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(54) HEATING RADIATOR ELEMENT AND METHOD AND DEVICE FOR CLOSING AN END PART OF A HEATING RADIATOR ELEMENT

HEIZKÖRPERELEMENT SOWIE VERFAHREN UND VORRICHTUNG FÜR DEN VERSCHLUSS EINES ENDTEILS EINES HEIZKÖRPERELEMENTS

ÉLÉMENT DE RADIATEUR CHAUFFANT ET PROCÉDÉ ET DISPOSITIF DESTINÉS À FERMER UNE PARTIE D'EXTRÉMITÉ D'UN ÉLÉMENT DE RADIATEUR CHAUFFANT

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(56) References cited:
EP-A1- 1 039 257
EP-A1- 1 182 165
EP-A1- 1 870 659
EP-A2- 1 471 309
WO-A1-2004/101379
WO-A1-2005/007556
WO-A1-2007/138627
WO-A1-2008/044363
DE-A1- 3 736 107
DE-C1- 19 637 324
DE-U1- 29 609 435
FR-A1- 2 134 365
FR-A1- 2 905 452
GB-A- 2 121 144
JP-A- 4 335 995
US-A1- 2001 045 001

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Description

TECHNICAL FIELD

[0001] The present invention relates to a heating radiator element and to a method and a device for closing an end part of a heating radiator element.

[0002] In particular, the invention applies to radiator elements, typically made of aluminium, manufactured by die-casting.

BACKGROUND ART

[0003] As is known, a die-cast aluminium radiator is normally formed by a battery of elements coupled to one another to form a radiator of suitable dimensions; each element has a substantially tubular body that extends along an axis and has an end part that, for constructional requirements, is open at the bottom; the end part hence has a bottom opening set along the axis, as well as, typically, a pair of opposite lateral holes to enable connection of the element to other elements of the same type.

[0004] Various systems are known for closing the bottom opening of a radiator element.

[0005] The traditional solution consists in welding a lid around a front edge of the bottom opening. This solution is not altogether satisfactory in so far as it requires execution of a weld with all the drawbacks associated thereto.

[0006] Other solutions, which envisage instead a mechanical engagement between a lid and the end part of the radiator element, are not fully satisfactory in terms of effectiveness of hydraulic tightness and/or of costs and simplicity of construction, as well as, in some cases, from the aesthetic standpoint.

[0007] In particular, the solution illustrated in WO2007/138627A1 envisages that the lid is pressed radially around the front edge of the end part so as to engage around said edge; this solution presents, however, the drawback of causing considerable stresses on the end part in a radial direction and hence, above all in the case of elements with cross section that is not circular but, for example, is oval or elliptical or polygonal, is not practicable, in so far as it would lead to squeezing of the element (unless large thicknesses are resorted to, with consequent high production costs) and/or to the deformation of the lid and consequent lack of effectiveness.

DISCLOSURE OF INVENTION

[0008] An aim of the present invention is to provide an element of a heating radiator and a method and a device for closing an end part of an element of a heating radiator that will be free from the drawbacks of the known art highlighted above; in particular, an aim of the invention is to provide a radiator element having a bottom opening, which is closed in a simple and fully effective way also in the case of radiator elements having a body with non-circular cross section, moreover optionally making it possible to bestow on the end part of the radiator element a particular aesthetic appearance.

[0009] The present invention hence regards an element of a heating radiator, in particular an element provided via die-casting of aluminium, and a method and a device for closing an end part of said radiator element, as defined in basic terms in the annexed Claims 1, 10, and 12, respectively.

[0010] The element of a heating radiator in accordance with the invention is provided with a closing plug that is simple and fully effective and that is applied in a simple, fast, and inexpensive way, without requiring relatively long and complex operations and at the same time enabling aesthetic solutions of particular quality. In addition, the invention can be easily applied also to elements having non-circular cross section (for example, oval or elliptical, polygonal, etc.).

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Further characteristics and advantages of the present invention will emerge clearly from the ensuing description of a non-limiting example of embodiment thereof, with reference to the figures of the annexed drawings, wherein:

- Figure 1 is a partial perspective view of an element of a heating radiator in accordance with the invention, and shows specifically an end part of the radiator element provided with a closing plug;
- Figure 2 is a view in longitudinal section of the radiator element of Figure 1;
- Figure 3 is a partial and partially sectioned schematic view of a device for closing the end part of the radiator element of Figures 1-2;
- Figure 4 is a schematic view from beneath, with parts removed for clarity, of a detail of the device of Figure 3;
- Figures 5-7 show schematically operation of the device of Figure 3;
- Figure 8 and 9 are respectively a partial perspective view and a view in longitudinal section of a variant of the element of a heating radiator of the invention; and
- Figures 10 and 11 are respectively a partial perspective view and a view in longitudinal section of a further variant of the element of a heating radiator of the invention.

BEST MODE FOR CURRYING OUT THE INVENTION

[0012] In Figures 1 and 2 designated as a whole by 1 is an element of a heating radiator; the element 1 has a body 2 made of metal material, in particular aluminium and for example die-cast aluminium; the body 2 is a substantially tubular body that comprises a main tubular portion 3, which extends longitudinally along an axis A that,

with reference to the normal position of use of the element 1, is substantially vertical; the element 1 is provided with an internal chamber 4 for the circulation of water, with transverse connector sleeves 5 for connection to other radiator elements and/or to a hydraulic circuit, and with a plurality of radiant fins and/or plates 6 variously connected to one another and/or to the body 2 and specifically to the main portion 3.

[0013] The element 1 comprises an end part 10 set at a longitudinal end 11 of the element 1, for example a bottom end (once again with reference to the normal position of use of the element 1).

[0014] Preferably, but not necessarily, the main portion 3 of the element 1, and hence also the end part 10, have a cross section that is substantially oval or elliptical and/or in any case elongated along a major axis B, and/or polygonal (quadrangular, rhomboidal, square, etc.), possibly with rounded sides and/or vertices.

[0015] The end part 10 is substantially tubular and also this extends substantially along the axis A and has a bottom opening 12 set along the axis A and substantially transverse to the axis A. The end part 10 comprises a radially outer collar 18 around the opening 12, set preferably at a free end of the end part 10 and carried preferably, but not necessarily, by a flared portion 15 diverging towards the opening 12.

[0016] The collar 18 has a pair of opposite flat parallel faces 19 substantially orthogonal to the axis A and at least partially overlapping in axial projection; in other terms, by projecting the faces 19 on one another in a plane perpendicular to the axis A, the projections of the two faces 19 are at least partially overlapping and preferably superimposed at least on a radially outer closed continuous annular surface, or on portions of an annular surface.

[0017] A first face 19a is defined by an annular front edge of the collar 18; a second face 19b is defined by an annular surface opposite to said front edge. It remains understood that each of the faces 19 can be constituted either by a substantially annular continuous surface, or by two or more separate surface portions, set at an angular distance from one another about the axis A.

[0018] The opening 12 is closed by a plug 20, which is partially inserted in the end part 10 through the opening 12 and is provided with at least one seal ring 21 set between the plug 20 and the end part 10; in particular, the seal ring 21 is a radial seal ring set within the end part 10 and radially set between an external lateral surface 22 of the plug 20 and an internal lateral surface 23 of the end part 10.

[0019] The plug 20 and the opening 12 have the same shape as the cross section of the collar 18 and hence, preferably (but not necessarily), substantially oval or elliptical and/or in any case elongated along the major axis B, and/or substantially polygonal (quadrangular, rhomboidal, square, etc.), possibly with rounded sides and/or vertices.

[0020] The plug 20 comprises a closing portion 24, housed within the end part 10 and shaped so as to close the opening 12, and an engagement portion 25, which is substantially annular and is shaped for example as a radially external annular flange that extends from a perimetral edge of the closing portion 24 and is fitted on the outside of the end part 10 around the collar 18.

[0021] The plug 20 is constituted by a monolithic body (comprising both the closing portion 24 and the engagement portion 25) preferably made of sheet metal, for example steel, or aluminium.

[0022] Preferably, the closing portion 24 of the plug 20 has a flared shape corresponding to the shape of the flared portion 15 of the end part 10.

