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(54) **Title:** FLOATING CALLIPER FOR DISC BRAKE

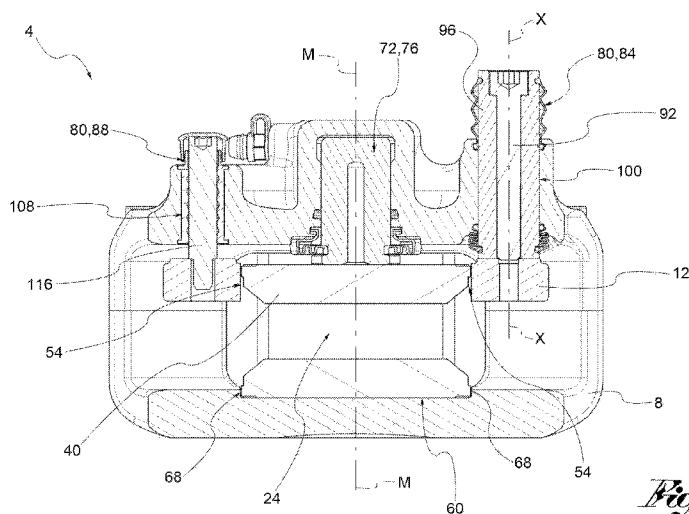


Fig. 1

(57) **Abstract:** Floating calliper for disc brake (4) comprising a calliper body (8) and a bracket (12), the bracket comprising means of attachment (36) of the calliper to a support, the calliper body (8) sliding in relation to the bracket (12) in an axial direction (X-X) and comprising means of coupling (80) between the calliper body (8) and the bracket (12), suitable to permit the relative sliding. The bracket (12) extends only on the inner side (16) of the calliper (4) and delimits a first seat (38) housing at least a first brake pad (40). The coupling means comprise a guide pin (84) and an attachment pin (88), the guide pin (84) enabling the relative sliding of the calliper body (8) and the attachment pin (88) angularly blocking the calliper body (8) preventing its rotation, so that the calliper body (8) is axially guided solely by the guide pin (84).

DESCRIPTION**"FLOATING CALLIPER FOR DISC BRAKE"**

[0001] The present invention relates to a calliper for disc brake, and in particular a floating calliper.

5 [0002] In particular, it is known of in the art to make callipers for disc brakes of the floating type wherein the calliper body positions itself astride the disc brake, positioning itself at least partially overhanging the bracket which enables the attachment of the calliper
10 to a fixed support, such as for example a stub axle. The braking action is exerted by thrust means, such as pistons, positioned on one side only of the calliper body, the inside, which press the pad/s against a first braking surface of the associable disc brake, said first
15 braking surface facing towards the inner side of the calliper body.

[0003] The calliper body is connected in a floating manner to the bracket: in other words, the calliper body translates axially in relation to the bracket and, in
20 such translation movement, pulls the pads of the outer side against a second braking surface of the disc brake, opposite the first braking surface and facing outwards.

[0004] In particular, the calliper body is connected mechanically to the bracket by means of pins which enable
25 the relative sliding between the calliper body and the

bracket, while the bracket is rigidly blocked to a relative support of the calliper body, such as for example a stub axle.

[0005] The solutions of the prior art have several
5 disadvantages.

[0006] In fact, on the one hand there is the need to make a calliper for disc brake which is as light as possible, so as to limit as far as possible the non-suspended masses of the vehicle which the disc brake is joined to and on
10 the other there is the need to ensure the necessary rigidity of the calliper body, to prevent it from deforming with use and jeopardising the braking action.

[0007] In particular, any deformations of the calliper body may jeopardise the sliding in relation to the bracket and
15 therefore produce an incorrect distribution of the thrust acting on the pads acting on opposite sides of the braking surface.

[0008] Obviously such requirements of rigidity and lightness are antithetic given that the increased
20 rigidity is usually achieved by an increased thickness of the components and of the relative masses.

[0009] The purpose of the present invention is to make a calliper for brake disc which overcomes the drawbacks mentioned with reference to the prior art.

25 [0010] Such drawbacks are resolved by a calliper for brake

disc according to claim 1.

[0011] Other embodiments of the calliper for brake disc according to the invention are described in the subsequent claims.

5 [0012] Further characteristics and advantages of the present invention will be more clearly comprehensible from the description given below of its preferred and non-limiting embodiments, wherein:

[0013] figures 1-2 show perspective views from different
10 angles of a calliper for brake disc according to one embodiment of the present invention;

[0014] figure 3 shows a side view of the calliper in figure 1, from the side of the arrow III in figure 1;

[0015] figure 4 shows a ground view of the calliper in
15 figure 1, from the side of the arrow IV in figure 1;

[0016] figure 5 shows a side view of the calliper in figure 1, from the side of the arrow V in figure 1;

[0017] figure 6 shows a side view of the calliper in figure 1, from the side of the arrow VI in figure 1;

20 [0018] figure 7 shows a cross-section view of the calliper in figure 1, along the cross-section plane VII-VII in figure 5;

[0019] figures 8-9 show perspective views, from different angles, of a calliper for brake disc according to a
25 further embodiment of the present invention;

[0020] figure 10 shows a side view of the calliper in figure 8, from the side of the arrow X in figure 8;

[0021] figure 11 shows a ground view of the calliper in figure 8, from the side of the arrow XI in figure 8;

5 [0022] figure 12 shows a side view of the calliper in figure 8, from the side of the arrow XII in figure 8;

[0023] figure 13 shows a side view of the calliper in figure 8, from the side of the arrow XIII in figure 8;

[0024] figure 14 shows a cross-section view of the calliper
10 in figure 8, along the cross-section plane XIV-XIV in figure 12;

[0025] figures 15a-15c show enlarged details of the cross-section in figure 14;

[0026] figures 16 shows a perspective views, in separate
15 parts, of a calliper for brake disc according to a further embodiment of the present invention;

[0027] figures 17-18 show perspective views, from different angles, of the calliper for brake disc in figure 16 in an assembled configuration;

20 [0028] figure 19 shows a side view of the calliper in figure 16, from the side of the arrow XIX in figure 17;

[0029] figure 20 shows a ground view of the calliper in figure 16, from the side of the arrow XX in figure 17;

[0030] figure 21 shows a side view of the calliper in
25 figure 16, from the side of the arrow XXI in figure 17;

[0031] figure 22 shows a side view of the calliper in figure 16, from the side of the arrow XXII in figure 17;

[0032] figure 23 shows a cross-section view of the calliper in figure 16, along the cross-section plane XXIII-XXIII in figure 22.

[0033] figures 24a-24b show enlarged details of the cross-section in figure 23.

[0034] The elements or parts of elements common to the embodiments described below will be indicated using the same reference numerals.

[0035] With reference to the aforesaid figures, reference numeral 4 globally denotes a calliper for disc brake associable with a disc brake (not shown), said calliper being of the floating type, as described further below.

[0036] The calliper 4 comprises a calliper body 8 and a bracket 12, wherein the calliper body 8 is suitable for being positioned astride the disc brake, extending from an inner side 16 of the calliper 4, at which the calliper is attached to a relative support (not shown), to an outer side 20 of the calliper 4, opposite the inner side 16.

[0037] The inner and outer sides 16, 20 are opposite each other in relation to a housing compartment 24 of an associable disc brake, suitable for housing a peripheral portion or braking surface of the disc brake on which to

exert the braking action.

[0038] The calliper body 8 may be of the monobloc type or may comprise a pair of half-bodies 28 joined to each other by connection means, such as screws.

5 [0039] The calliper body 8 comprises for example a pair of lateral bridges 32 which delimit the angular extension of the calliper body itself, the calliper body may also comprise one or more central bridges 24 which position themselves astride the associable disc brake.

10 [0040] In the floating function, the calliper body 8 floats, that is translates or slides axially in an axial direction X-X to the bracket 12 which is instead fixed and integral with the support of the calliper 4.

[0041] The bracket 12 in fact comprises means of attachment
15 36 of the calliper 4 to a relative support.

[0042] According to one embodiment, the means of attachment 36 of the bracket 12 to a relative support of the calliper comprise axial attachment pins and holes 35, directed parallel to said axial direction X-X.

20 [0043] According to a further embodiment, the means of attachment 36 of the bracket 12 to a relative support of the calliper 4 comprise radial attachment pins and holes 37 directed perpendicular to said axial direction X-X, in a radial direction R-R.

25 [0044] The bracket 12 extends only on the inner side 16 of

the calliper 4 and delimits a first seat 38 for housing at least a first pad 40 to exert the braking action on an inner side of the disc brake facing the inner side 16 of the calliper 4, the braking forces exchanged by the first
5 pad 40 with the first braking side of the disc brake thereby exerting directly and exclusively on the bracket 12.

[0045] According to one embodiment, the bracket 12 has an overall "U" shape, having a cross-member 44 and, at
10 opposite lateral ends 48 of said cross-member 44, a pair of uprights 52, the cross-member 44 and the uprights 52 delimiting said first seat 38 to house the first pad 40.

[0046] Each upright 52 interfaces in contact with a lateral rim 54 of said first pad 40, so as to receive the braking
15 forces transmitted by said first pad 40.

[0047] According to one embodiment, housing holes 56 of said means of attachment 36 of the bracket 12 to the relative support of the calliper 4 are made on said cross-member 44.

20 [0048] Preferably, said bracket 12 is made of aluminium or of an aluminium alloy.

[0049] The calliper body 8 delimits a second seat 60, axially opposite the first seat 38, so as to house at least a second pad 64 exerting a braking action on an
25 outer side of the disc brake facing the outer side 20 of

the calliper 4; the braking forces exchanged by the second pad 64 with the second braking side thereby exerting directly on the calliper body 8.

[0050] According to one embodiment, the calliper body 8
5 comprises a pair of shoulders 68 on the outer side 20 which define the second seat 60 for housing the second pad 64.

[0051] Said shoulders 68 abut against the lateral rims 54 of said second pad 64, so as to receive and transmit the
10 braking forces transmitted by said second pad 64 to the calliper body 8.

[0052] The calliper body 8 further comprises thrust means 72 for pushing the pads 40, 64 against the associable disc brake, said thrust means 72 being positioned on the
15 inner side 16 of the calliper 4.

[0053] The thrust means 72 act directly on the first pad 40; the floating movement of the calliper body 8 also exerts a corresponding thrust action on the second pad 64 (in a known manner).

20 [0054] Said thrust means 72 comprise at least one piston 76; the piston 76 may be hydraulically and/or electrically-operated and may act both as foot brake or as hand brake.

[0055] Advantageously, the calliper 4 comprises means of
25 coupling 80 between the calliper body 8 and the bracket

12, suitable to permit the relative sliding between these parallel to the axial direction X-X.

[0056] According to one embodiment, the means of coupling 80 comprise a guide pin 84 and an attachment pin 88.

5 [0057] In particular, the guide pin 84 enables and guides a relative sliding, in the axial direction X-X, of the calliper body 8 in relation to the bracket 12, and the attachment pin 88 angularly blocks the calliper body 8 on the bracket 12, preventing its rotation in relation to
10 the guide pin 84, so that the calliper body 8 is axially guided solely by the guide pin 84.

[0058] According to one embodiment, the uprights 52 of the bracket 12 house the coupling means 80 of the calliper body 8 and the bracket 12 at least partially.

15 [0059] For example, the coupling means 80 comprise a guide pin 84 passing at least partially through the inner side 16 of the calliper body 8 and, at least partially, through an upright 52 of the bracket 12.

[0060] The guide pin 84 comprises a core 92 which engages
20 at least partially in the bracket 12, and which is at least partially surrounded by a calibrated sliding bush 96; in other words the sliding bush is mounted coaxially to said guide pin 84.

[0061] The sliding bush 96 engages inside a corresponding
25 calibrated guide hole 100 made on the calliper body 8, so

as to realise the translatory coupling between the calliper body 8 and the bracket 12.

[0062] Preferably, said guide pin 84 is made of aluminium or of an aluminium alloy.

5 [0063] Preferably, the guide pin 84 comprises protective bellows or gaskets 104 at opposite axial ends to prevent the infiltration of dust or dirt which could contrast the floating movement of the calliper body 8 in relation to the bracket 12.

10 [0064] The coupling means 80 comprise an attachment pin 88 mechanically separate from the guide pin 84, so as to prevent the rotation of the calliper body 8 in relation to the bracket 12, around the guide pin 84, the attachment pin 88 engaging in an attachment hole 108; the
15 coupling between the attachment pin 88 and the attachment hole 108 is a free coupling so as not to influence the axial translation movement guided only by the guide pin 84.

[0065] In other words, a single pin, that is the guide pin
20 84, guides and supports the axial movement of the calliper body 8 in relation to the bracket 12; such movement is in no way prevented by the attachment pin which in no way influences the translation movement of the calliper body 8. The braking forces exchanged between
25 the pads and the disc brake and therefore transmitted

from the pads to the calliper body 8, would tend to make the calliper body 8 rotate in relation to the guide pin 8; such rotation is prevented by the attachment pin 88.

