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(54) A sealing cap for radiator elements

(57) A sealing cap (4) for radiator elements (8), suitable for hermetically sealing an end (12) of radiator elements (8). The cap (4) is mounted with a snap-wise connection, obtained by a connecting element (32, 76) without using threaded connecting means. The fluid seal is ensured by a seal (28) associated to the cap (4) which therefore does not need the interposition of adhesives or sealers between the cap (4) and the radiator element (8).

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Description

[0001] The present invention relates to a sealing cap for radiator elements suitable for hermetically sealing the ends of the fluid feeding channels of the radiators.

[0002] In the art, the use of sealing caps provided with threaded connections is known.

[0003] In particular, an internal threading is obtained relative to the cylindrical duct or hole to be closed, and the cap is screwed therein, which at a side facing outwards exhibits a slot, for example with hexagonal section, for inserting an Allen screw, suitable for allowing the screwing and the tightening of the cap into the respective seat. The seal is ensured by sealing fluids such as Loctite® and the like, with which the cap threading is covered.

[0004] The caps of the prior art exhibit a series of disadvantages. In the first place, the internal threading operation on the radiator element seat is slow and expensive to carry out; moreover, the screwing does not ensure that at the travel end, the external surface of the cap is perfectly flush with the radiator element. In this way, proper coating of the radiator element is not ensured, even at the tightening wrench seat. Finally, the sealant laying further increases the assembly times and costs.

[0005] The need of a cap which should allow closing radiator elements in a simple, quick and inexpensive manner is therefore felt.

[0006] The object of the present invention is to provide a cap capable of solving the problems mentioned above with reference to the prior art.

[0007] Such object is achieved by a cap according to claim 1.

[0008] Further features and the advantages of the cap according to the present invention will appear from the following description of a preferred non-limiting embodiment of such cap, wherein:

[0009] figure 1 shows a front exploded view of a sealing cap according to an embodiment of the invention;

[0010] figure 2 shows a front view of the sealing cap of figure 1, in an assembled configuration;

[0011] figure 3 shows a perspective view of a radiator element suitable for receiving a sealing cap according to the present invention;

[0012] figure 4 is a side view, from the side of arrow IV, of the radiator element of figure 3;

[0013] figure 5 shows a front partial section view of the sealing cap of figure 1, in an assembled configuration into a radiator element.

[0014] Elements or parts of elements in common between the embodiments described below are referred to with the same reference numerals.

[0015] With reference to the annexed figures, reference numeral 4 globally denotes a cap for radiator elements 8, in particular suitable for sealing an open end 12 of circulation channels 16 of the radiator elements 8, suitable for allowing the internal circulation of a fluid, such as hot water, for heating rooms.

[0016] Preferably, said channels 16 and said open ends 12 are cylindrical, and the open ends 12, at an internal side wall 18 of channel 16, exhibit an inlet flaring 20 for caps 4, as illustrated in figures 3 and 4.

[0017] Cap 4 comprises a cap body 24, a seal 28 and a connecting element 32.

[0018] The cap body 24 has a generally cylindrical shape and exhibits a symmetry axis X. In an assembled configuration of cap 4 on end 12, the symmetry axis X of the cap body 24 overlaps on an end symmetry axis Y.

[0019] Relative to an axial direction, parallel to the symmetry axis X, the cap body 24 extends between a collar 36 and a bottom 40, axially opposite to each other.

[0020] Collar 36, preferably axial-symmetrical, is suitable for being inserted into end 12 of the circulation channel 16. Preferably, collar 36 exhibits a maximum diameter smaller than the diameter of end 12 of channel 16, said diameters being measured relative to planes perpendicular to the symmetry axes X and Y respectively.

[0021] The cap body 24 further comprises a conical portion 44, preferably truncated-cone, which enlarges moving from collar 36 towards bottom 40, up to reaching a diameter substantially equal to the diameter of end 12 of channel 16.

[0022] The conical portion 44 and bottom 40 determine and axially delimit a seat 48, of toroidal shape, having a seat diameter smaller than the maximum diameter of the conical portion 44, and therefore smaller than the diameter of end 12 of channel 16. The seat has an axial height 50, that is, the axial distance between bottom 40 and the conical portion 44, and a radial depth 51, intended as depth relative to a plane perpendicular to the symmetry axis X.