[0023] The seal ring 21, for example a seal ring of an O-ring type made of elastomeric material, is fitted around the closing portion 24, possibly housed in a seat formed on the surface 22 and/or on the surface 23, and extends radially from the surface 22 towards the surface 23 so as to seal the end part 10 in a fluid-tight way.

[0024] The engagement portion 25 has a pair of opposite flat parallel fixing surfaces 29 facing one another and orthogonal to the axis A, which are directly in contact and axially gripped and squeezed against respective faces 19 of the collar 18. In particular, a first surface 29a rests bearing upon the face 19a of the collar 18, and a second surface 29b rests bearing upon the face 19b.

[0025] Each of the surfaces 29 (in particular, the surface 29b) can be constituted either by a substantially annular continuous surface or by two or more separate surface portions, set at an angular distance from one another about the axis A, for example two diametrally opposite surface portions (in particular, set at opposite ends of the major axis B).

[0026] The engagement portion 25 further comprises a side wall 30 substantially parallel to the axis A and set about the axis A; the side wall 30 connects the two opposite fixing surfaces 29 and is set radially external around the collar 18.

[0027] The plug 20 is gripped against the end part 10 and mechanically coupled to the end part 10 via the fixing surfaces 29, which are forced axially against the respective faces 19 of the collar 18; the side wall 30 is not, instead, subjected to any force in a radial direction; i.e., it is essentially unloaded.

[0028] In the example illustrated in Figures 1 and 2, the engagement portion 25 comprises a pair of appendages 34, which are set at respective diametrally opposite ends of the plug 20, in particular at opposite ends of the major axis B, are substantially bent to form a C around the collar 18, and are provided with the fixing surfaces 29. The plug 20 is hence engaged to the end part 10 via the two appendages 34. It remains in any case understood that the plug 20 can instead be engaged to the collar 18 via a continuous annular perimetral band, once again bent around the collar 18.

[0029] The plug 20 has an external front surface 35, opposite to the surface 29a, for example substantially annular.

[0030] The plug 20 is advantageously mounted on the element 1, for example, via a device 50, illustrated schematically in Figures 3-4, which has precisely the purpose of closing the end part 10 of the element 1 with the plug 20.

[0031] The device 50 basically comprises a clamping group 51, provided with a housing seat 52 shaped for receiving an assembly 53 formed by the end part 10 and by the plug 20, which is fitted on the collar 18 thereof and extends about an axis that hence coincides with the axis A of the element 1 inserted in the seat 52; in particular, the seat 52 has a contrast surface 54 carried by a base body 55 and co-operating axially (along the axis A) by bearing upon the plug 20 and specifically upon the front surface 35.

[0032] The clamping group 51 comprises movable gripping members 56, driven by an actuator system (known and not illustrated) co-operating with the engagement portion 25 of the plug 20 so as to deform the engagement portion 25 around the collar 18 and to engage the plug 20 to the collar 18.

[0033] In particular, the clamping group 51 comprises two half-grippers 57, which are movable with respect to one another in a sliding direction S, substantially orthogonal to the axis A and advantageously parallel to or coinciding with the major axis B, and are provided with respective cavities 58 defining, together with the surface 54, the seat 52.

[0034] The two half-grippers 57 are shaped in such a way as to clamp laterally on opposite sides the assembly 53 housed in the seat 52. The clamping group 51 comprises also a detent 59 co-operating with the half-grippers 57 to stop the movement of the half-grippers in a preset position in the sliding direction S.

[0035] The gripping members 56 are movable parallel to the axis A and are configured in such a way as to grip the plug 20 axially against the seat 52 and specifically against the contrast surface 54 so as to cause plastic deformation of the engagement portion 25 of the plug 20 housed in the seat 52 and bend the fixing surface 29b of the plug 20 underneath the collar 18, so as to exert on the collar 18 gripping forces applied essentially only in an axial direction (parallel to the axis A) and substantially without radial components of stress.

[0036] With reference also to Figures 5-7, operation of the device 50 in implementing the closing method according to the invention is described in what follows.

[0037] The plug 20 is pre-arranged in an undeformed configuration, in which the fixing surface 29b, which with the plug 20 mounted is bent perpendicularly to the axis A underneath the collar 18, constitutes instead a free end portion of the side wall 30 and is also set parallel to the axis A as prolongation of the side wall 30; the plug 20 is then applied on the end part 10 by introducing the closing portion 24, with the seal ring 21, through the opening 12 and fitting the engagement portion 25 on the collar 18; the fixing surface 29a of the plug 20 is set bearing upon the face 19a of the collar 18.

[0038] The assembly 53 formed by the element 1 and by the plug 20 (undeformed) is set between the two half-grippers 57 of the device 50, which are in a divaricated opening position (Figure 3; Figure 5) at an appropriate distance apart from one another; the half-grippers 57 are then brought close to one another in the sliding direction S (Figure 6) to define the seat 52 in which the assembly 53 remains housed and laterally clamped.

[0039] The gripping members 56 are then moved in a direction parallel to the axis A (Figure 7) so as to cause plastic deformation of the engagement portion 25 to bend the fixing surface 29b underneath the collar 18 and against the face 19b of the collar 18 and to grip the fixing surfaces 29a, 29b axially against the respective faces 19a, 19b of the collar 18, in such a way as to exert on the collar 18 gripping forces applied essentially only in an axial direction (parallel to the axis A) and substantially without radial components of stress (orthogonal to the axis A).

[0040] In the further embodiment of Figures 8-9, in which items similar to or the same as those already described are designated by the same numbers, the plug 20 once again comprises a closing portion 24 housed within the end part 10 and a radially external flange head 25a, which extends on the outside of the end part 10 and has an annular shoulder 26 axially co-operating with the collar 18 by bearing thereupon and specifically resting against the face 19a.

[0041] Preferably, the closing portion 24 of the plug 20 has a free end 27 (opposite to the head 25a) that is chamfered and has a flared shape corresponding to the shape of the flared portion 15 of the end part 10. The free end 27 has a terminal closing surface 28 substantially orthogonal to the axis A and set within the end part 10; the head 25a has a front surface 39 opposite and substantially parallel to the terminal closing surface 28.

[0042] The plug 20 is gripped against the end part 10 and mechanically coupled to the end part 10 by a fixing member 38, which co-operates with and rests against the front surface 39 of the plug 20 by bearing thereupon and is mechanically fastened to the end part 10 via engagement portions 31 of the fixing member 38, which are bent back and are plastically deformed in such a way as to grip the plug 20 against a contrast surface of the end part 10, defined in the case in point by the face 19a of the collar 18, and consequently squeeze the seal ring 21 between the external lateral surface 22 of the plug 20 and the internal lateral surface 23 of the end part 10.

[0043] Advantageously, the fixing member 38 (which constitutes the engagement portion 25 of the plug 20) and the plug 20 are constituted by respective pieces, which are preferably monolithic, distinct, and separate. Preferably, the plug 20 is made of aluminium, and the fixing member 38 is made of sheet metal, for example steel.

[0044] In the example illustrated in Figures 8 and 9, the fixing member 38 is engaged to the end part 10 via engagement portions 31 that are substantially bent to form a C around the collar 18 and that engage the face

19b.

[0045] In particular, the fixing member 38 comprises a plate 32 that covers at least partially (in the example shown, but not necessarily, entirely) the front surface 39 of the plug 10, and a perimetral band 33, which extends from a perimetral edge of the plate 32 and is bent around the collar 18 to constitute the engagement portions 31 that engage the end part 10 and specifically the collar 18.

[0046] It remains understood that, instead of a continuous perimetral band, the fixing member 38 can be provided with engagement portions 31 of other shapes.

[0047] For example, in the embodiment illustrated in Figures 10 and 11, the fixing member 38 comprises the plate 32 and appendages 34 that extend from the perimetral edge of the plate 32 and constitute respective engagement portions 31 that engage the end part 10 (and specifically, once again, the collar 18).

[0048] In particular, the appendages 34 are set at at least two diametrally opposite ends of the plate 32.