[0066] According to one embodiment, the attachment pin 88
5 comprises a locking head 112 and a stem 116 at last partially screwed into the bracket 12, the locking head 112 being operable from the inner side 16 of the calliper body 8, so as to allow the extraction of the attachment pin 88 and the rotation of the calliper body 8 around the
10 guide pin 84 to perform replacement operations of the pads 40, 64 without dismantling the calliper 8 from the relative support.

[0067] According to one embodiment, the guide pin 84 and the attachment pin 88 are mounted on respective opposite
15 uprights 52 of the bracket 12.

[0068] According to one embodiment, a direction of advancement F of the vehicle being established, the guide pin 84 is positioned upstream of the first pad 40 while the attachment pin 88 is positioned downstream of the
20 first pad 40.

[0069] According to a further embodiment, the guide pin 84 is positioned in an aligned position with the thrust means 72 acting on the pads, in a radial direction R-R perpendicular to said axial direction X-X.

25 [0070] In other words, an axis of symmetry of the guide pin

84 is aligned radially with an axis of symmetry of the piston 76 of the thrust means 72.

[0071] According to one embodiment, the guide pin 84 engages in a relative guide hole 100 made on a cross-member 44 of the bracket 12.

[0072] According to a further embodiment, a direction of advancement F of the vehicle and a centreline plane M-M, parallel to said axial direction X-X and passing through the centreline of the housing compartment 24 of the disc brake being established, the guide pin 84 is positioned downstream of said centreline plane M-M while the attachment pin 88 is positioned upstream of said centreline plane M-M.

[0073] As may be appreciated from the description the calliper for disc brake according to the invention makes it possible to overcome the drawbacks of the prior art.

[0074] In fact, the deformation of the calliper is first of all controlled by distributing the braking forces exchanged between the disc brake and the pads. In particular, the pads on the outer side exert their forces exclusively on the calliper body, while the pads on the inner side exert the braking forces directly on the bracket.

[0075] This specific distribution of the forces makes it possible to make the bracket and/or the calliper body

from lighter and less resistant materials than steel, such as aluminium and its alloys.

[0076] Moreover, the use of a single guide pin facilitates the relative sliding of the calliper body in relation to the bracket preventing the sticking typical of floating calliper solutions with two guide pins.

[0077] Moreover, the reciprocal positioning of the guide and attachment pins on the calliper body in relation to the direction of advancement favours the relative sliding of the calliper body and prevents possible sticking of the same in relation to the bracket.

[0078] A person skilled in the art may make numerous modifications and variations to the calliper for disc brake described above so as to satisfy contingent and specific requirements while remaining within the sphere of protection of the invention as defined by the following claims.

Claims

1. Calliper for disc brake (4) associable with a disc brake, said calliper (4) being of the floating type and comprising a calliper body (8) and a bracket (12),
- 5 wherein the calliper body (8) is suitable for being positioned astride the disc brake, extending from an inner side of the calliper (4), at which the calliper (4) is attached to a relative support, to an outer side (20) of the calliper (4), opposite the inner side (16), said
- 10 inner and outer sides (16,20) being opposite each other in relation to a housing compartment (24) of an associable disc brake, suitable to house a peripheral portion of the disc brake on which to exert the braking action,
- 15 - wherein the bracket (12) comprises means of attachment (36) of the calliper for disc brake to a relative support,
- the calliper body (8) sliding in relation to the bracket (12) in an axial direction (X-X),
- 20 - the calliper (4) comprising means of coupling (80) between the calliper body (8) and the bracket(12), suitable to enable the relative sliding between these parallel to the axial direction (X-X), and thrust means (72) suitable to exert the thrust of relative pads on the
- 25 disc brake,

characterised by the fact that

- the bracket (12) extends only on the inner side (16) of the calliper (4) and delimits a first seat (38) housing at least a first pad (40) to exert the braking action on
5 an inner side of the disc brake facing the inner side (16) of the calliper (4), the braking forces exchanged by the first pad (40) with the first braking side exerting directly and exclusively on the bracket (12),
- wherein the calliper body (8) delimits a second seat
10 (60), axially opposite the first seat (38), so as to house at least a second pad (64) exerting a braking action on an outer side of the disc brake facing the outer side (20) of the calliper (4), the braking forces exchanged by the second pad (64) with the second braking
15 side exerting directly on the calliper body (8),
- wherein the coupling means comprise a guide pin (84) and an attachment pin (88), the guide pin (84) enabling and guiding a relative sliding,
in the axial direction (X-X), of the calliper body (8) in
20 relation to the bracket (12) and the attachment pin (88) angularly blocking the calliper body (8) on the bracket (12), preventing its rotation in relation to the guide pin (84), wherein the calliper body (8) is axially guided solely by the guide pin (84).

25 2. Calliper for disc brake (4) according to claim 1,

wherein the means of attachment (36) of the bracket (12) to a relative support of the calliper (4) comprise axial attachment pins and holes (35) directed parallel to said axial direction (X-X).

5 3. Calliper for disc brake (4) according to claim 1 or 2, wherein the means of attachment (36) of the bracket to a relative support of the calliper (4) comprise radial attachment pins and holes (37) directed perpendicular to said axial direction X-X, in a radial direction (R-R).

10 4. Calliper for disc brake (4) according to any of the previous claims, wherein the bracket (12) has an overall "U" shape, having a cross-member (44) and, at opposite lateral ends (48) of said cross-member (44), a pair of uprights (52), the cross-member (44) and the uprights
15 (52) delimiting said first seat (38) to house the first pad (40).

5. Calliper for disc brake (4) according to claim 4, wherein each upright (52) interfaces in contact with a lateral rim (54) of said first pad (40), so as to receive
20 the braking forces transmitted by said first pad (40).

6. Calliper for disc brake (4) according to claim 4 or 5, wherein housing holes (56) of said means of attachment (36) of the bracket (12) to the relative support of the calliper (4) are made on said cross-member (44).

25 7. Calliper for disc brake (4) according to claim 4, 5

or 6, wherein said uprights (52) of the bracket (12) house the coupling means (80) of the calliper body (8) and the bracket (12) at least partially.

8. Calliper for disc brake (4) according to any of the
5 previous claims, wherein said bracket (12) is made from aluminium or an aluminium alloy.

9. Calliper for disc brake (4) according to any of the previous claims, wherein the calliper body (8), comprises a pair of shoulders (68) on the outer side (20) which
10 define the second seat (60) housing the second pad (64).

10. Calliper for disc brake (4) according to claim 9, wherein said shoulders (68) abut against the lateral rims (54) of said second pad (64), so as to receive and transmit the braking forces transmitted by said second
15 pad (64) to the calliper body (8).

11. Calliper for disc brake (4) according to any of the previous claims, wherein the calliper body (8) comprises the thrust means (72) pushing the pads against the associable disc brake, said thrust means (72) being
20 positioned on the inner side (16) of the calliper (4).

12. Calliper for disc brake (4) according to any of the previous claims, wherein said thrust means (72) comprise at least one hydraulically or electrically-operated piston (76).

25 13. Calliper for disc brake (4) according to any of the

previous claims, wherein the coupling means (80) comprise a guide pin (84) passing at least partially through the inner side (16) of the calliper body (8) and, at least partially, through an upright (52) of the bracket (12),
5 said guide pin (84) comprising a core (92) which engages at least partially in the bracket (12), at least partially surrounded by a calibrated sliding bush (96), said sliding bush (96) engaging inside a corresponding calibrated guide hole (100) made on the calliper body
10 (8), so as to realise the translatory coupling between the calliper body (8) and the bracket (12).

14. Calliper for disc brake (4) according to claim 13, wherein said guide pin (84) is made from aluminium.

15. Calliper for disc brake (4) according to claim 13 or
15 14, wherein the guide pin (84) comprises protective bellows or gaskets (104) at opposite axial ends.

16. Calliper for disc brake (4) according to any of the claims from 13 to 15, wherein the coupling means (80) comprise an attachment pin (88) mechanically separate
20 from the guide pin (84), so as to prevent the rotation of the calliper body (8) in relation to the bracket (12), around the guide pin (84), the attachment pin (88) engaging in an attachment hole (108) according to a free coupling so as not to influence the axial translation
25 movement of the calliper body (8) guided only by the

guide pin (84).

17. Calliper for disc brake (4) according to claim 16, wherein the attachment pin (88) comprises a locking head (112) and a stem (116) at last partially screwed into the bracket (12), the locking head (112) being operable from the inner side (16) of the calliper body (8) so as to allow the extraction of the attachment pin (88) and the rotation of the calliper body (8) around the guide pin (84) to perform replacement operations of the pads (40, 64) without dismantling the calliper (8) from the relative support.

18. Calliper for disc brake (4) according to claim 16 or 17, wherein the guide pin (84) and the attachment pin (88) are mounted on respective opposite uprights (52) of the bracket (12).

19. Calliper for disc brake (4) according to any of the claims from 13 to 18, wherein, a direction of advancement (F) of the vehicle to which the calliper (4) is applied being established, the guide pin (84) is positioned upstream of the first pad (40) while the attachment pin (88) is positioned downstream of the first pad (40).

20. Calliper for disc brake (4) according to any of the claims from 13 to 18, wherein the guide pin (84) is positioned in an aligned position

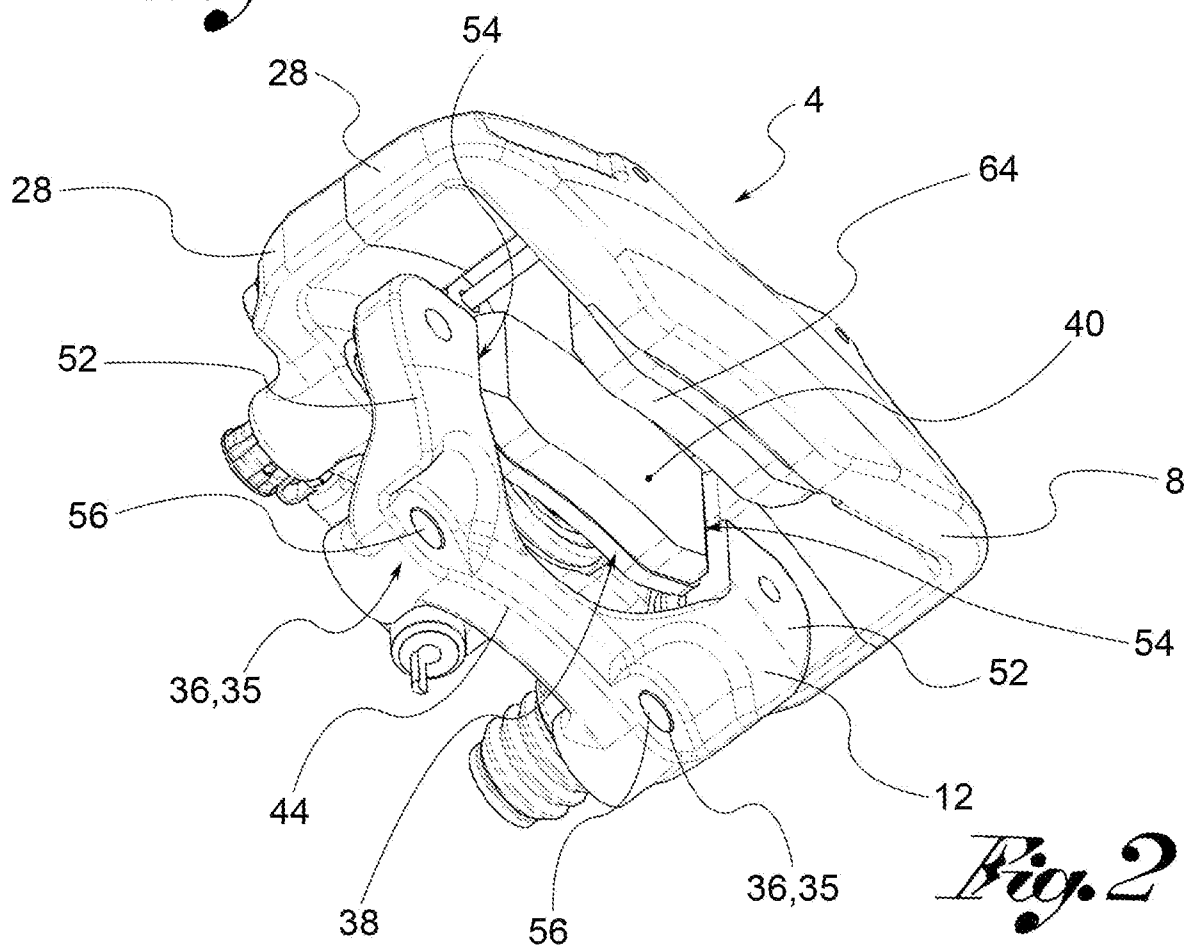
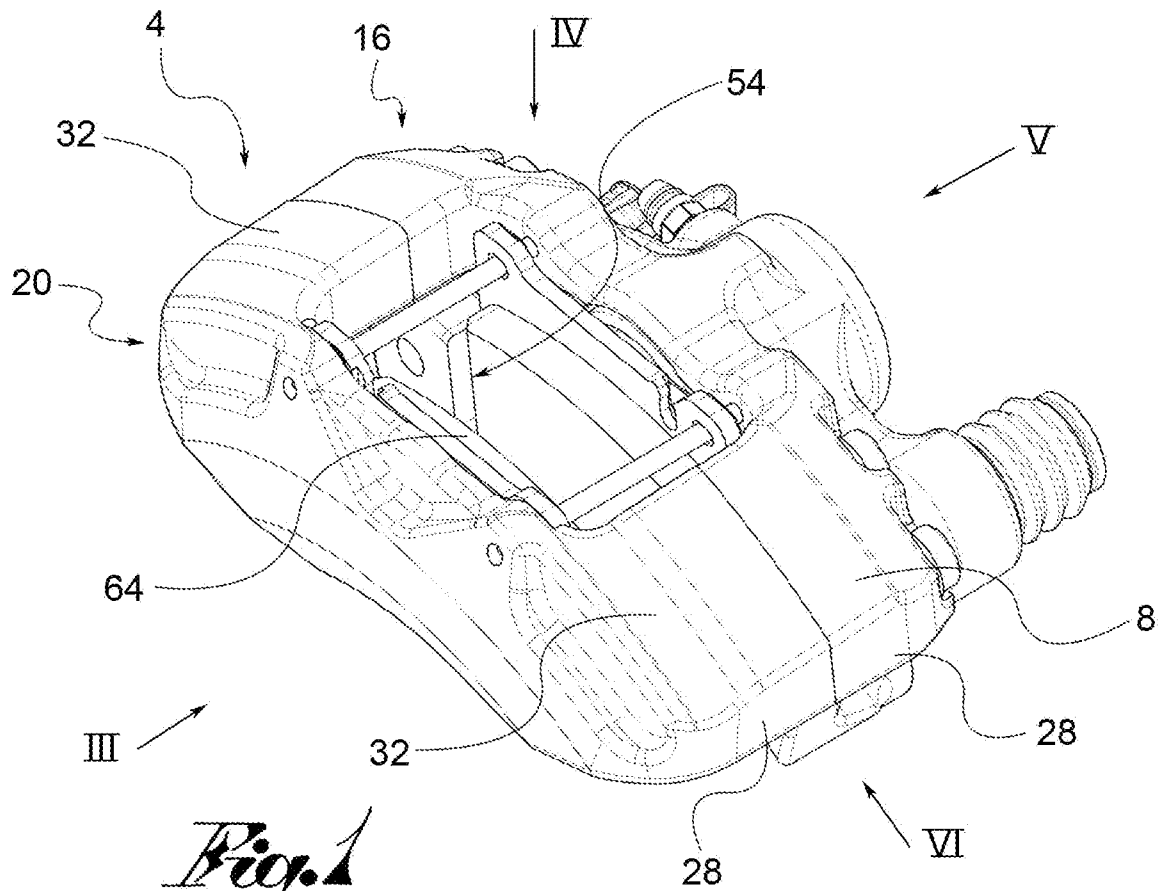
with the thrust means (72) acting on the pads (40, 64), in