[0023] Bottom 40 comprises an internal portion 52, axially facing the conical portion 44. The internal portion 52 preferably exhibits the same diameter as the conical portion 44 and equal to the diameter of end 12 of channel 16.

[0024] Bottom 40 comprises a stop ring 56, having a diameter slightly larger than the diameter of the conical portion 44.

[0025] The stop ring 56 is jointed to the internal portion 52 by a flaring 60 facing collar 36 and counter shaped relative to the inlet flaring 20 of end 12 of channel 16.

[0026] The stop ring 56 advantageously makes a travel end to the axial penetration of cap 4 inside end 12 of channel 16. On the side opposite seat 48, the stop ring 56 exhibits a flat wall 64, so that following the introduction of cap 4 into end 12 of channel 16, such flat wall 64 is substantially flush with the radiator element 8.

[0027] On the end of collar 36, the cap body 24 exhibits a hole 68 coaxial to the symmetry axis X.

[0028] Said hole 68 is blind, that is, does not axially crosses the entire cap body 24, but for example axially reaches seat 48. In any case, hole 68 does not go through the stop ring 56 of bottom 40.

[0029] Seal 28 has a toroidal shape, of the O-ring type, and exhibits an inner diameter at rest that is equal to or smaller than the diameter of seat 48 of the cap body 24.

[0030] A thickness 72 of seal 28, intended as the di-

ameter of the circular section of the seal relative to a section plane parallel to the symmetry axis X, is substantially equal to the axial distance between the internal portion 52 of bottom 40 and the conical portion 44, that is, it is equal to the axial height of seat 48. Moreover, thickness 72 of seal 28 is preferably greater than the radial depth 51 of seat 48.

[0031] The seal is made of an elastomeric material and preferably of a silicone rubber.

[0032] Silicone stands up to temperatures of about 260°C and substantially keeps its elasticity unaltered over time.

[0033] After being assembled, the radiator elements 8 are normally subject to a pickling step, with degreasing and de-oxidising substances or through immersion in slightly acid baths. In fact, pickling serves for cleaning the metal surfaces of the elements themselves, basically made of aluminium, for allowing good coating thereof. Coating is carried out in special baths and then the coated elements are annealed. Silicone rubbers tend to pollute the coating baths.

[0034] Advantageously, seals 28 of cap 4 according to the present invention are pre-treated undergoing a dry furnace treatment at the temperature of about 200-210°C, for at least 12 hours; preferably, for about 24 hours. Thanks to this thermal treatment, after being assembled on caps 4 and then on elements 8, the latter can be immersed in the coating baths without the occurrence of any polluting phenomena of the baths by silicone particles.

[0035] The connecting element 32, according to an embodiment, comprises a washer 76, having a hollow central ring 78 from which at least one tongue 80, preferably a plurality of tongues 80, equal and equally angularly spaced from one another, radially develop. The cavity of the hollow central ring 78 has a diameter larger than or equal to the diameter of collar 36, for allowing the introduction of washer 76 about the collar.

[0036] Tongues 80 are separated from each other by slots 82, for example having circle arc pattern.

[0037] Preferably, washer 76 is not planar, but exhibits a spherical cap pattern.

[0038] Advantageously, washer 76 is made of stainless steel, subsequently subject to multiple hardening, so as to ensure suitable stiffness thereof.

[0039] Washer 76 may also be made of steel and then hardened.

[0040] Preferably, the sealing cap 24 comprises pre-loading means 86 inserted between the conical portion 44 and washer 76. Preferably, said pre-loading means 86 comprise an elastic ring 90, such as an O-ring, for example of polymeric or metal material, inserted in abutment on the conical portion 44 so as to influence tongues 80 of washer 76 to open, that is, to move away from the conical portion 44.

[0041] The assembly of the cap according to the invention shall now be described.

[0042] At first, cap 4 is assembled by fitting the seal 28 in the relevant seat 48 of the cap body 24. Seal 28 is elastic and can thus be radially enlarged so as to be axially positioned on seat 48. By releasing the seal, the same elastically recovers the radial dimension thereof, abutting on seat 48.

[0043] Thanks to the fact that thickness 72 of seal 28 is greater than the radial depth of seat 48, along the circumference of seal 28, a seal portion protrudes from seat 48 so as to interfere with the internal wall 18 of end 12 of the radiator element 8, following the introduction of cap 4.