[0049] This solution enables also reduction of the length (measured along the axis A) of the end part 10, and use of an accordingly shorter plug 20, with particularly satisfactory aesthetic results.

[0050] It also remains understood that the fixing member 38 and the plug 20 can be constituted by respective pieces pre-assembled and/or joined fixedly in any manner, in such a way as to form a unitary body that can be applied to the end part 10 instead of the two separate pieces constituted by the plug 20 and by the fixing member 38.

[0051] As already described with reference to Figures 1 and 2, then, the fixing member 38 may be constituted by a portion of the plug 20, specifically by the engagement portion 25; i.e., it may be made integrally of a single piece with the plug 20 to constitute a monolithic body (for example made of aluminium); for instance, the fixing member 38 can be constituted by a radially external flange portion of the plug 20, which can be continuous or constituted by angularly separate sectors defining one or more engagement portions 31 bent around the collar 18 in a way altogether similar to what has been described previously.

[0052] In any case, the end part 10 has optionally, in addition to the opening 12, a pair of opposite holes 40, set on opposite sides of the end part 10 and substantially orthogonal to the opening 12 and to the axis A; the holes 40 are delimited by respective edges 41, for example substantially circular, and hydraulically connect the chamber 4 with the transverse connector sleeves 5.

[0053] According to one aspect of the invention, the plug 20 extends within the end part 10 so as to come into the close proximity of the holes 40, in order to prevent formation of air pockets during dipping of the element 1 in a generic treatment bath. In particular, the plug 20 is shaped in such a way that, once it is fixed to the end part 10, the terminal closing surface 28 is set in the close proximity of respective proximal stretches 42 of the edges 41 facing the opening 12 and set closest to the opening 12.

[0054] Preferably, the terminal closing surface 28 is substantially tangential to the holes 40 and/or the terminal closing surface 28 lies in a plane that is substantially tangential to the edges 41 or is secant with respect to the edges 41 (specifically, the proximal stretches 42 of the edges 41).

[0055] It is then understood that modifications and variations may be made to what has been described and illustrated herein, without thereby departing from the scope of the invention as defined in the annexed claims.

Claims

1. A heating radiator element (1) comprising: a body (2), provided with an internal chamber (4) for water circulation and having a substantially tubular end part (10), which extends along an axis (A); a plug (20) that closes a bottom opening (12) of the end part (10) and is mechanically coupled to the end part (10); and at least one seal ring (21) set between the plug (20) and the end part (10); the end part (10) having a radially outer collar (18) around the opening (12) having a pair of flat and parallel opposite faces (19), substantially orthogonal to the axis (A); and the plug (20) being mechanically fastened to the collar (18); the radiator element being **characterized in that** said pair of flat and parallel opposite faces (19) are at least partially overlapping in axial projection; and the plug (20) is mechanically fastened to the collar (18) by means of a pair of parallel, flat, opposite fixing surfaces (29), which face one another and are orthogonal to the axis (A) and are axially gripped and squeezed against respective faces (19) of the collar (18).

2. The radiator element according to Claim 1, wherein the plug (20) is gripped on the collar (18) via gripping forces, which essentially act only in an axial direction and squeeze the fixing surfaces (29) of the plug (20) axially against the faces (19) of the collar (18), and substantially without radial stress components.

3. The radiator element according to Claim 1 or Claim 2, wherein the opening (12) and the plug (20) have a shape that is substantially oval or elliptical and is in any case elongated along a major axis (B), and/or substantially polygonal possibly with rounded sides and/or vertices.

4. The radiator element according to Claim 3, wherein at least one of the fixing surfaces (29) of the plug (20) comprises diametrally opposite surface portions, set at respective diametrally opposite ends of the plug (20) along the major axis (B) and separate from one another.

5. The radiator element according to any one of the preceding claims, wherein the seal ring (21) is a radial seal ring set within the end part (10) and radially set between an external lateral surface (22) of the plug (20) and an internal lateral surface (23) of the end part (10).

6. The radiator element according to any one of the preceding claims, wherein the plug (20) is fixed to the end part (10) via a fixing member (38), which cooperates with a front surface (39) of the plug (20) by bearing thereupon and is mechanically fastened to the end part (10) via at least one engagement portion (31) of its own that is plastically deformed and bent back around at least one corresponding collar portion (18) of the end part (10) to grip the plug (20) against the end part (10).

7. The radiator element according to Claim 6, wherein the fixing member (38) and the plug (20) are constituted by respective pieces, preferably monolithic, distinct and separate, and optionally pre-assembled and/or joined fixedly to one another in any manner, in such a way as to form a unitary body that can be applied to the end part (10) instead of the two separate pieces constituted by the plug (20) and by the fixing member (38).

8. The radiator element according to Claim 7, wherein the plug (20) is made of aluminium and the fixing member (38) is made of sheet metal, for example steel.

9. The radiator element according to any one of Claims 6 to 8, wherein the fixing member (38) comprises a plate (32) that covers at least partially the front surface (39) of the plug (20), and from a perimetral edge of the plate (32) there extend one or more engagement portions (31) that engage the end part (10).

10. A method for closing an end part of a heating radiator element, the radiator element (1) having a body (2) provided with an internal chamber (4) for water circulation and comprising a substantially tubular end part (10), which extends along an axis (A) and has a bottom opening (12) delimited by a radially outer collar (18) provided with a pair of flat and parallel opposite faces (19), substantially orthogonal to the axis (A); the method comprising the step of:

- applying on the end part (10) a plug (20), having a closing portion (24) shaped so as to close the opening (12) and a radially external engagement portion (25) shaped so as to be fitted around the collar (18) and plastically deformable to engage the plug (20) mechanically to the collar (18);

the method being **characterized by** comprising the steps of: .

- pressing a first fixing surface (29a) of the plug (20), carried.internally by the engagement portion (25), against a first face (19a) of the collar (18);
- plastically deforming the engagement portion (25) to bend a second fixing surface (29b) underneath the collar (18) and against a second face (19b) of the collar (18); and
- gripping axially the fixing surfaces (29) against the respective faces (19) of the collar (18) so as to exert on the collar (18) gripping forces applied essentially only in an axial direction and substantially without radial stress components; wherein the flat and parallel opposite faces (19), of the collar (18) are at least partially overlapping in axial projection.

11. The method according to Claim 10, wherein the opening (12) and the plug (20) have a shape that is substantially oval or elliptical and is in any case elongated along a major axis (B), and/or substantially polygonal possibly with rounded sides and/or vertices.

12. A device (50) for closing an end part of a heating radiator element, in particular by mounting a plug on the end part of the radiator element, comprising:

- a clamping group (51) provided with a housing seat (52), which extends about an axis (A) and is shaped for receiving an assembly (53) formed by an end part (10) of the radiator element and by a plug (20) fitted on a radially outer collar (18) of the end part (10); and
- gripping members (56) that are movable parallel to the axis (A) and configured in such a way as to grip the plug (20) against the seat (52) and cause plastic deformation of an engagement portion (25) of the plug (20) housed in the seat (52) and bend a fixing surface (29b) of the plug (20) underneath the collar (18);

the device being **characterized in that** the gripping members (56) are configured in such a way as to grip the plug (20) against the seat (52) and cause plastic deformation of the engagement portion (25) of the plug (20) housed in the seat (52) and bend the fixing surface (29b) of the plug (20) underneath the collar (18) so as to exert on the collar (18) gripping forces applied essentially only in an axial direction and substantially without radial stress components.

13. The device according to Claim 12, wherein the clamping group (51) is shaped so as to clamp the assembly (53) housed in the seat (52) laterally on

opposite sides.

14. The device according to Claim 12 or Claim 13, wherein the clamping group (51) comprises two half-grippers (57) movable with respect to one another in a sliding direction (S) and provided with respective cavities (58) together defining the housing seat (52); the sliding direction (S) being substantially perpendicular to the axis (A).

15. The device according to Claim 14, comprising a detent (59) co-operating with the half-grippers (57) to stop the movement of the half-grippers (57) in a preset position in the sliding direction (S).