a radial direction (R-R) perpendicular to said axial direction (X-X).

21. Calliper for disc brake (4) according to any of the claims from 13 to 20, wherein the guide pin (84) engages
5 in a relative guide hole (100) made on a cross-member (44) of the bracket (12).

22. Calliper for disc brake (4) according to any of the claims from 13 to 19, wherein, a direction of advancement (F) of the vehicle to which the calliper (4) is applied
10 and a centreline plane (M-M) parallel to said axial direction (X-X) and passing through the centreline of the housing compartment of the disc brake being established,, the guide pin (84) is positioned downstream of said centreline plane (M-M) while the attachment pin (88) is
15 positioned upstream of said centreline plane (M-M).

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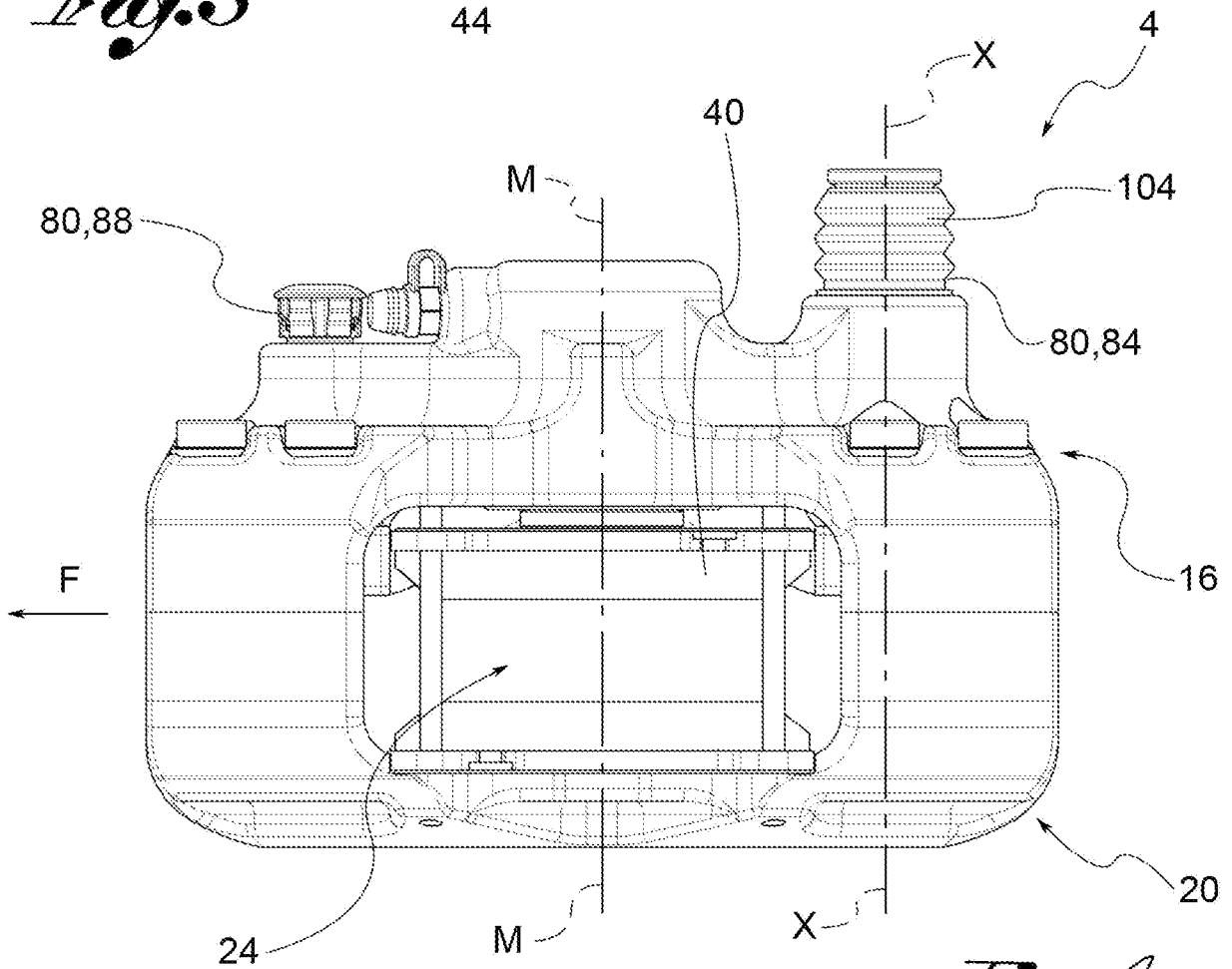
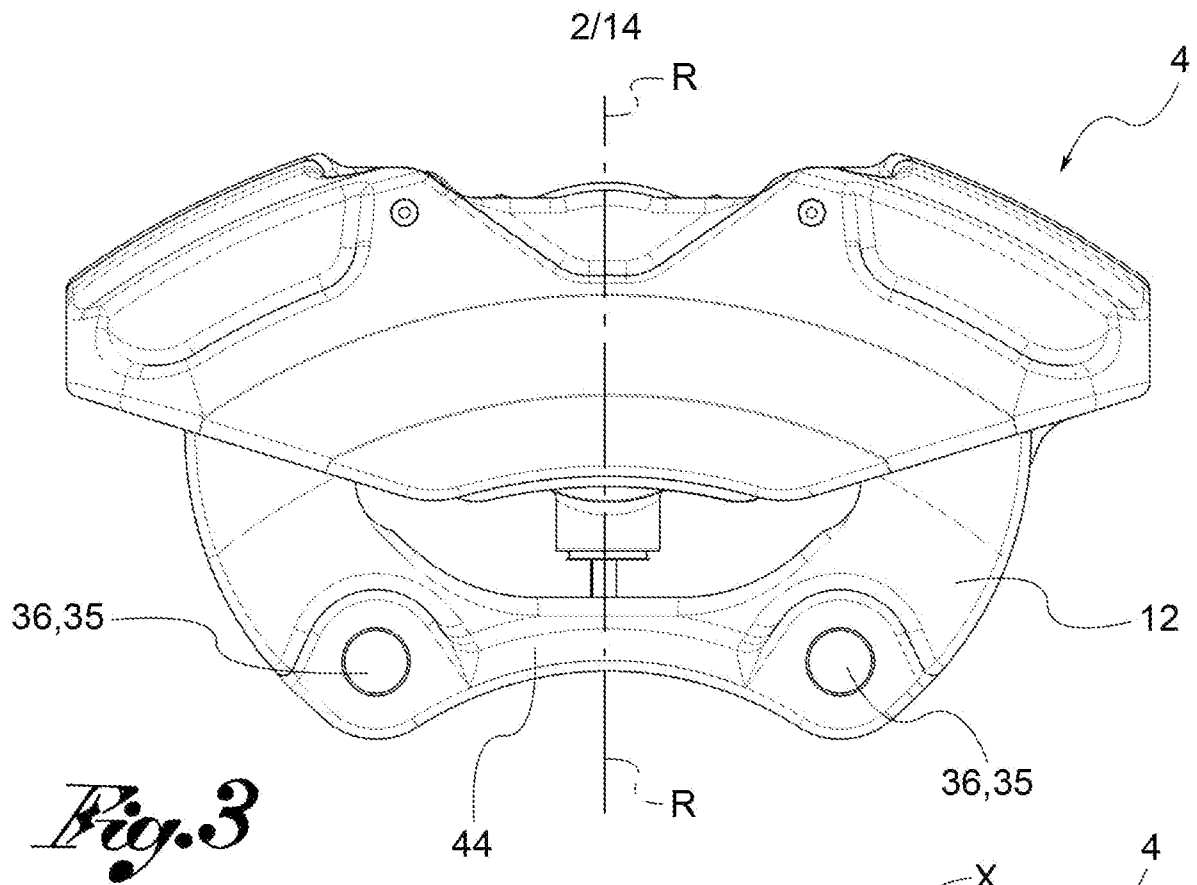


Fig. 4

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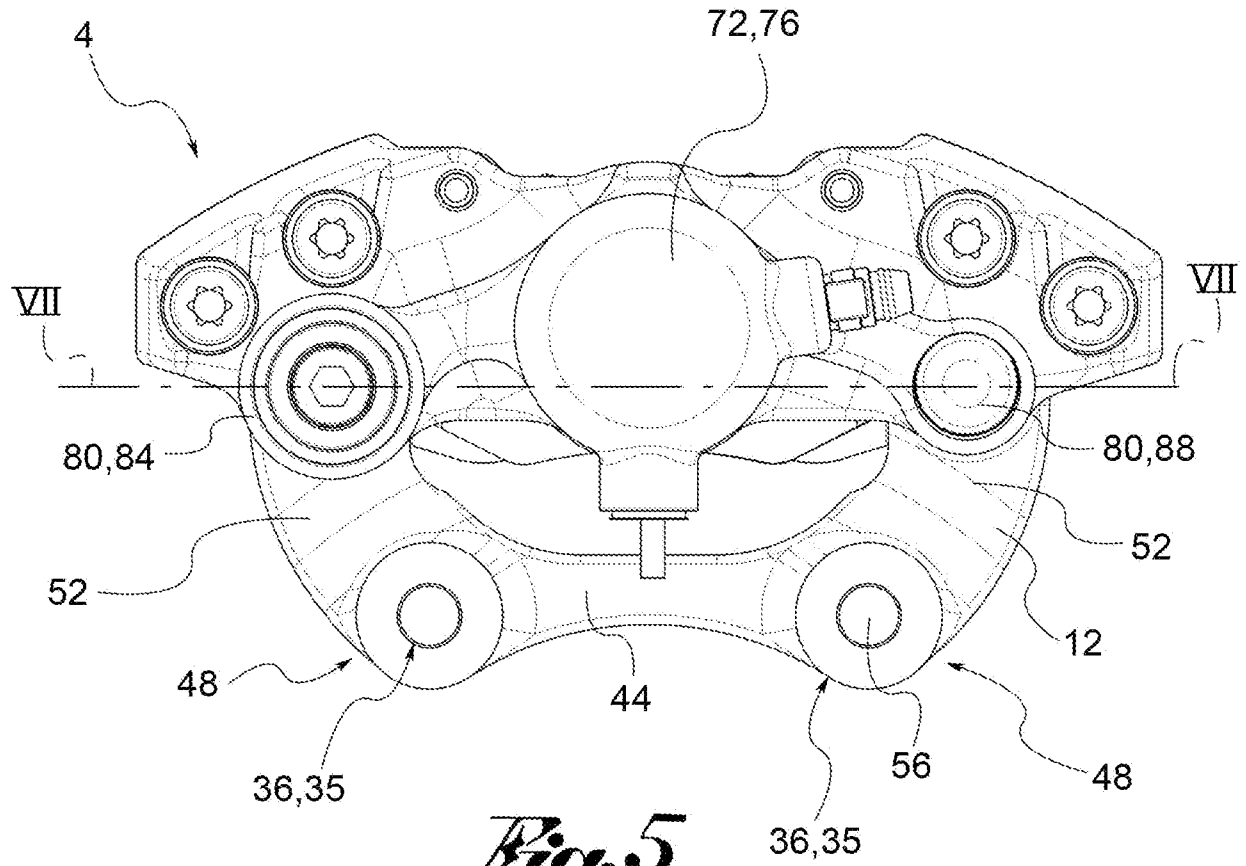