[0044] The elastic ring 90 is then fitted on the conical portion 44 and washer 76 is fitted coaxially relative to collar 36 of the cap body 24, positioning the same washer with tongues 80 inclined towards the conical portion 44 of the cap body 24.

[0045] Through a punch 84, for example conical as illustrated in figure 2, axially forced against hole 68 of the cap body 24, collar 36 is deformed so as to plastically squash it. Under the compression action of punch 84, collar 36 takes on a flared section, in particular as an isosceles trapezium, relative to a section plane passing by the symmetry axis X of the cap. The flaring thus forms an undercut 88 which locks the washer in axial position between the collar and the conical portion. Collar 36 thus deformed forms a sort of rivet.

[0046] Cap 4 thus assembled can then be inserted on end 12 of the radiator element 8, as illustrated in figure 5.

[0047] In particular, cap 4 is positioned coaxially to end 12 fitting the conical portion on flaring 20 of end 12, and cap 4 is pushed towards the end itself, for example dealing a hammer blow on the flat wall 64 of bottom 40.

[0048] Following the axial thrust on cap 4, tongues 80 of washer 76 elastically bend towards the conical portion 44, as illustrated in figure 5, and slightly incise the internal side wall 18 of end 12, usually made of aluminium, making some notches 92 on the wall itself. In fact, aluminium is more flexible and soft then the steel of washer 76. The presence of the pre-loading means 86, such as the elastic ring 90, influences tongues 80 to elastically open and to jib on notches 92, ensuring the locking of cap 4 into the seat.

[0049] Thanks to the elasticity of tongues 80, cap 4 therefore fits snap-wise onto end 12 until the stop ring 56 abuts against the inlet flaring 20 of end 12. When such travel end has been reached, the flat wall 64 of bottom 40 is perfectly flush with the end of the radiator element 8.

[0050] A thrust action from inside cap 4, that is, on collar 36 and on the conical portion 44, due for example to the pressure of the fluid contained in the radiator element 8, is contrasted by tongues 80 which, jibbing on notches 92 made on the internal wall 18 of end 12, oppose the extraction of the cap itself.

[0051] Seal 28 is radially and elastically compressed between seat 48 and the internal side wall 18 of end 12, ensuring a hermetical fluid seal. In particular, seal 28 elastically deforms, filling seat 48 entirely.

[0052] As can be understood from the description, the

sealing caps according to the invention allow overcoming the disadvantages of the prior art caps.

[0053] In fact, the sealing caps according to the invention require no internal threading of the end of the radiator element channel.

[0054] The cap is inserted by exerting a simple axial pressure, for example with a hammer, so as to obtain a snap-wise connection.

[0055] After the assembly, the external surface of the cap is perfectly flush with the edges of the channel to be sealed. In this way, proper coating of the radiator element can be obtained, without unaesthetic smudges.

[0056] Moreover, the external surface of the cap is free from holes of seats for the introduction of wrenches; in this way, better coating of the cap itself is ensured.

[0057] Unusually, the cap according to the invention allows a quick and inexpensive assembly operation.

[0058] The cap assembly does not require gluing or any kind of screwing, but a simple pressure, for example with a hammer.

[0059] The operation for sealing the ends of the radiator element therefore is especially simple, quick and inexpensive to carry out.

[0060] Of course, a man skilled in the art may make several changes and adjustments to the sealing caps described above in order to meet specific and incidental needs, all falling within the scope of protection defined in the following claims.

Claims

1. A sealing cap (4) for radiator elements (8), suitable for hermetically sealing an end (12) of a channel (14) for feeding fluid into the radiator element (8), comprising a cap body (24) suitable for being inserted at least partly into said end (12), **characterised in that** said cap (4) comprises

   - a connecting element (32), associable to the cap body (24), suitable for determining a snap-wise coupling with an internal side wall (18) of said end (12), so as to form a joint of the cap (4) relative to the end (12) and
   - a sealing element (28) suitable for ensuring the fluid seal of the cap (4) relative to a fluid circulating into said feeding channel (14).

2. A sealing cap (4) according to claim 1, wherein the cap body (24) has a generally cylindrical shape and exhibits a symmetry axis (X) which in an assembled configuration on the end (12), overlaps on an end symmetry axis (Y).