Patentansprüche

1. Heizkörperelement (1), das Folgendes umfasst: einen Körper (2), der mit einer Innenkammer (4) für den Wasserumlauf versehen ist und einen im Wesentlichen röhrenförmigen Endteil (10) aufweist, der sich entlang einer Achse (A) erstreckt; einen Stopfen (20), der eine untere Öffnung (12) des Endteils (10) verschließt und mechanisch an den Endteil (10) gekoppelt ist; und mindestens einen Dichtring (21), der zwischen dem Stopfen (20) und dem Endteil (10) eingesetzt ist; wobei der Endteil (10) einen radial äußeren Kragen (18) um die Öffnung (12) herum aufweist, der ein Paar flache und parallele entgegengesetzte Seiten (19) aufweist, die im Wesentlichen orthogonal zu der Achse (A) sind; und der Stopfen (20) mechanisch an dem Kragen (18) befestigt ist; wobei das Heizkörperelement **dadurch gekennzeichnet ist, dass** das Paar flache und parallele entgegengesetzte Seiten (19) sich in der axialen Projektion zumindest teilweise überlappt; und der Stopfen (20) mittels eines Paares paralleler, flacher entgegengesetzter Befestigungsflächen (29) mechanisch an dem Kragen (18) befestigt ist, die einander zugewandt sind und orthogonal zu der Achse (A) sind und axial gegen entsprechende Seiten (19) des Kragens (18) ergriffen und zusammengedrückt sind.

2. Heizkörperelement nach Anspruch 1, wobei der Stopfen (20) auf dem Kragen (18) über Griffkräfte ergriffen ist, die im Wesentlichen lediglich in eine axiale Richtung wirken und die Befestigungsflächen (29) des Stopfens (20) axial und im Wesentlichen ohne radiale Spannungskomponenten gegen die Seiten (19) des Kragens (18) zusammendrücken.

3. Heizkörperelement nach Anspruch 1 oder Anspruch 2, wobei die Öffnung (12) und der Stopfen (20) eine Form aufweisen, die im Wesentlichen oval oder elliptisch ist und auf jeden Fall entlang einer Hauptachse (B) länglich und/oder im Wesentlichen vieleckig, möglicherweise mit abgerundeten Seiten und/oder Ecken, ist.

4. Heizkörperelement nach Anspruch 3, wobei mindestens eine von den Befestigungsflächen (29) des Stopfens (20) diametral entgegengesetzte Flächenabschnitte umfasst, die an entsprechenden diametral entgegengesetzten Enden des Stopfens (20) entlang der Hauptachse (B) und getrennt voneinander eingesetzt sind.

5. Heizkörperelement nach einem der vorhergehenden Ansprüche, wobei der Dichtring (21) ein radialer Dichtring ist, der innerhalb des Endteils (10) eingesetzt ist und radial zwischen einer äußeren Seitenfläche (22) des Stopfens (20) und einer inneren Seitenfläche (23) des Endteils (10) eingesetzt ist.

6. Heizkörperelement nach einem der vorhergehenden Ansprüche, wobei der Stopfen (20) am Endteil (10) über ein Befestigungselement (38) befestigt ist, das mit einer Vorderfläche (39) des Stopfens (20) zusammenwirkt, indem es sich darauf stützt, und mechanisch an dem Endteil (10) über mindestens einen Eingriffsabschnitt (31) von ihm selbst befestigt ist, der plastisch verformt und um mindestens einen entsprechenden Kragenabschnitt (18) des Endteils (10) zurückgebogen ist, um den Stopfen (20) gegen den Endteil (10) zu ergreifen.

7. Heizkörperelement nach Anspruch 6, wobei das Befestigungselement (38) und der Stopfen (20) durch entsprechende Teile gebildet sind, die vorzugsweise monolithisch, verschieden und getrennt und wahlweise vormontiert und/oder auf irgendeine Weise fest miteinander verbunden sind, derart, dass ein einheitlicher Körper gebildet wird, der anstatt der zwei getrennten Teile, die durch den Stopfen (20) und durch das Befestigungselement (38) gebildet sind, an den Endteil (10) angesetzt werden kann.

8. Heizkörperelement nach Anspruch 7, wobei der Stopfen (20) aus Aluminium hergestellt ist und das Befestigungselement (38) aus Blech, zum Beispiel Stahl, hergestellt ist.

9. Heizkörperelement nach einem der Ansprüche 6 bis 8, wobei das Befestigungselement (38) eine Platte (32) umfasst, die die Vorderfläche (39) des Stopfens (20) zumindest teilweise abdeckt, und sich von einer Umfangskante der Platte (32) ein oder mehrere Eingriffsabschnitte (31) erstrecken, die in den Endteil (10) eingreifen.

10. Verfahren zum Verschluss eines Endteils eines Heizkörperelements, wobei das Heizkörperelement (1) einen Körper (2) aufweist, der mit einer Innenkammer (4) für den Wasserumlauf versehen ist und einen im Wesentlichen röhrenförmigen Endteil (10)

umfasst, der sich entlang einer Achse (A) erstreckt und eine untere Öffnung (12) aufweist, die durch einen radial äußeren Kragen (18) abgegrenzt ist, der mit einem Paar flacher und paralleler entgegengesetzter Seiten (19) versehen ist, die im Wesentlichen orthogonal zu der Achse (A) sind; wobei das Verfahren den folgenden Schritt umfasst:

- Ansetzen eines Stopfens (20), der einen Verschlussabschnitt (24), der geformt ist, um die Öffnung (12) zu verschließen, und einen radial äußeren Eingriffsabschnitt (25) aufweist, der geformt ist, um um den Kragen (18) herum eingerichtet zu werden, und plastisch verformbar ist, um den Stopfen (20) mechanisch an dem Kragen (18) in Eingriff zu bringen, an den Endteil (10); wobei das Verfahren **dadurch gekennzeichnet ist, dass** es die folgenden Schritte umfasst:
- Drücken einer ersten Befestigungsfläche (29a) des Stopfens (20), die innen durch den Eingriffsabschnitt (25) getragen wird, gegen eine erste Seite (19a) des Kragens (18);
- plastisches Verformen des Eingriffsabschnitts (25) zum Biegen einer zweiten Befestigungsfläche (29b) unter dem Kragen (18) und gegen eine zweite Seite (19b) des Kragens (18); und
- axiales Ergreifen der Befestigungsflächen (29) gegen die entsprechenden Seiten (19) des Kragens (18), um auf den Kragen (18) Greifkräfte auszuüben, die im Wesentlichen lediglich in eine axiale Richtung und im Wesentlichen ohne radiale Spannungskomponenten angewandt werden; wobei die flachen und parallelen entgegengesetzten Seiten (19) des Kragens (18) sich zumindest teilweise in der axialen Projektion überlappen.

11. Verfahren nach Anspruch 10, wobei die Öffnung (12) und der Stopfen (20) eine Form aufweisen, die im Wesentlichen oval oder elliptisch ist und auf jeden Fall entlang einer Hauptachse (B) länglich und/oder im Wesentlichen vieleckig, möglicherweise mit abgerundeten Seiten und/oder Ecken, ist.

12. Vorrichtung (50) zum Verschluss eines Endteils eines Heizkörperelements, insbesondere durch Anbringen eines Stopfens auf dem Endteil des Heizkörperelements, die Folgendes umfasst:

- eine Klemmgruppe (51), die mit einem Gehäusesitz (52) versehen ist, der sich um eine Achse (A) erstreckt und geformt ist, um eine Baugruppe (53) aufzunehmen, die durch einen Endteil (10) des Heizkörperelements und durch einen Stopfen (20) gebildet ist, der auf einem radial äußeren Kragen (18) des Endteils (10) eingerichtet ist; und
- Greifelemente (56), die parallel zu der Achse (A) bewegt werden können und derart ausgestaltet sind, dass sie den Stopfen (20) gegen den Sitz (52) ergreifen und die plastische Verformung eines Eingriffsabschnitts (25) des Stopfens (20) bewirken, der in dem Sitz (52) untergebracht ist, und eine Befestigungsfläche (29b) des Stopfens (20) unter dem Kragen (18) biegen;

wobei die Vorrichtung **dadurch gekennzeichnet ist, dass** die Greifelemente (56) derart ausgestaltet sind, dass sie den Stopfen (20) gegen den Sitz (52) ergreifen und die plastische Verformung des Eingriffsabschnitts (25) des Stopfens (20) bewirken, der in dem Sitz (52) untergebracht ist und die Befestigungsfläche (29b) des Stopfens (20) unter dem Kragen (18) biegen, um auf den Kragen (18) Greifkräfte auszuüben, die im Wesentlichen lediglich in eine axiale Richtung und im Wesentlichen ohne radiale Spannungskomponenten angewandt werden.