Fig. 5

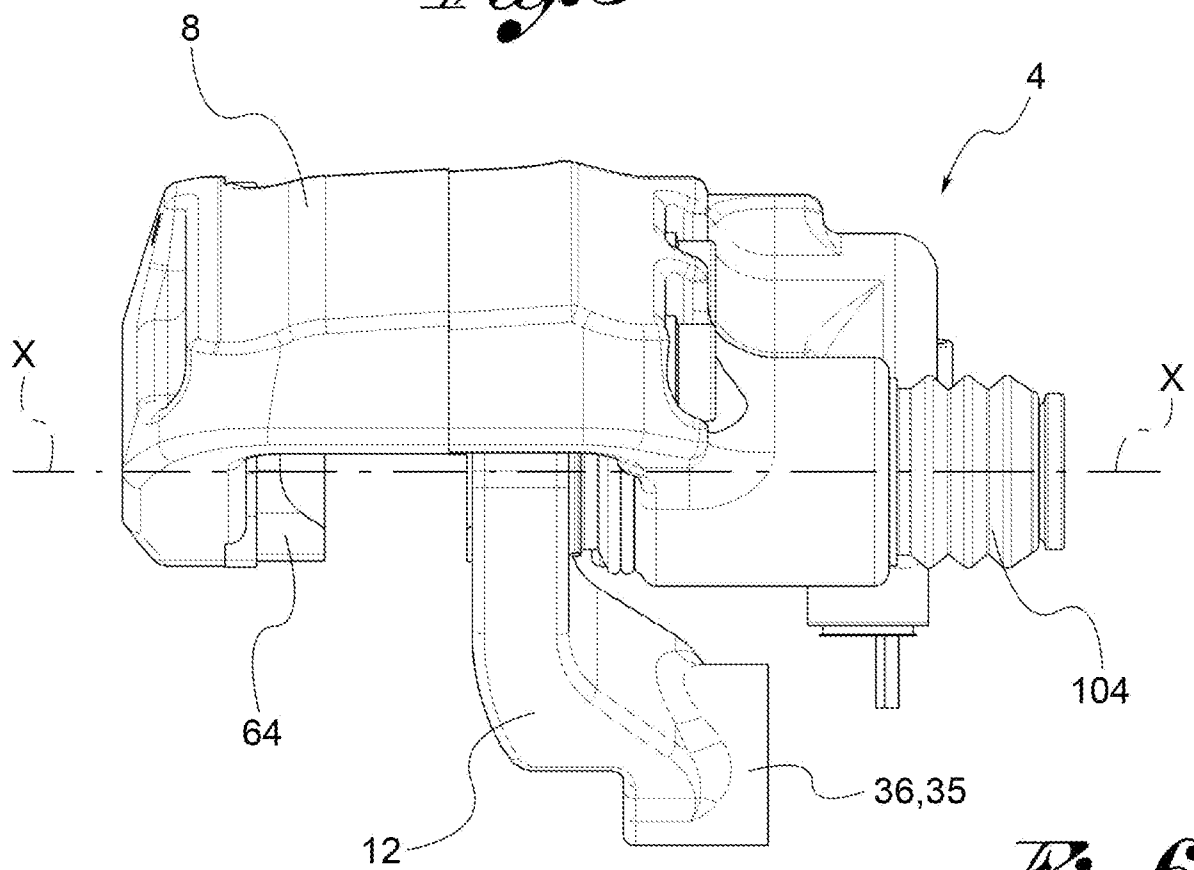


Fig. 6

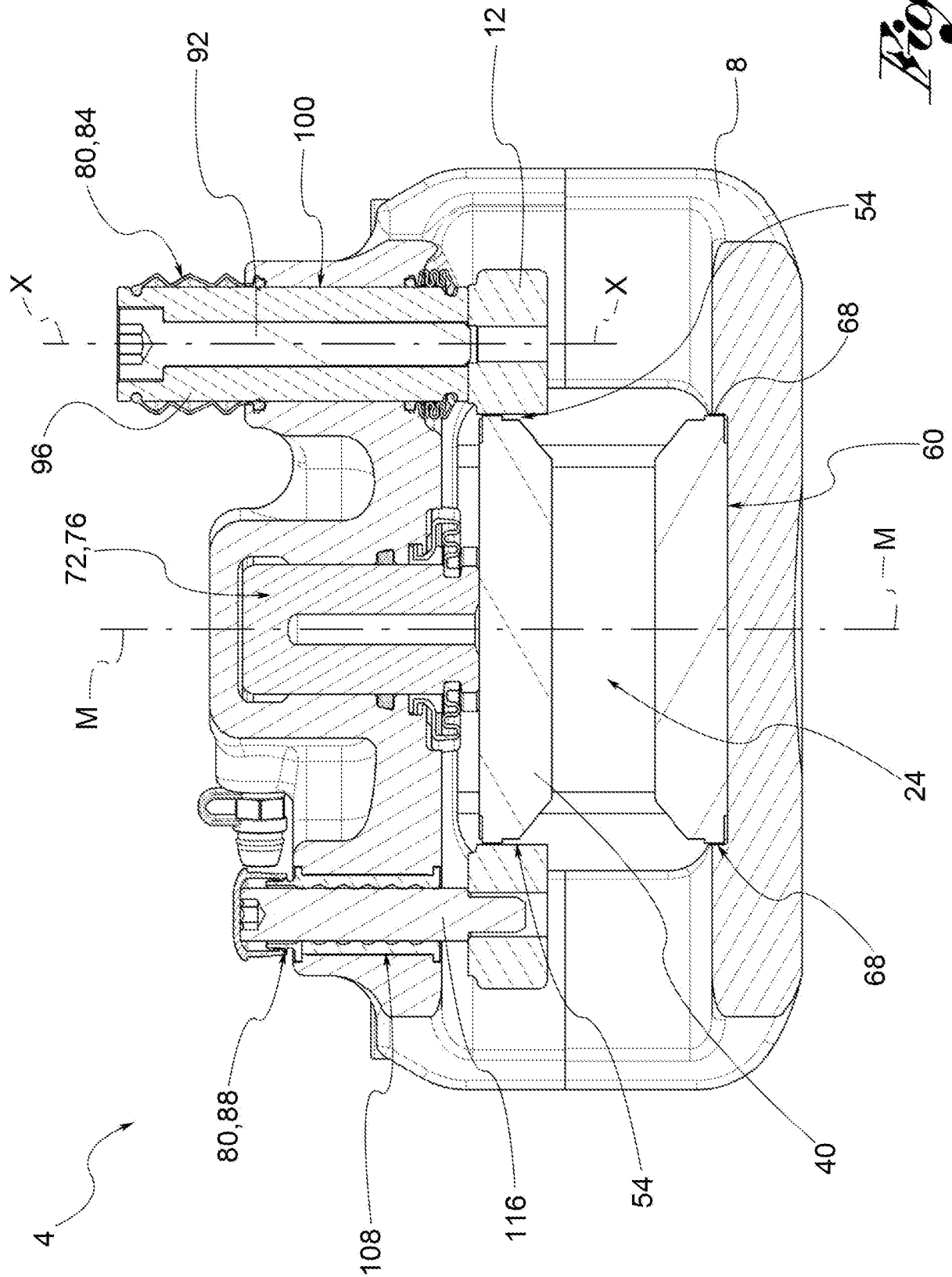


Fig. 7

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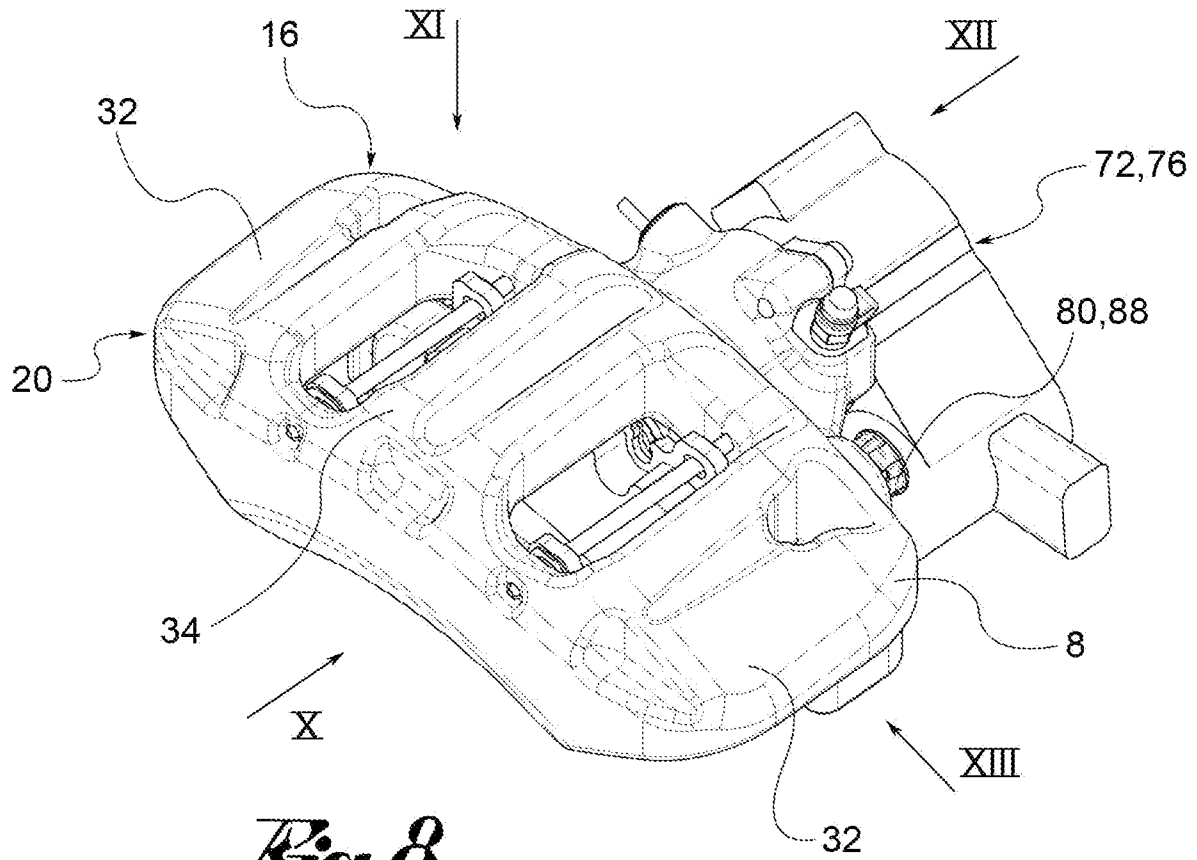