3. A sealing cap (4) according to claim 1 or 2, wherein the cap body (24) extends between a collar (36), suitable for being inserted in the end (12) of the circulation channel (16), and a bottom (40), axially opposite to each other, relative to an axial direction, parallel to the symmetry axis (X).

4. A sealing cap (4) according to any one of the previous claims, wherein the cap body (24) comprises a conical portion (44) which enlarges moving from the collar (36) towards the bottom (40), up to reaching a diameter substantially equal to the diameter of the end (12) of the channel (16), said conical portion (44) forming an inlet for the introduction of the cap (4) in the end (12).

5. A sealing cap (4) according to claim 4, wherein the conical portion (44) and the bottom (40) determine and axially delimit a seat (48), suitable for seating said sealing element (28).

6. A sealing cap (4) according to any one of claims 3 to 5, wherein the bottom (40) comprises a stop ring (56), having a larger diameter than the diameter of the conical portion (44) so as to form a travel end to the introduction of the cap (4) into the end (12).

7. A sealing cap (4) according to claim 6, wherein the stop ring (56) exhibits a flaring (60) facing the collar (36) and counter shaped relative to an inlet flaring (20) of the end (12) of the channel (16).

8. A sealing cap (4) according to any one of claims 3 to 7, wherein on the side opposite the seat (48), the bottom (40) exhibits a flat wall (64), so that following the introduction of the cap (4) into the end (12), such flat wall (64) is substantially flush with the radiator element (8).

9. A sealing cap (4) according to any one of claims 3 to 8, wherein the cap body (24) exhibits, on the end of the collar (36), a blind hole (68), suitable for receiving a punch (84) for deforming the collar and blocking the connecting element (32) in position on the cap body (24).

10. A sealing cap (4) according to any one of the previous claims, wherein the connecting element (32) is locked to the cap by an undercut (88) on the cap body (24).

11. A sealing cap (4) according to any one of the previous claims, wherein the connecting element (32) comprises a washer (76) having a hollow central ring (78) from which at least one tongue (80) radially develops.

12. A sealing cap (4) according to claim 11, wherein the connecting element (32) comprises a plurality of tongues 80, equal and equally angularly spaced from one another.

13. A sealing cap (4) according to claim 11 or 12, wherein the hollow central ring (78) has a diameter larger than or equal to the diameter of the collar (36) for allowing the introduction of the washer (76) about the collar (36).

14. A sealing cap (4) according to claim 11, 12 or 13, wherein the washer (76) exhibits a spherical cap pattern.

15. A sealing cap (4) according to any one of claims 11 to 14, wherein the washer (76) is made of stainless steel, subsequently subject at least to a hardening step.

16. A sealing cap (4) according to any one of claims 11 to 15, wherein the tongues (80) are elastically hinged relative to the central ring (78), so that following the axial thrust on the cap (4), they elastically bend towards the conical portion (44), incising the internal side wall (18) of the end (12) making notches (92) on the wall itself.

17. A sealing cap (4) according to any one of claims 11 to 16, comprising pre-loading means (86) inserted between the conical portion (44) and the washer (76) so as to influence the tongues (80) of the washer (76) to open.

18. sealing cap (4) according to claim 17, wherein said pre-loading means (86) comprise an elastic ring (90) inserted in abutment on the conical portion (44).

19. A sealing cap (4) according to claim 18, wherein said elastic ring is made of a polymeric or metal material.

20. A sealing cap (4) according to any one of the previous claims, wherein the connecting element (32) is made of a harder material than the material of the internal side wall (18) of the channel (16), so that in the cap introduction step, the connecting element (32) makes notches (92) in the internal side wall (18).

21. A sealing cap (4) according to any one of the previous claims, wherein the sealing element (28) has a toroidal shape and exhibits an inner diameter at rest equal to or smaller than the diameter of the seat (48) of the cap body (24).

22. A sealing cap (4) according to any one of the previous claims, wherein the sealing element (28) is made of a silicone rubber.

23. A sealing cap (4) according to any one of the previous claims, wherein the sealing elements (28) are pretreated undergoing a dry furnace treatment at the temperature of about 200-210C, for at least 12 hours.