13. Vorrichtung nach Anspruch 12, wobei die Klemmgruppe (51) geformt ist, um die Baugruppe (53), die in dem Sitz (52) untergebracht ist, seitlich auf entgegengesetzten Seiten zu klemmen.

14. Vorrichtung nach Anspruch 12 oder Anspruch 13, wobei die Klemmgruppe (51) zwei Halbgreifer (57) umfasst, die in einer Gleitrichtung (S) in Bezug zueinander bewegt werden können und mit entsprechenden Hohlräumen (58) versehen sind, die zusammen den Gehäusesitz (52) definieren; wobei die Gleitrichtung (S) im Wesentlichen senkrecht zur Achse (A) ist.

15. Vorrichtung nach Anspruch 14, die eine Arretierung (59) umfasst, die mit den Halbgreifern (57) zusammenwirkt, um die Bewegung der Halbgreifer (57) in einer voreingestellten Stellung in der Gleitrichtung (S) anzuhalten.

Revendications

1. Elément de radiateur chauffant (1) comprenant : un corps (2) prévu avec une chambre interne (4) pour la circulation de l'eau et ayant une partie d'extrémité (10) sensiblement tubulaire qui s'étendant le long d'un axe (A) ; un bouchon (20) qui ferme une ouverture inférieure (12) de la partie d'extrémité (10) et est mécaniquement couplé à la partie d'extrémité (10) ; et au moins une bague d'étanchéité (21) placée entre le bouchon (20) et la partie d'extrémité (10) ; la partie d'extrémité (10) ayant un collier radialement externe (18) autour de l'ouverture (12) ayant une paire de faces opposées plates et parallèles (19), sensiblement orthogonales à l'axe (A) ; et

le bouchon (20) étant mécaniquement fixé au collier (18) ; l'élément de radiateur étant **caractérisé en ce que** ladite paire de faces opposées plates et parallèles (19) se chevauchent au moins partiellement en saillie axiale ; et le bouchon (20) est mécaniquement fixé au collier (18) au moyen d'une paire de surfaces de fixation opposées parallèles, plates (29), qui se font face et sont orthogonales à l'axe (A) et sont axialement saisies et comprimées contre les faces (19) respectives du collier (18).

2. Elément de radiateur selon la revendication 1, dans lequel le bouchon (20) est saisi sur le collier (18) via des forces de préhension, qui agissent essentiellement uniquement dans une direction axiale et compriment les surfaces de fixation (29) du bouchon (20) axialement contre les faces (19) du collier (18), et sensiblement sans composantes de tension radiales.

3. Elément de radiateur selon la revendication 1 ou la revendication 2, dans lequel l'ouverture (12) et le bouchon (20) ont une forme qui est sensiblement ovale ou elliptique et est, de toute façon, allongée le long d'un axe majeur (B), et/ou éventuellement sensiblement polygonale avec des côtés et/ou des sommets arrondis.

4. Elément de radiateur selon la revendication 3, dans lequel au moins l'une des surfaces de fixation (29) du bouchon (20) comprend des parties de surface diamétralement opposées, placées au niveau des extrémités diamétralement opposées respectives du bouchon (20) le long de l'axe majeur (B) et séparées l'une de l'autre.

5. Elément de radiateur selon l'une quelconque des revendications précédentes, dans lequel la bague d'étanchéité (21) est une bague d'étanchéité radiale placée à l'intérieur de la partie d'extrémité (10) et placée radialement entre une surface latérale externe (22) du bouchon (20) et une surface latérale interne (23) de la partie d'extrémité (10).

6. Elément de radiateur selon l'une quelconque des revendications précédentes, dans lequel le bouchon (20) est fixé à la partie d'extrémité (10) via un élément de fixation (38) qui coopère avec une surface avant (39) du bouchon (20) en s'appuyant sur ce dernier, et est mécaniquement fixé à la partie d'extrémité (10) via au moins sa partie de mise en prise (31) qui est plastiquement déformée et repliée autour d'au moins une partie de collier (18) correspondante de la partie d'extrémité (10) pour saisir le bouchon (20) contre la partie d'extrémité (10) .

7. Elément de radiateur selon la revendication 6, dans lequel l'élément de fixation (38) et le bouchon (20) sont constitués par des pièces respectives, de préférence monolithiques, distinctes et séparées, et facultativement pré-assemblées et/ou fixement assemblées les une aux autres de n'importe quelle manière, afin de former un corps unitaire qui peut être appliqué sur la partie d'extrémité (10) au lieu des deux pièces séparées constituées par le bouchon (20) et par l'élément de fixation (38).

8. Elément de radiateur selon la revendication 7, dans lequel le bouchon (20) est réalisé à partir d'aluminium et l'élément de fixation (38) est réalisé avec un métal en feuille, par exemple de l'acier.

9. Elément de radiateur selon l'une quelconque des revendications 6 à 8, dans lequel l'élément de fixation (38) comprend une plaque (32) qui recouvre au moins partiellement la surface avant (39) du bouchon (20) et à partir d'un bord périmétral de la plaque (32), s'étendent une ou plusieurs parties de mise en prise (31) qui mettent en prise la partie d'extrémité (10) .

10. Procédé pour fermer une partie d'extrémité d'un élément de radiateur chauffant, l'élément de radiateur (1) ayant un corps (2) prévu avec une chambre interne (4) pour la circulation de l'eau et comprenant une partie d'extrémité (10) sensiblement tubulaire, qui s'étend le long d'un axe (A) et a une ouverture inférieure (12) délimitée par un collier radialement externe (18) prévu avec une paire de faces opposées plates et parallèles (19), sensiblement orthogonales à l'axe (A), le procédé comprend l'étape consistant à :

- appliquer, sur la partie d'extrémité (10), un bouchon (20), ayant une partie de fermeture (24) formée afin de fermer l'ouverture (12) et une partie de mise en prise radialement externe (25) formée afin d'être montée autour du collier (18) et plastiquement déformable pour mettre en prise le bouchon (20) mécaniquement sur le collier (18) ;

le procédé étant **caractérisé en ce qu'**il comprend les étapes consistant à :

- comprimer une première surface de fixation (29a) du bouchon (20), portée intérieurement par la partie de mise en prise (25), contre une première face (19a) du collier (18) ;
- déformer plastiquement la partie de mise en prise (25) pour plier une seconde surface de fixation (29b) sous le collier (18) et contre une seconde face (19b) du collier (18) ; et
- saisir axialement les surfaces de fixation (29) contre les faces (19) respectives du collier (18) afin d'exercer sur le collier (18), des forces de préhension appliquées essentiellement uniquement dans une direction axiale et sensiblement

sans composantes de tension radiales ; dans lequel les faces opposées plates et parallèles (19) du collier (18) se chevauchent au moins partiellement en saillie axiale.

11. Procédé selon la revendication 10, dans lequel l'ouverture (12) et le bouchon (20) ont une forme qui est sensiblement ovale ou elliptique et est, de toute façon, allongée le long d'un axe majeur (B), et/ou sensiblement éventuellement polygonale avec des côtés et/ou des sommets arrondis.