Fig. 8

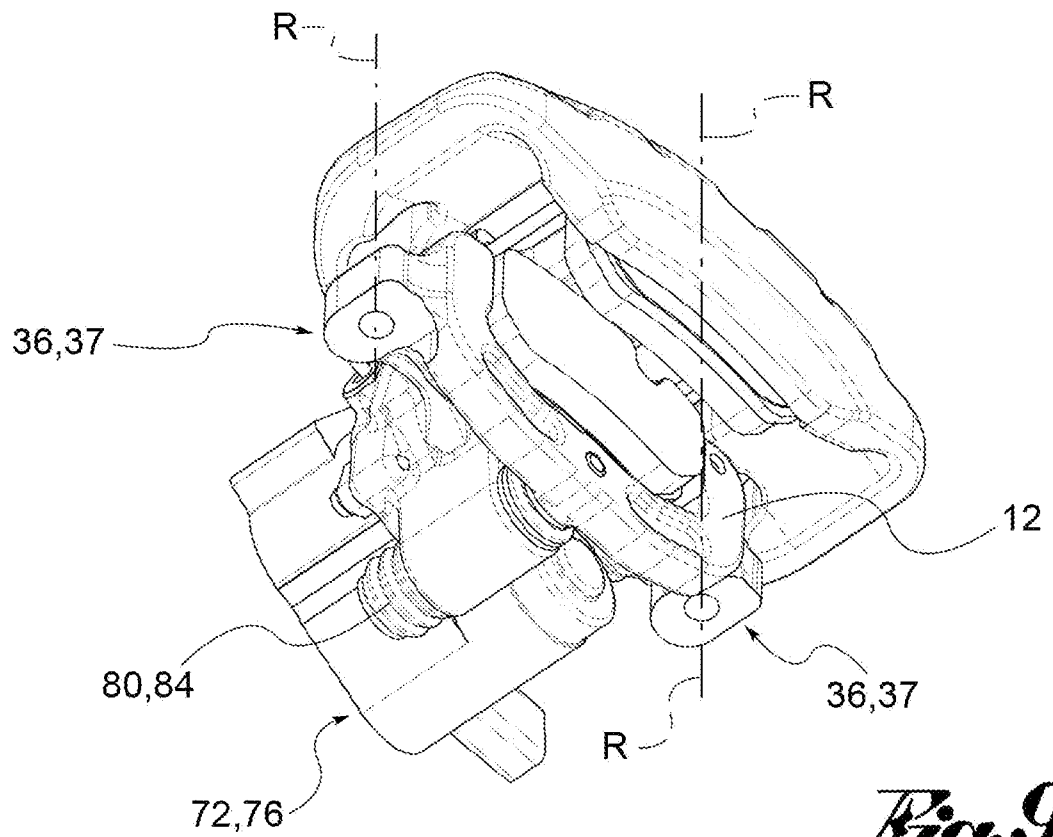


Fig. 9

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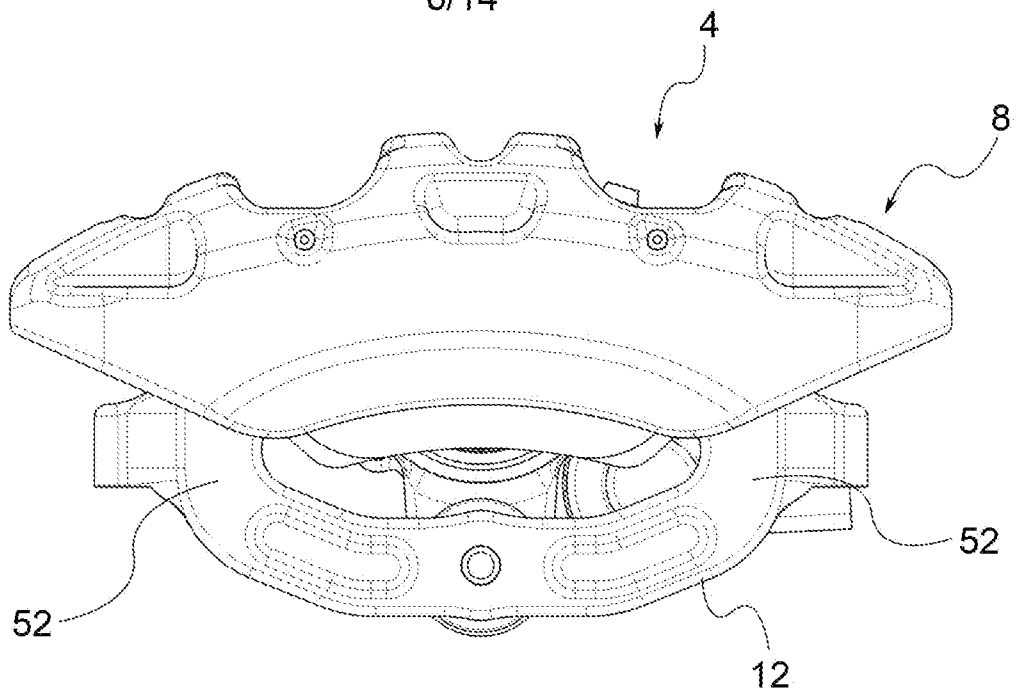


Fig. 10

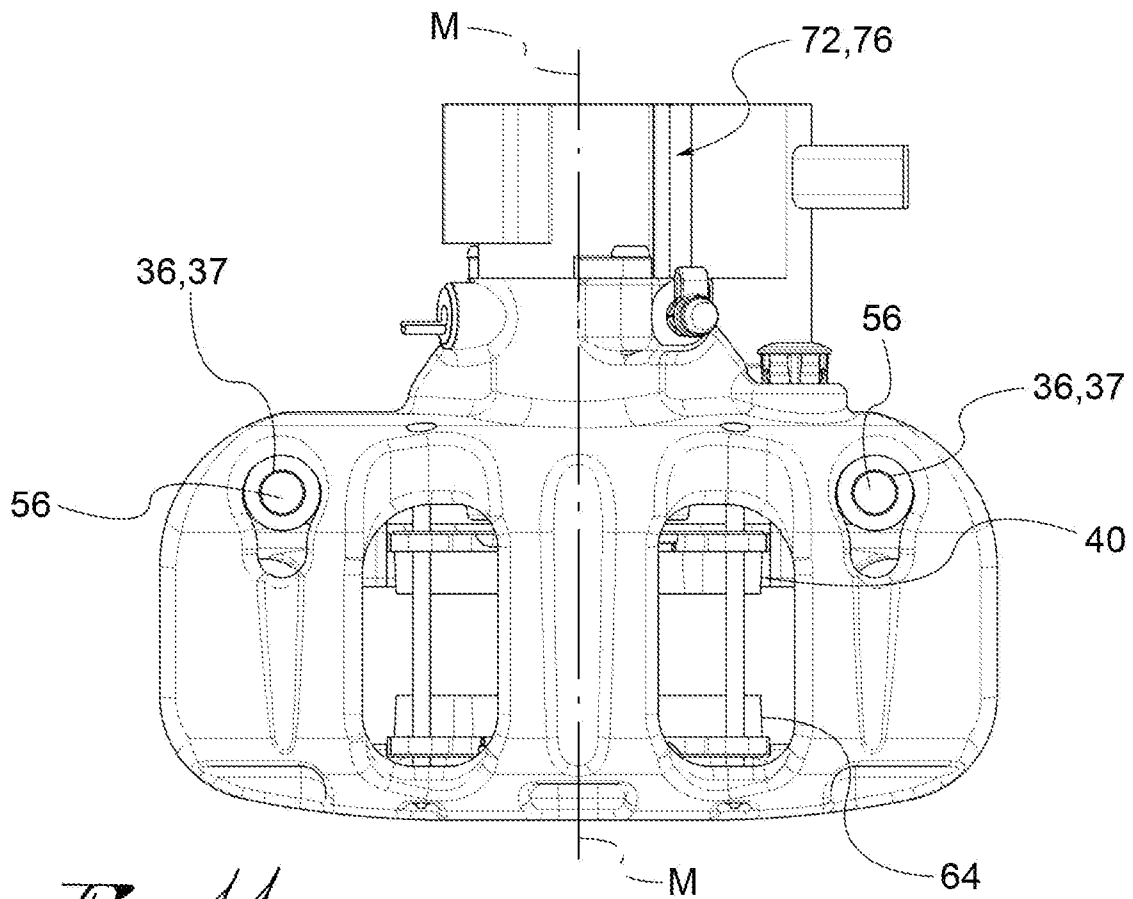
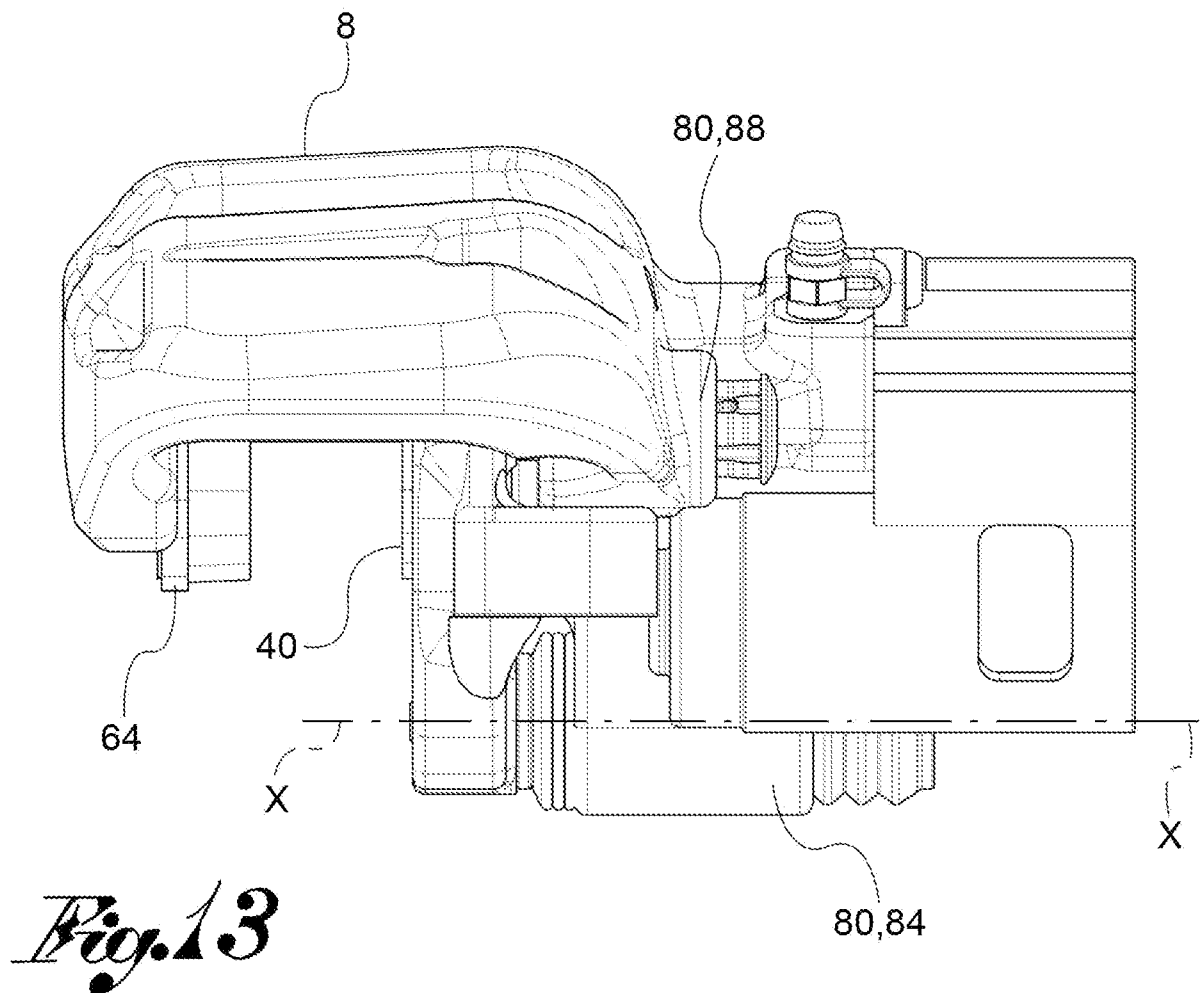
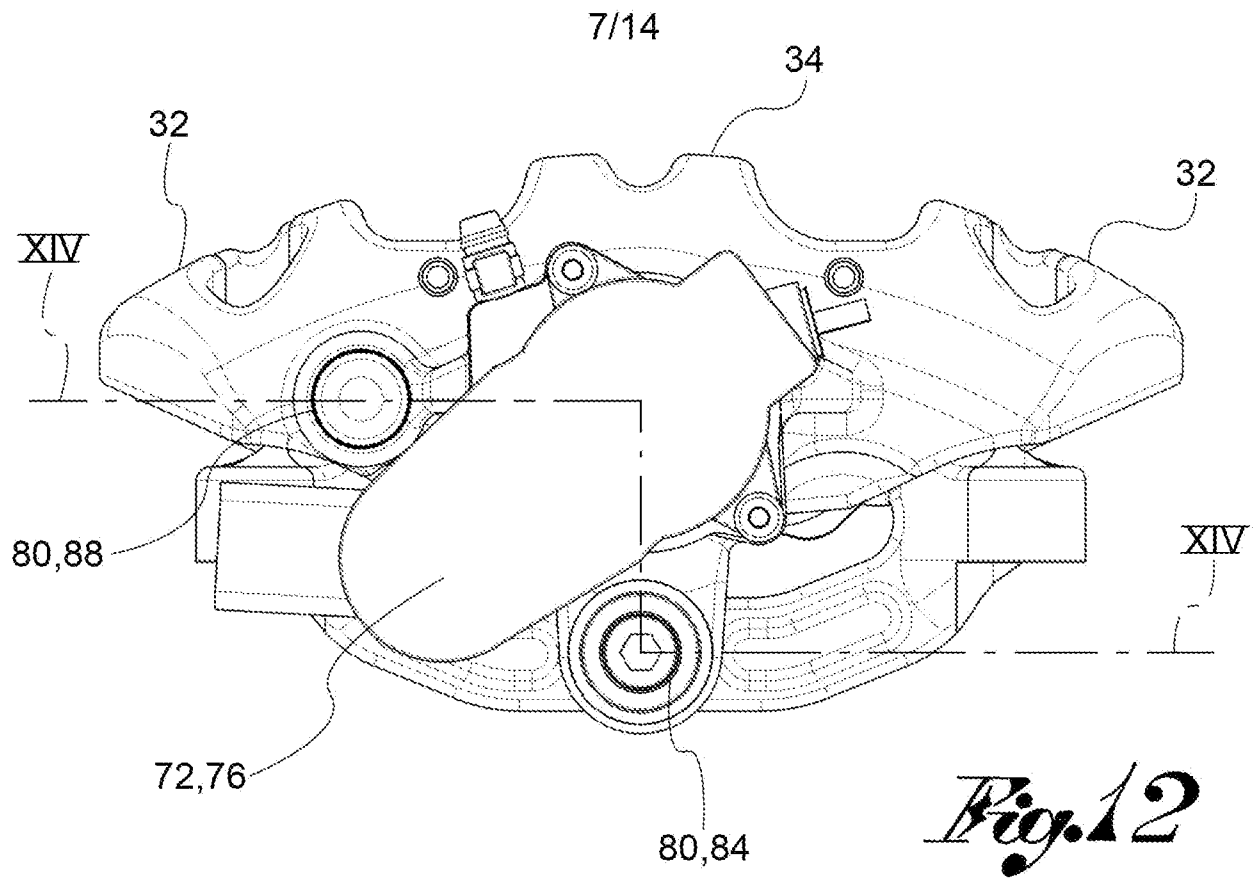


