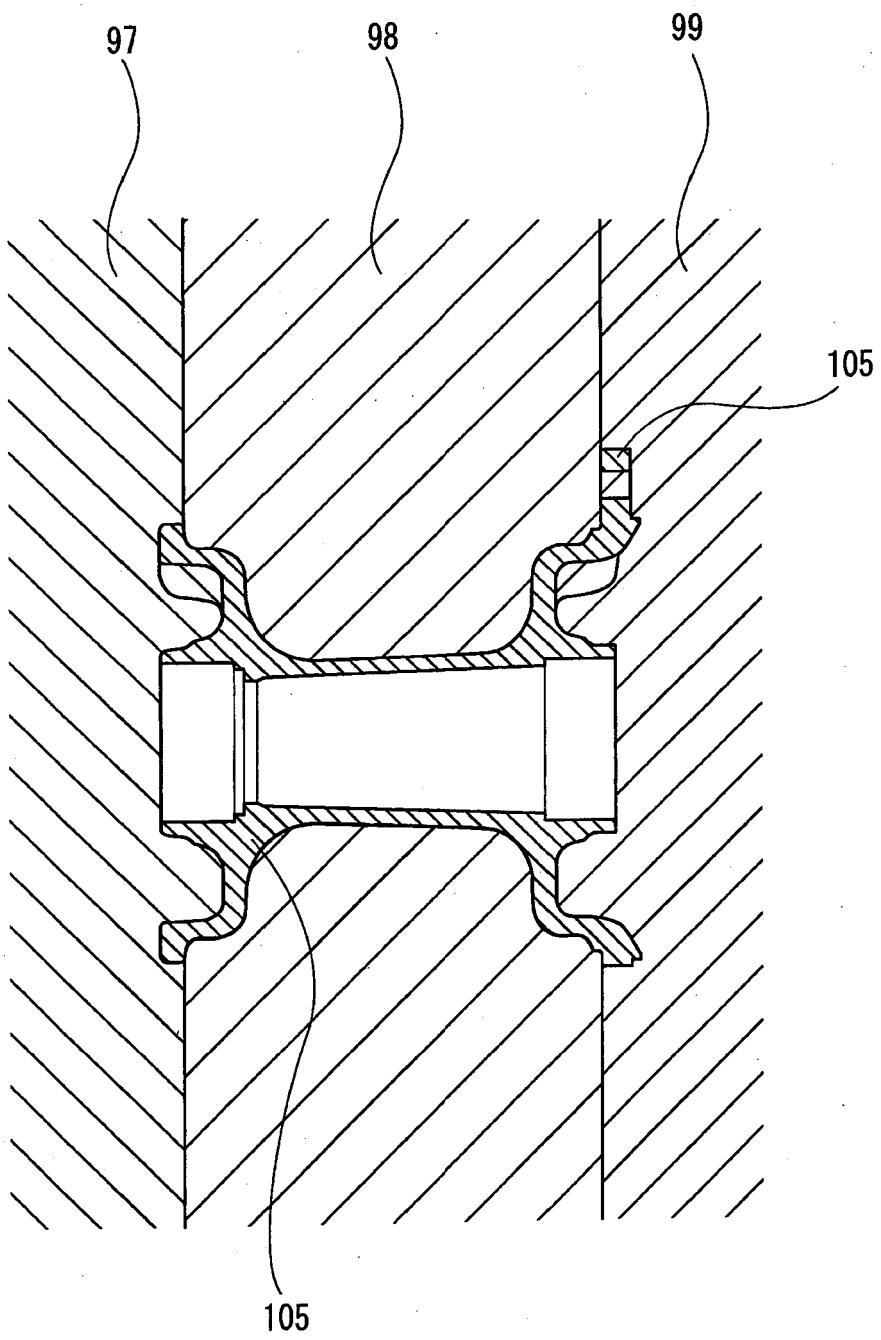
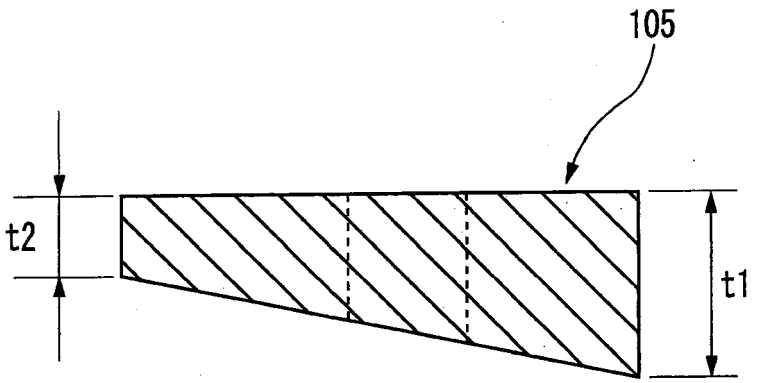


FIG. 14



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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 6849

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A	US 2006/022515 A1 (UCHIYAMA MIKIO [JP] ET AL) 2 February 2006 (2006-02-02) * paragraphs [0036] - [0044]; figures 5, 6 * -----	1-9	INV. B60B27/02 B22D17/00
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B60B
B22D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 January 2012	Schreck, Mathias

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