12. Dispositif (50) pour fermer une partie d'extrémité d'un élément de radiateur chauffant, en particulier en montant un bouchon sur la partie d'extrémité de l'élément de radiateur, comprenant :

- un groupe de serrage (51) prévu avec un siège de logement (52), qui s'étend autour d'un axe (A) et est formé afin de recevoir un ensemble (53) formé par une partie d'extrémité (10) de l'élément de radiateur et par un bouchon (20) monté sur un collier radialement externe (18) de la partie d'extrémité (10) ; et
- des éléments de préhension (56) qui sont mobiles parallèlement à l'axe (A) et configurés afin de saisir le bouchon (20) contre le siège (52) et provoquer la déformation plastique d'une partie de mise en prise (25) du bouchon (20) logé dans le siège (52) et plier une surface de fixation (29b) du bouchon (20) sous le collier (18) ;

le dispositif étant **caractérisé en ce que** les éléments de préhension (56) sont configurés afin de saisir le bouchon (20) contre le siège (52) et provoquer la déformation plastique de la partie de mise en prise (25) du bouchon (20) logé dans le siège (52) et plier la surface de fixation (29b) du bouchon (20) sous le collier (18) afin d'exercer, sur le collier (18), des forces de préhension appliquées essentiellement uniquement dans une direction axiale et sensiblement sans composantes de tension radiales.

13. Dispositif selon la revendication 12, dans lequel le groupe de serrage (51) est formé afin de serrer l'ensemble (53) logé dans le siège (52) latéralement sur des côtés opposés.

14. Dispositif selon la revendication 12 ou la revendication 13, dans lequel le groupe de serrage (51) comprend deux demi-pinces (57) mobiles l'une par rapport à l'autre dans une direction de coulissement (S) et prévues avec des cavités (58) respectives définissant ensemble le siège de logement (52) ; la direction de coulissement (S) étant sensiblement perpendiculaire à l'axe (A).

15. Dispositif selon la revendication 14, comprenant un encliquetage (59) coopérant avec les demi-pinces (57) afin d'arrêter le mouvement des demi-pinces (57) dans une position prédéterminée dans la direction de coulissement (S).