Fig. 11



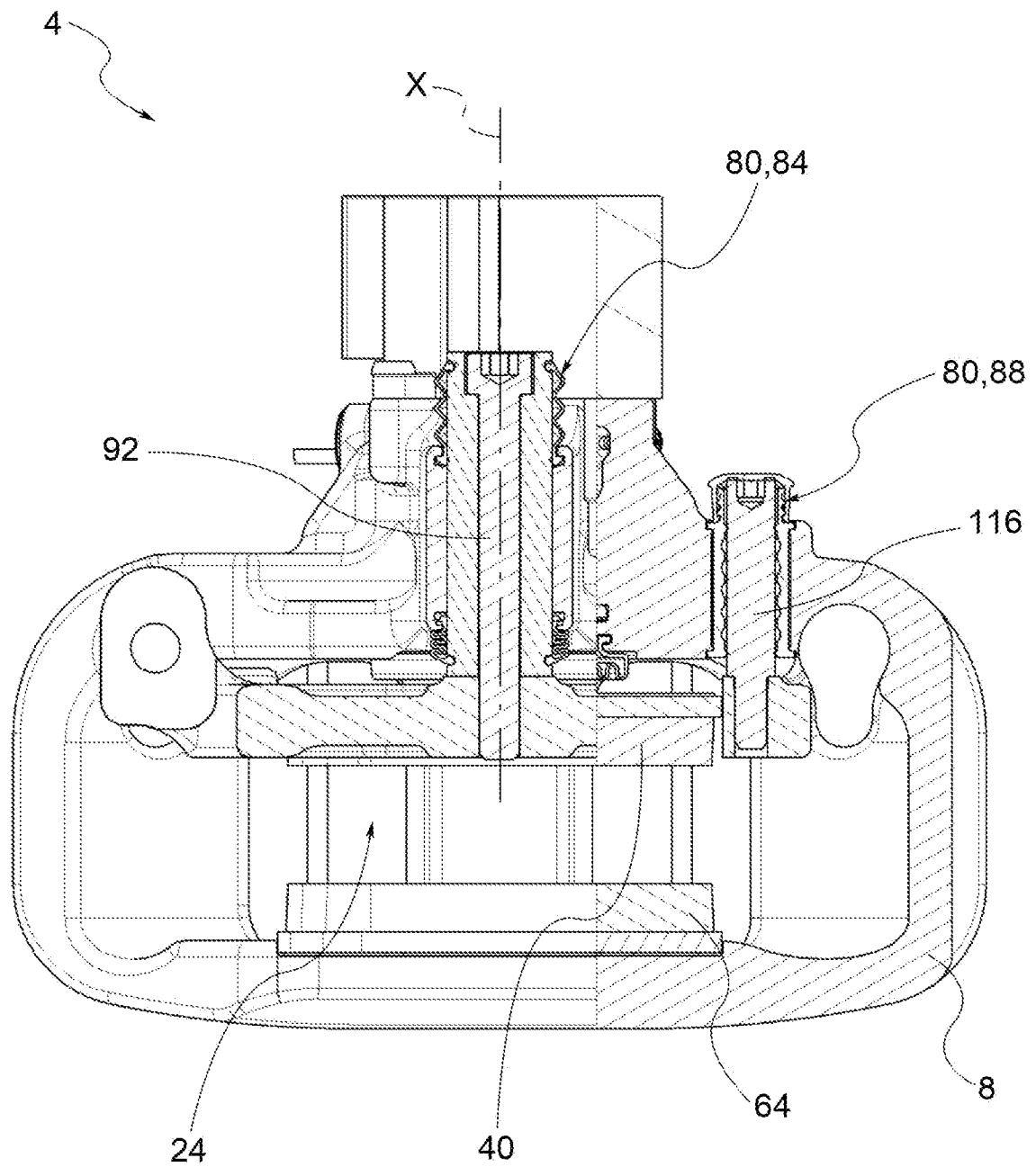


Fig. 14

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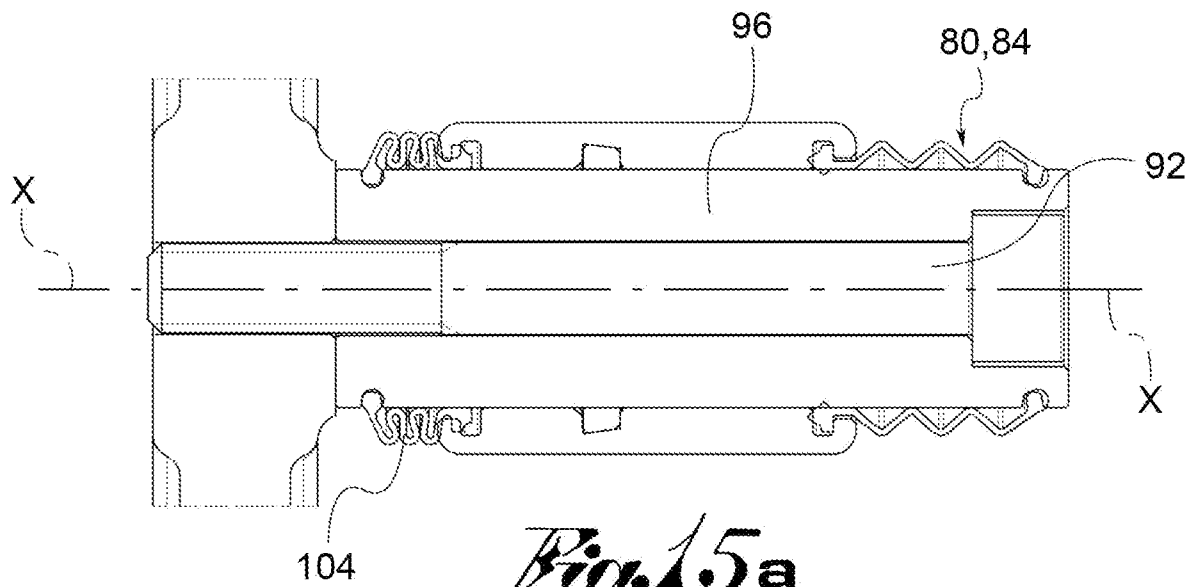


Fig. 15a

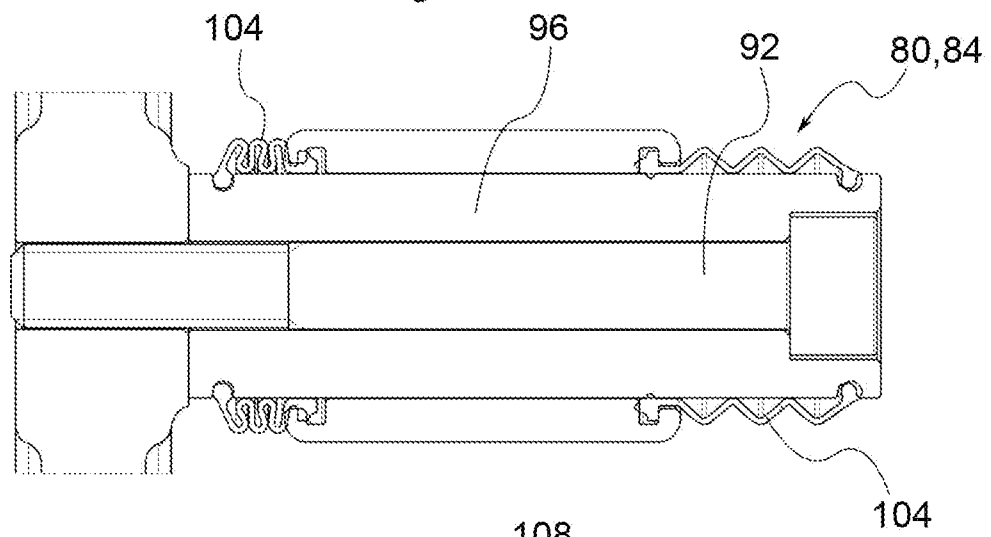


Fig. 15b

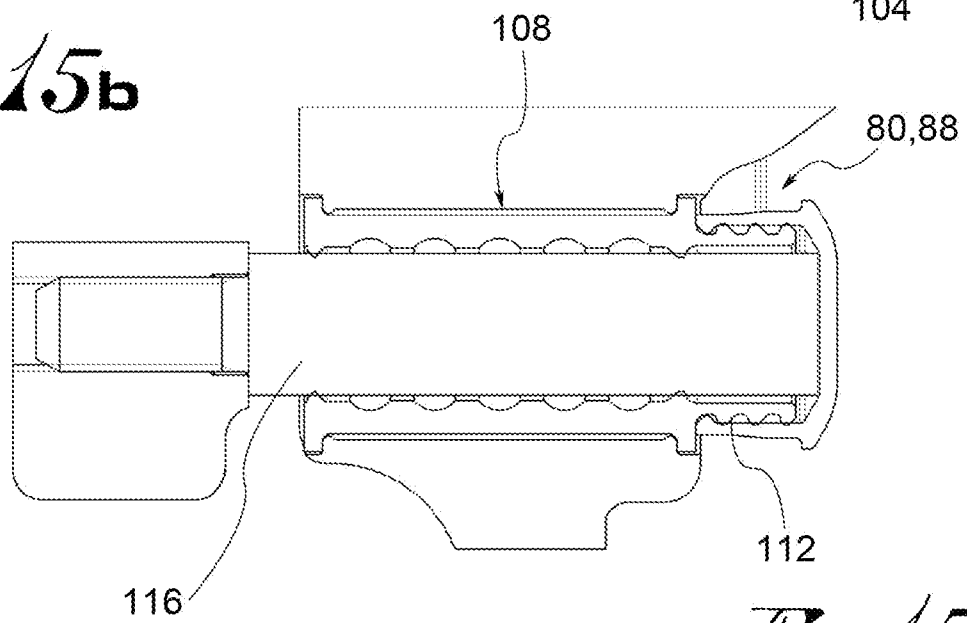


Fig. 15c

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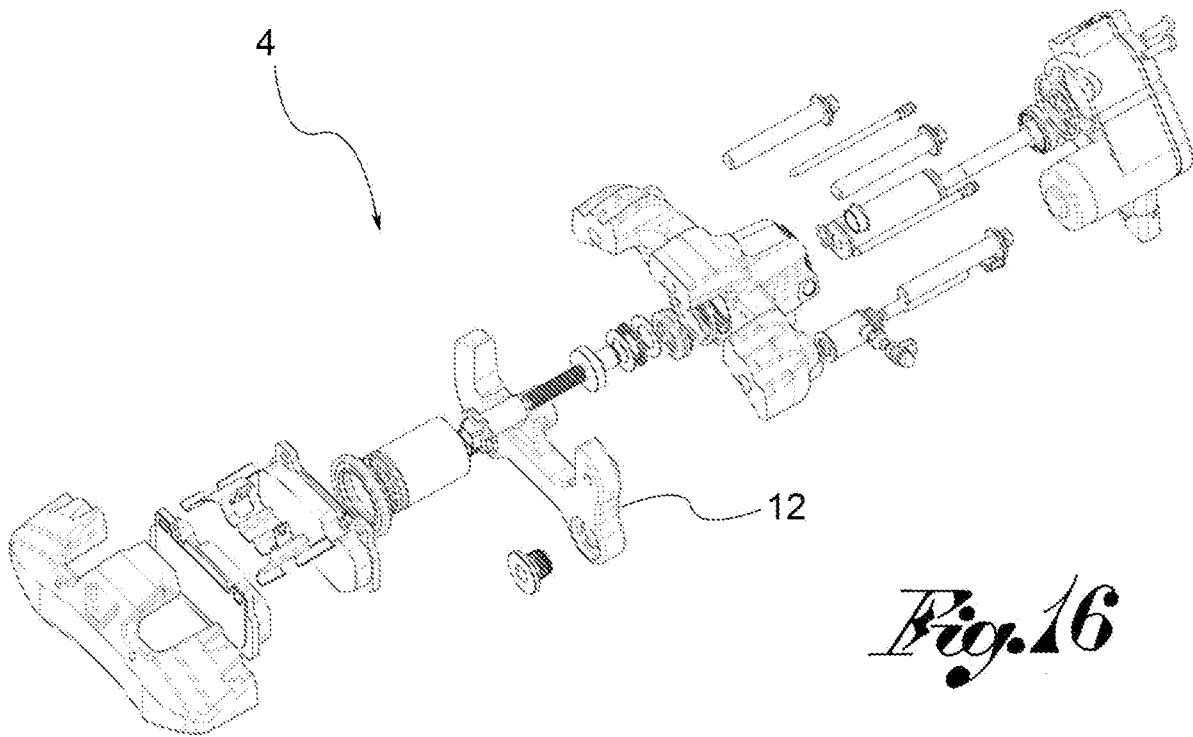