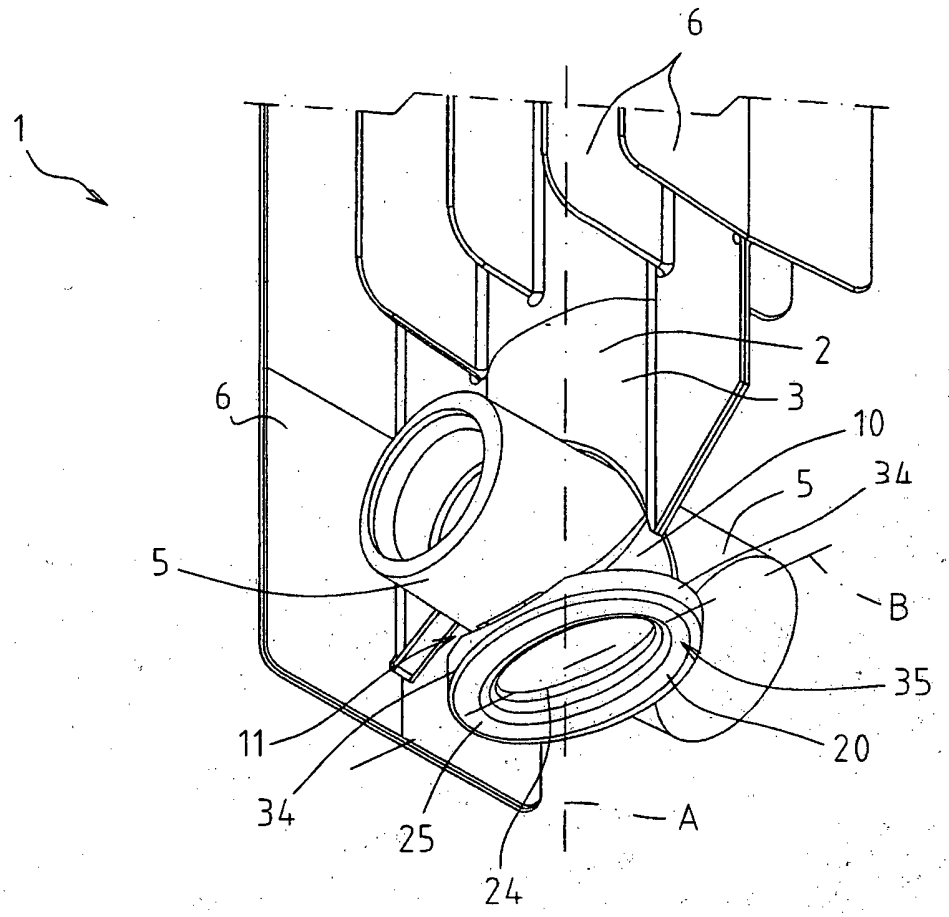

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Fig. 1

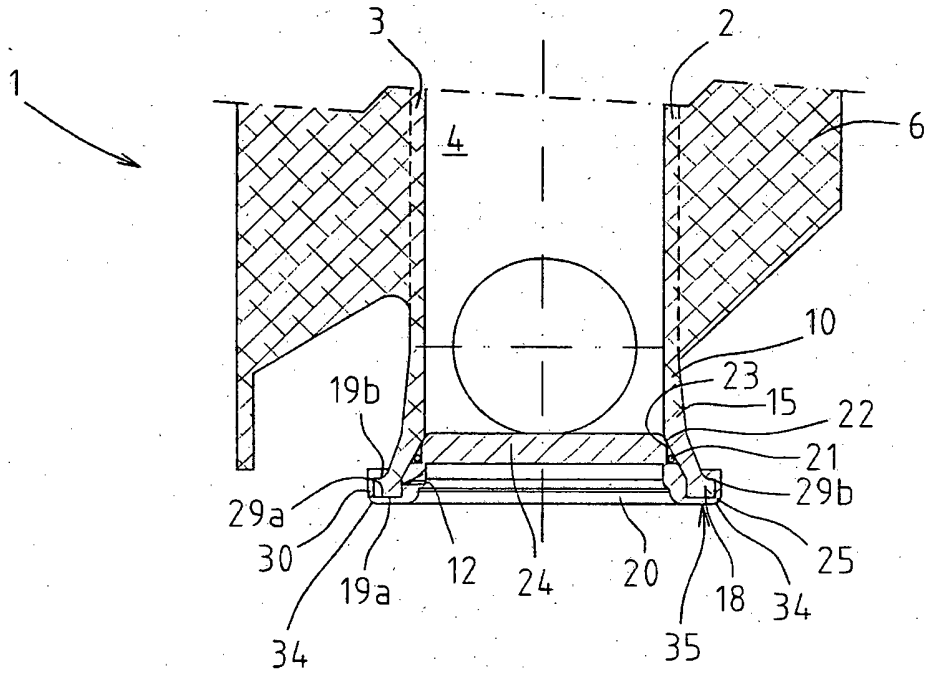

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Fig. 2

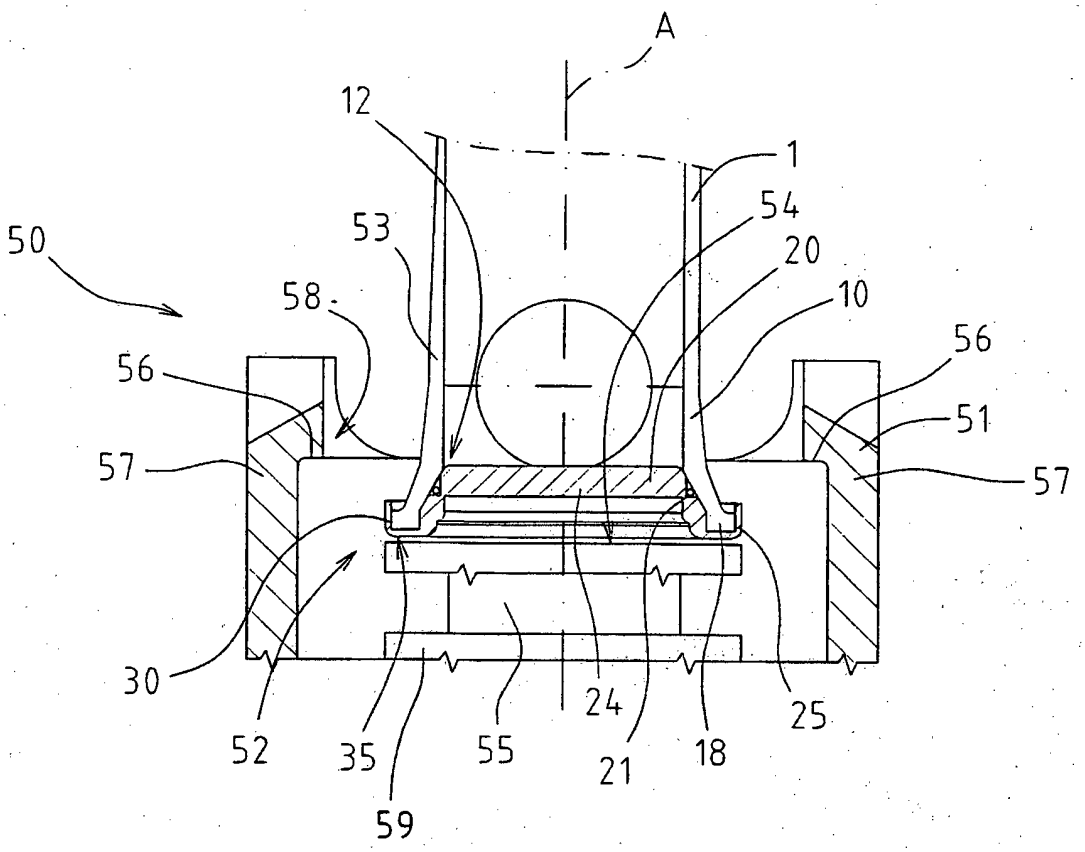

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Fig. 3

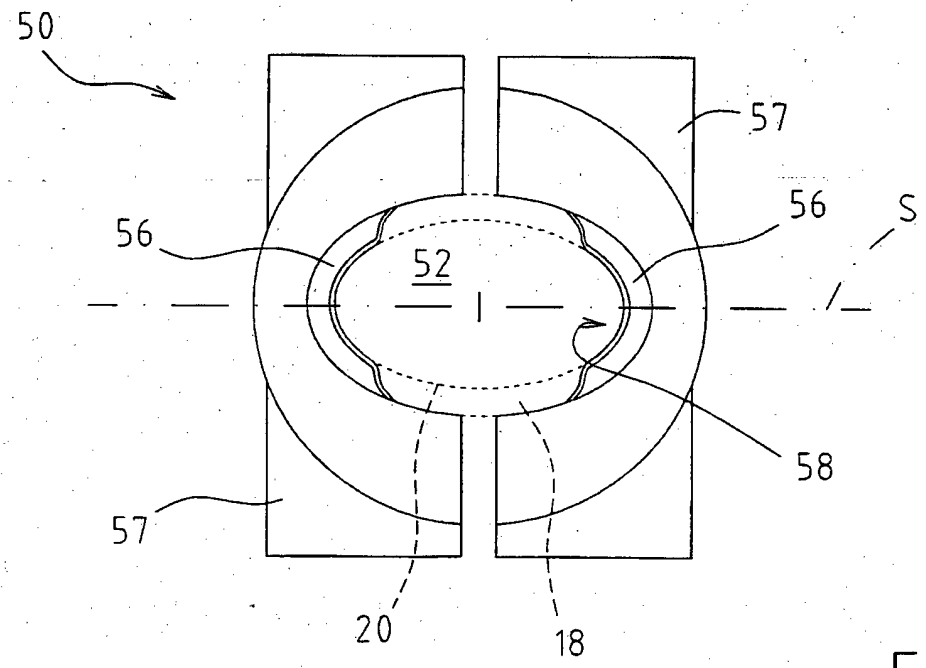

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Fig. 4

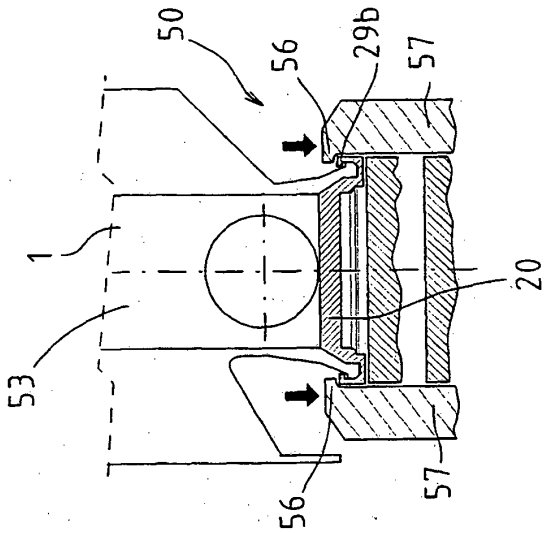


Fig. 7

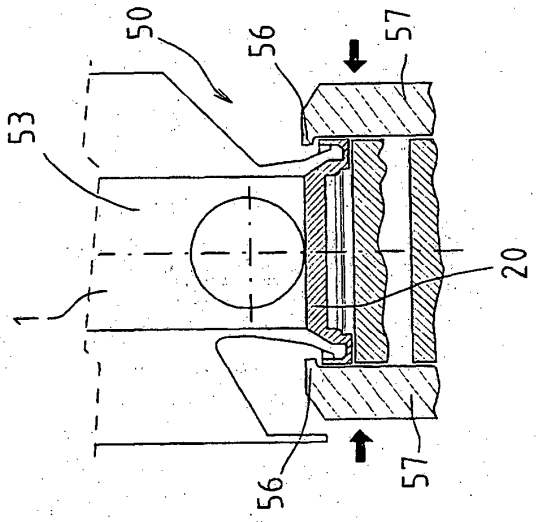


Fig. 6