Fig. 16

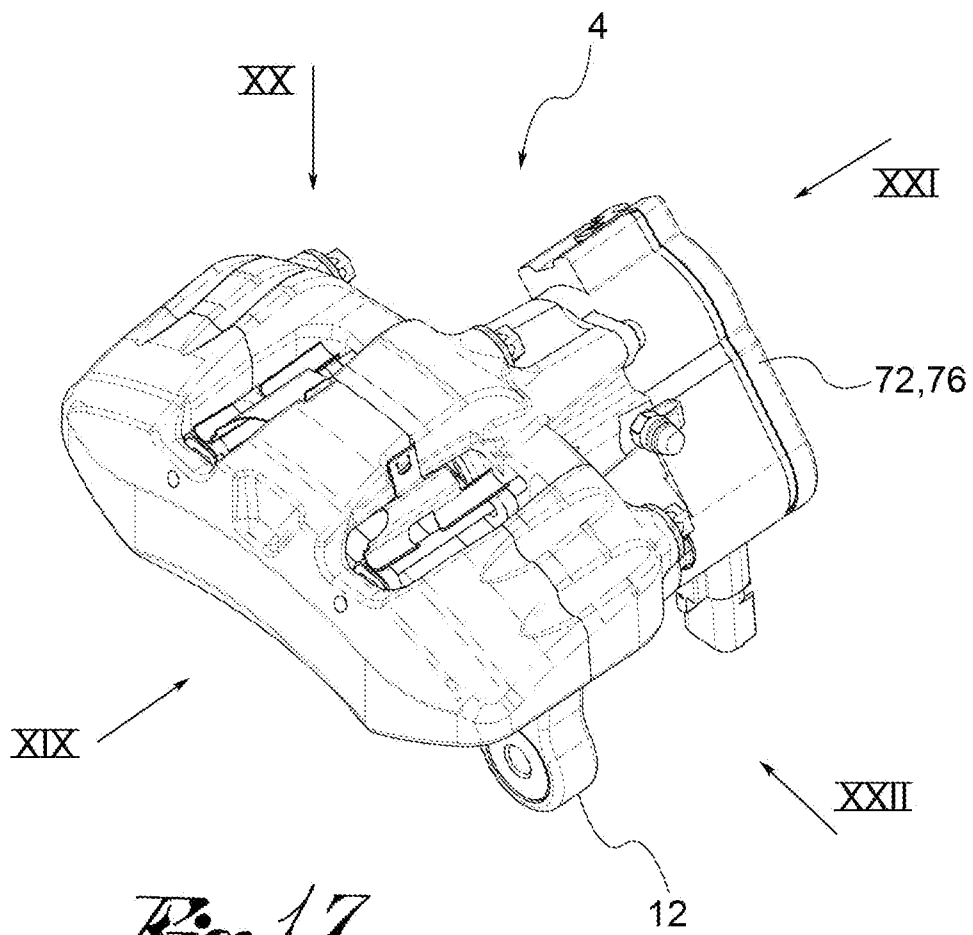
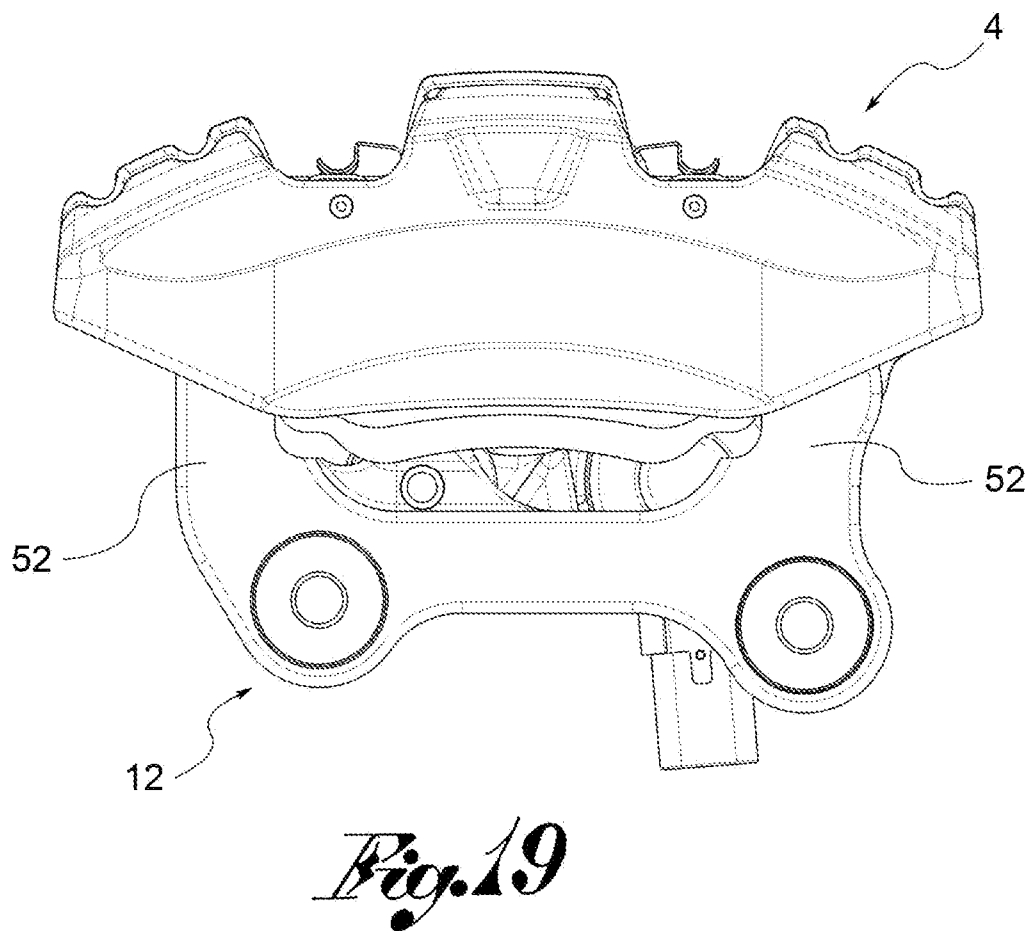
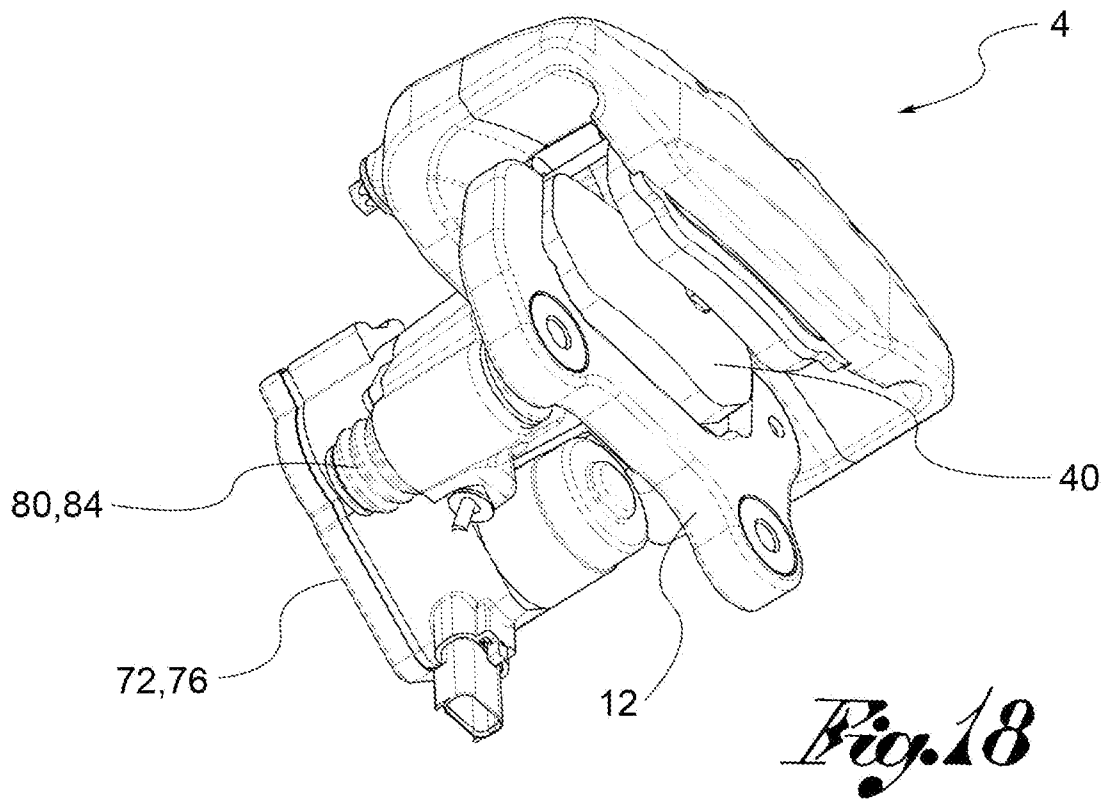


Fig. 17

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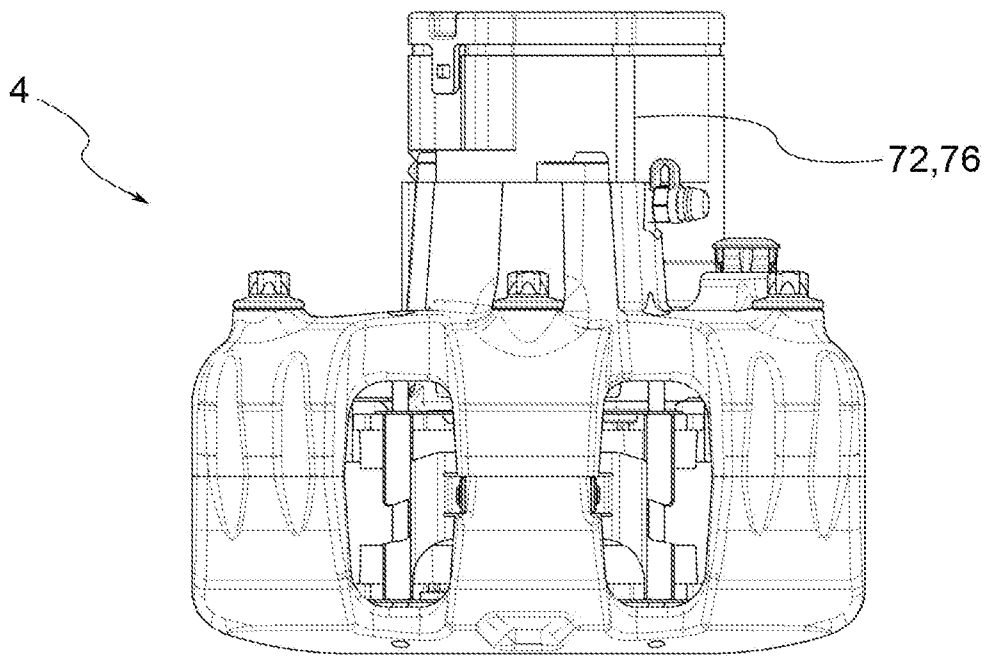


Fig. 20

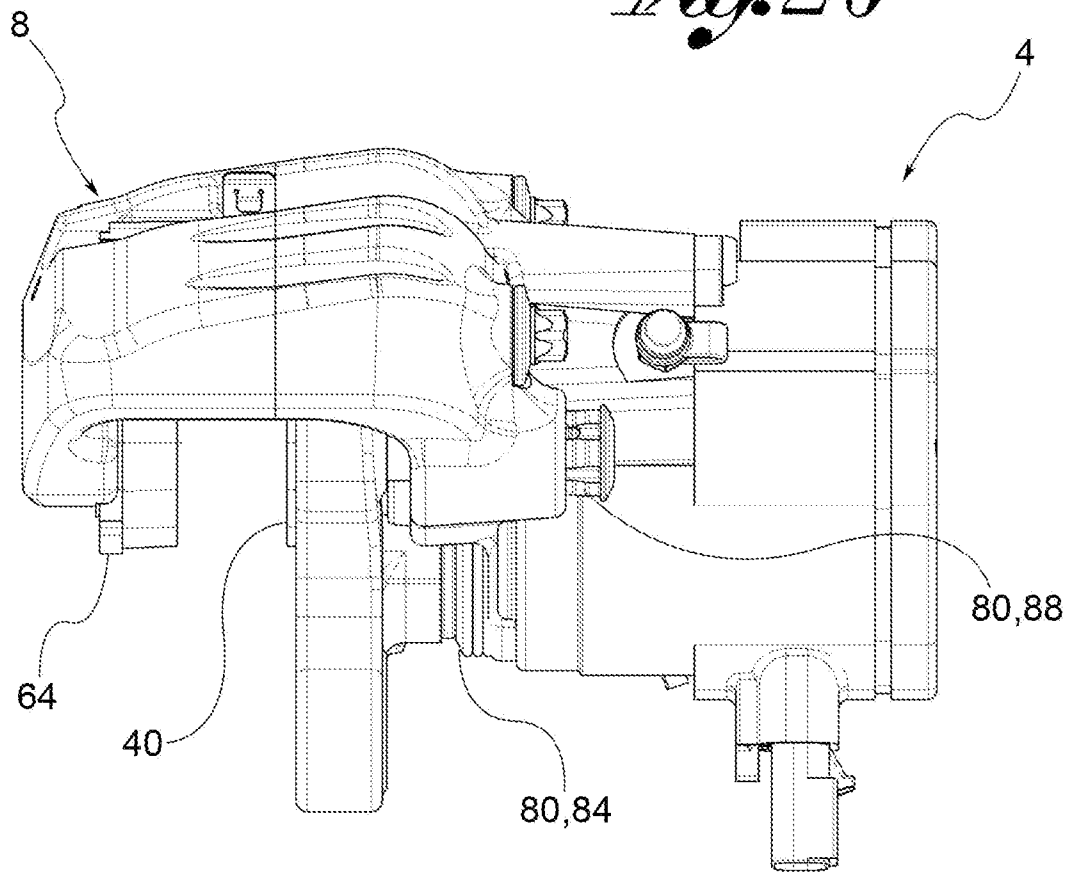


Fig. 21

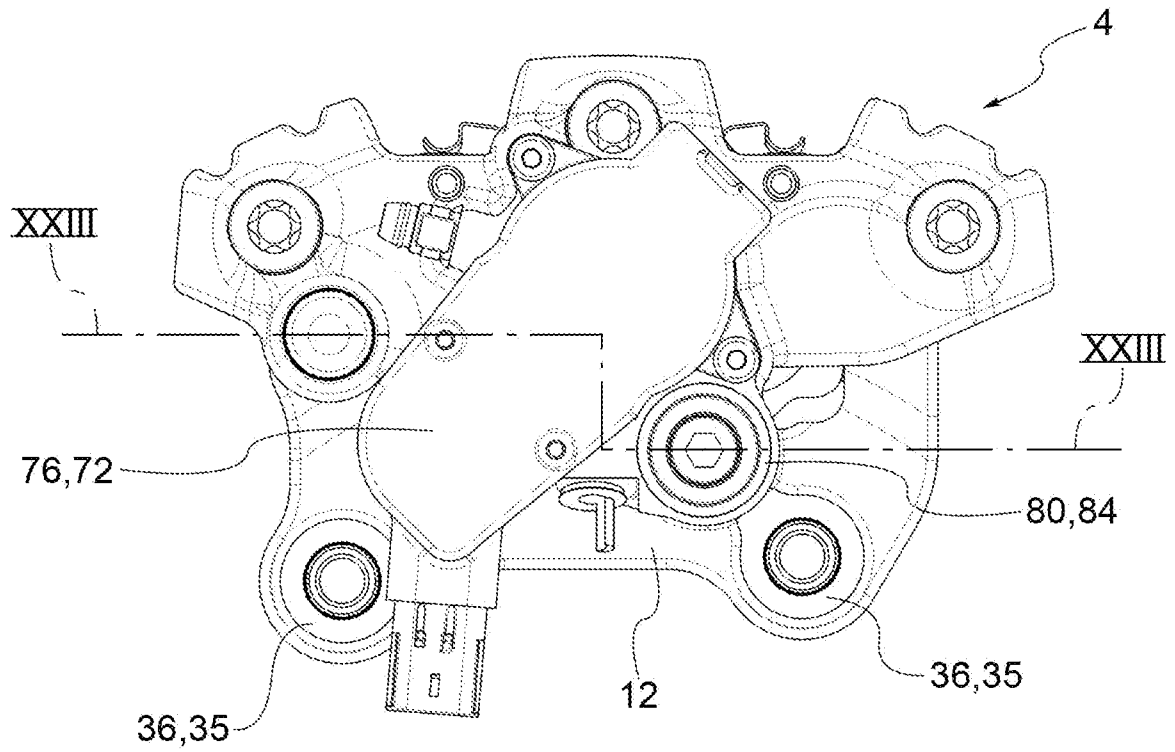


Fig. 22

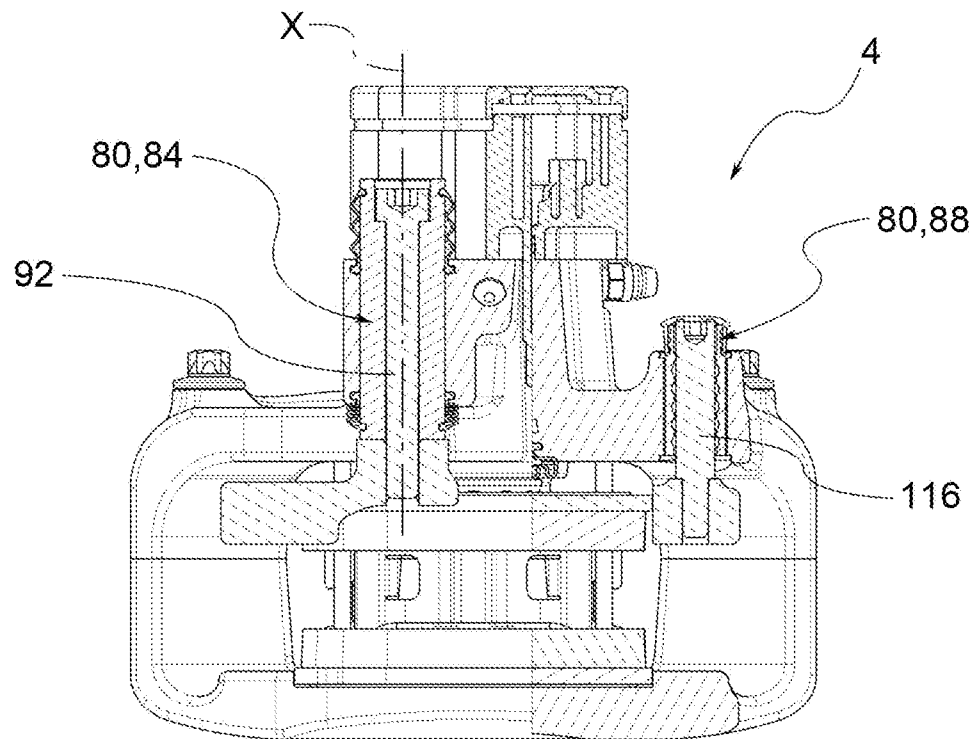


Fig. 23

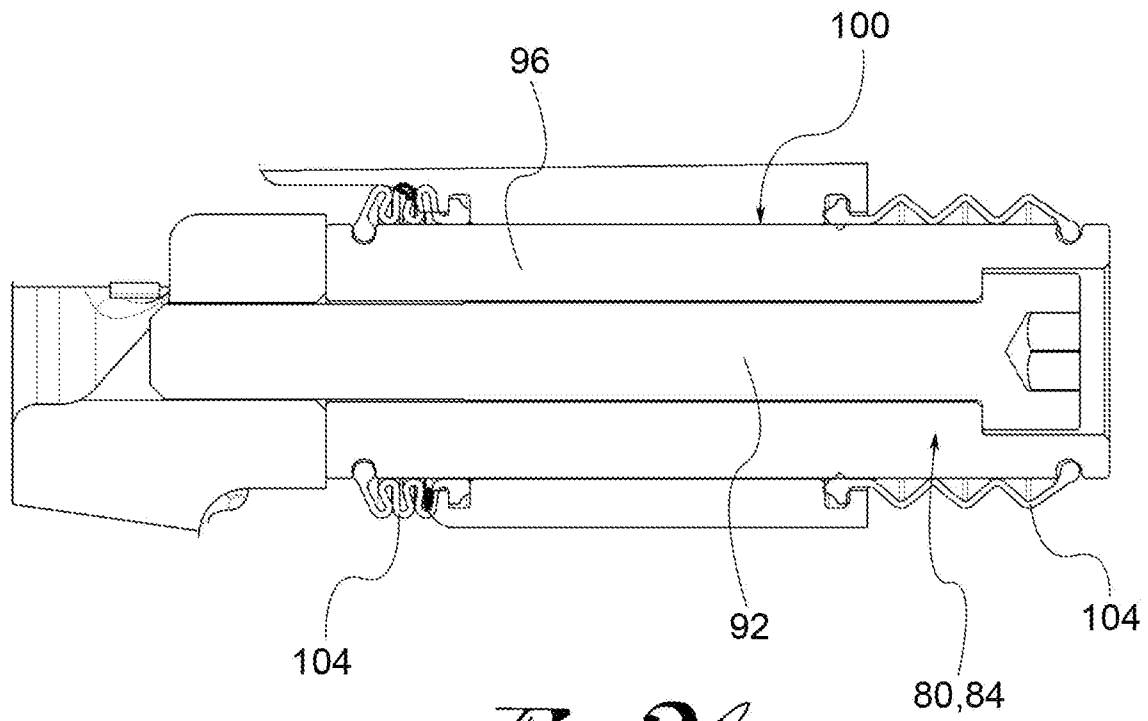


Fig. 24a

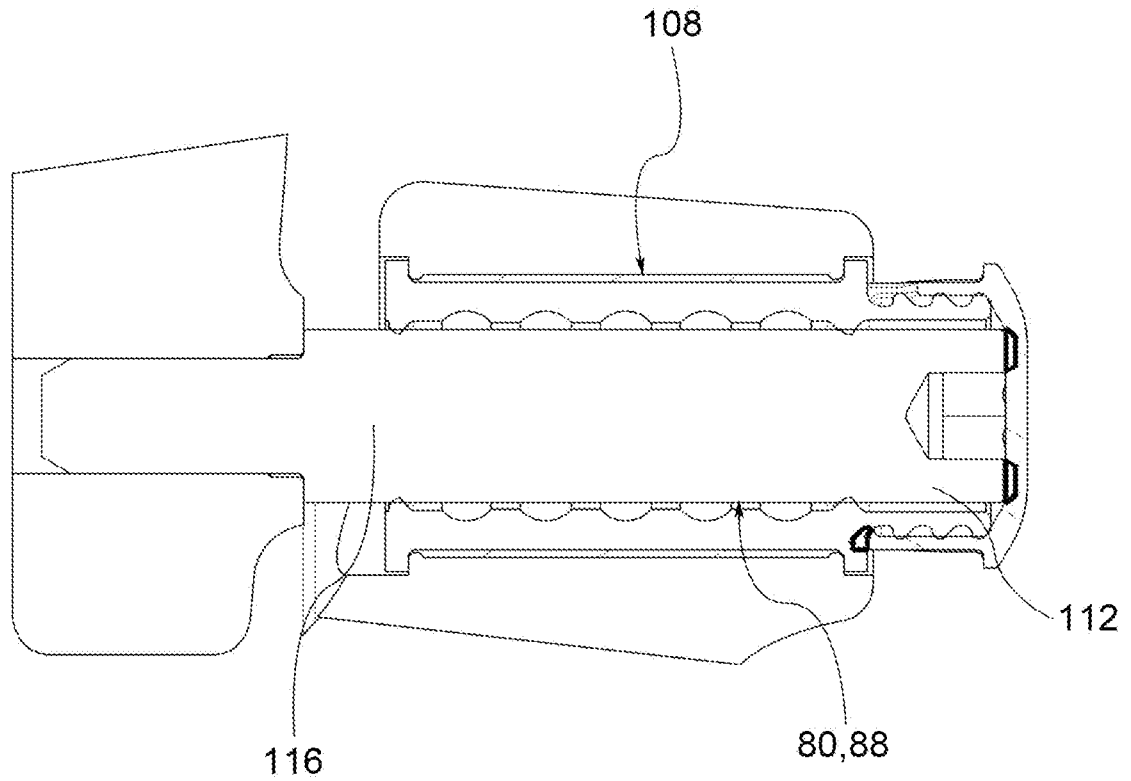


Fig. 24b

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052158

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16D55/2265 F16D65/00 F16D55/227
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)

EP0-Internal

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☒ See patent family annex.

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Date of the actual completion of the international search

2 July 2012

Date of mailing of the international search report

09/07/2012

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052158

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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