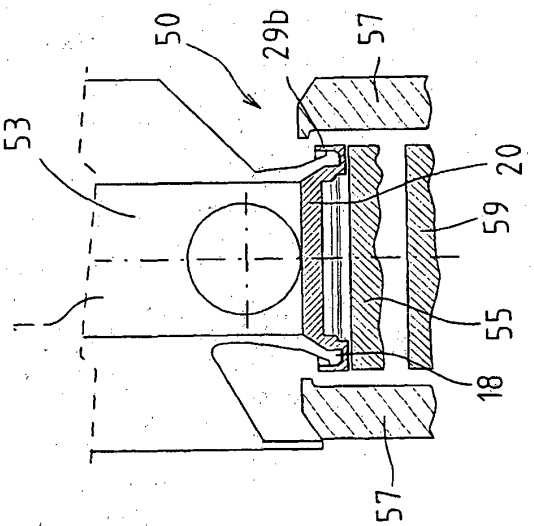


Fig. 5

FIG. 8

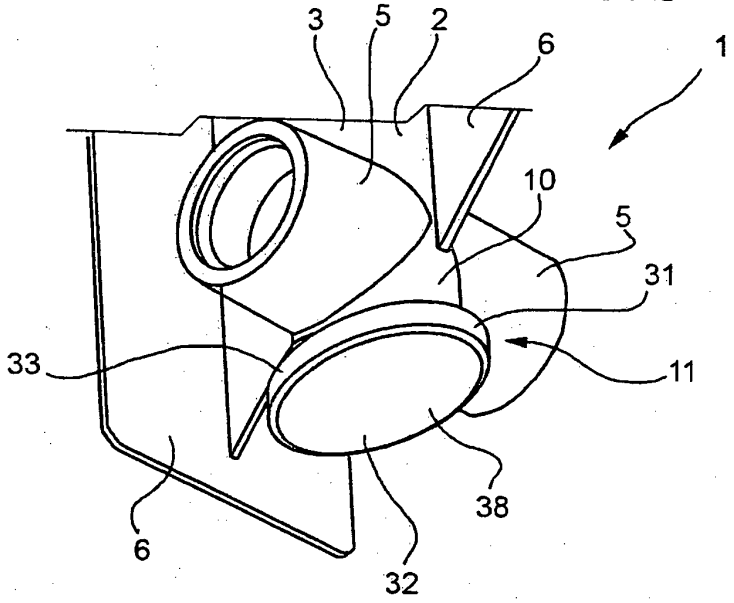

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FIG. 9

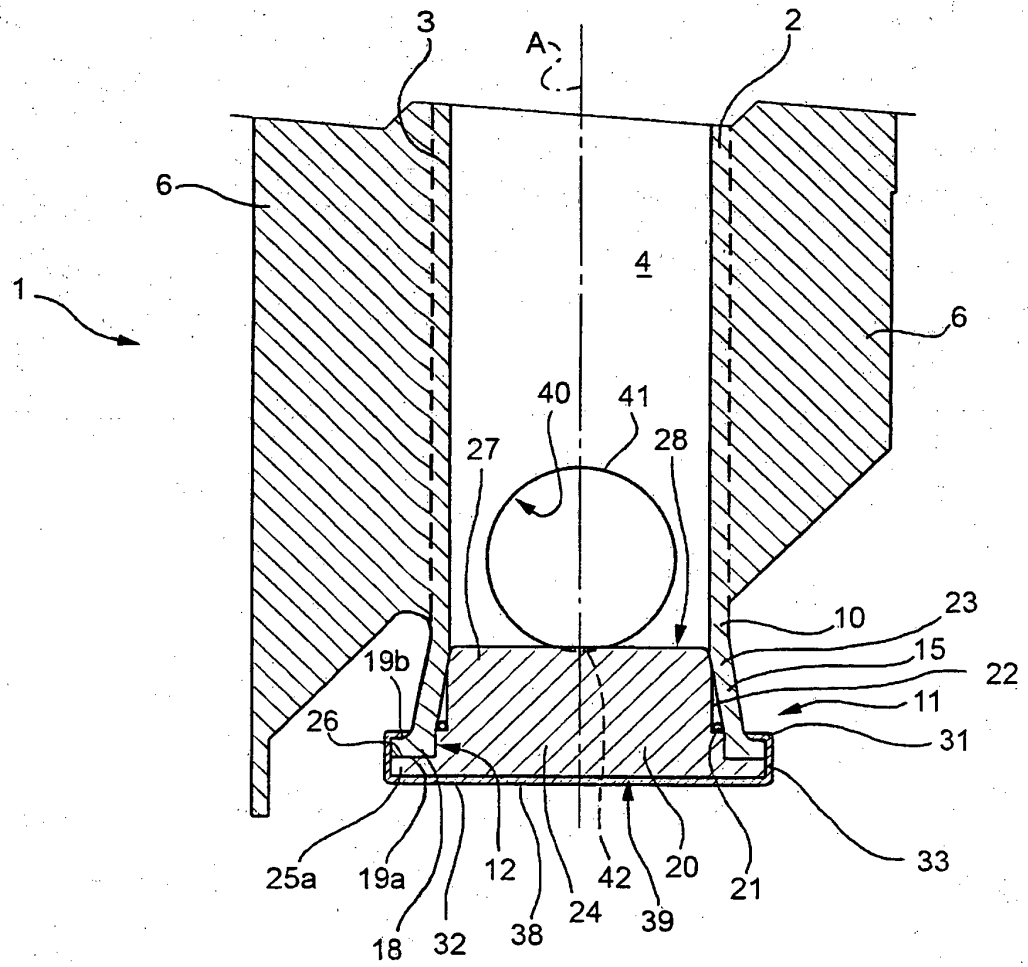

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FIG. 10

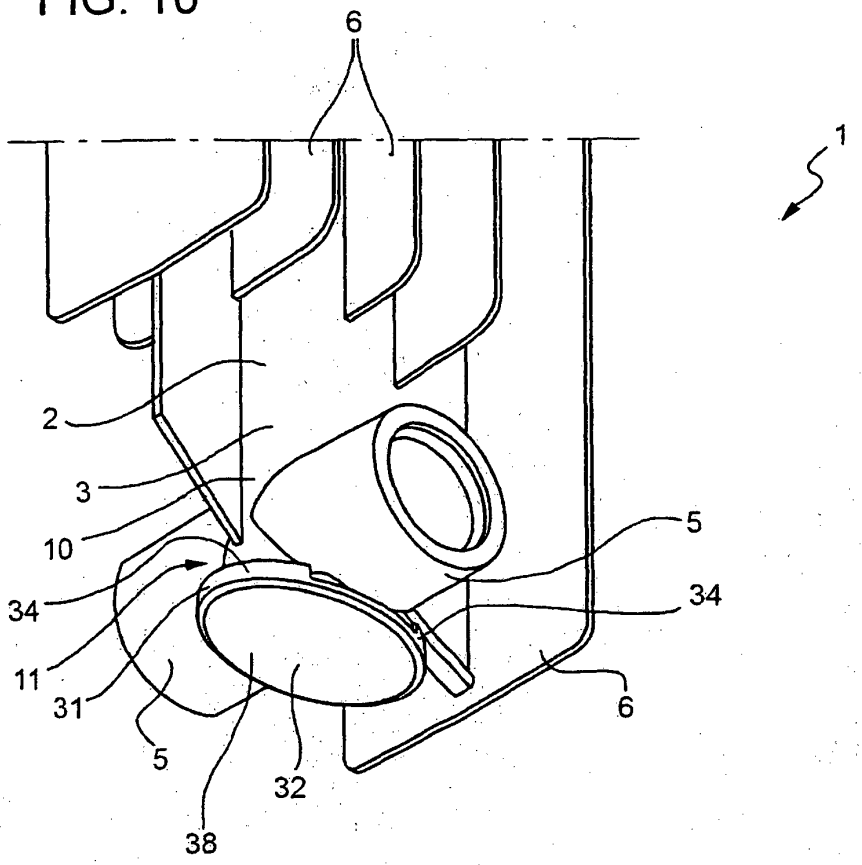
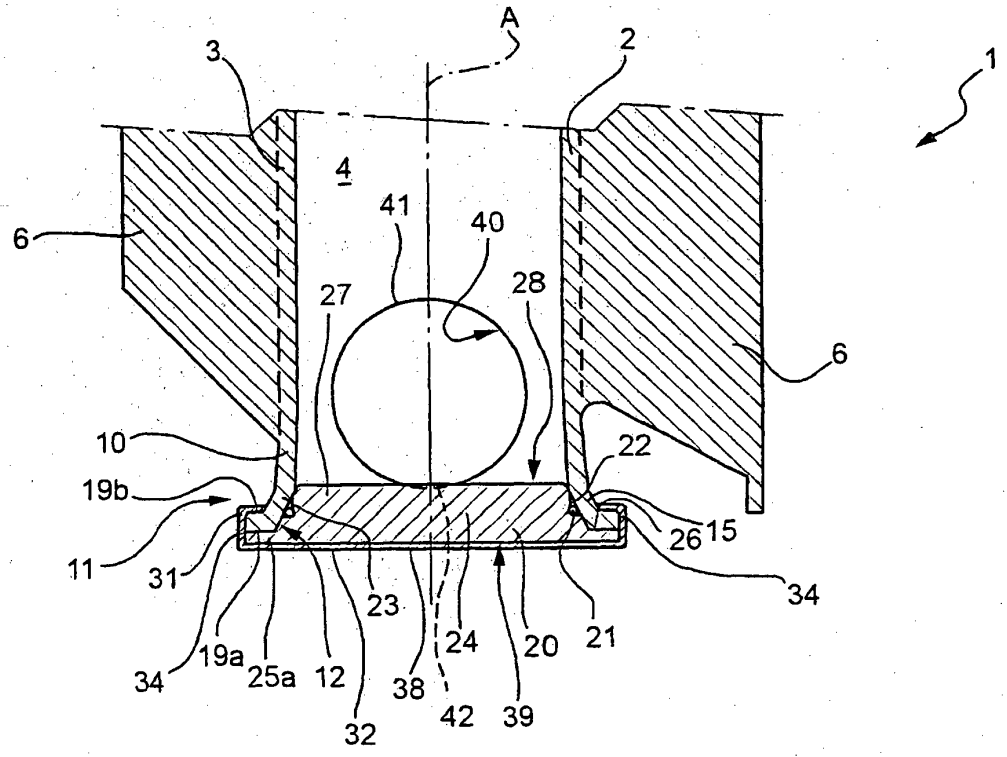

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FIG. 11


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Patent documents cited in the description

- WO 2007138627 A1 **[0007]**