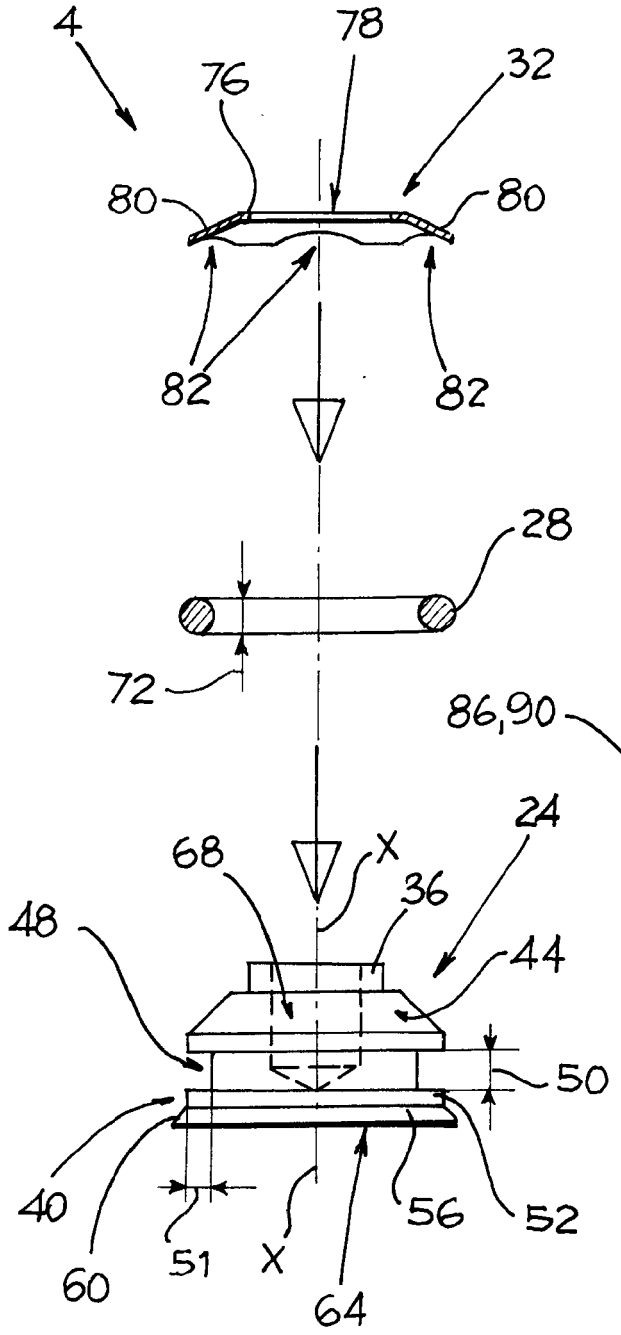
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Fig.1

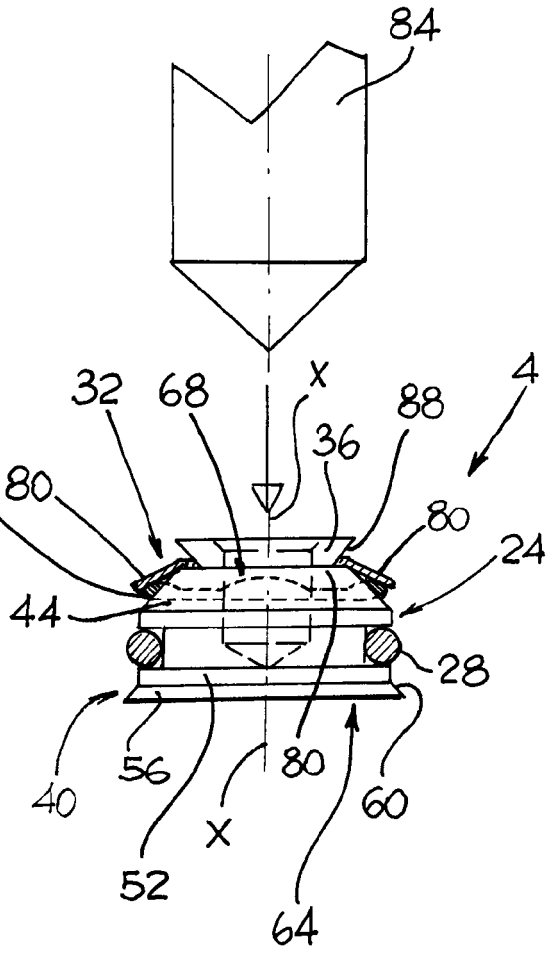
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Fig.2

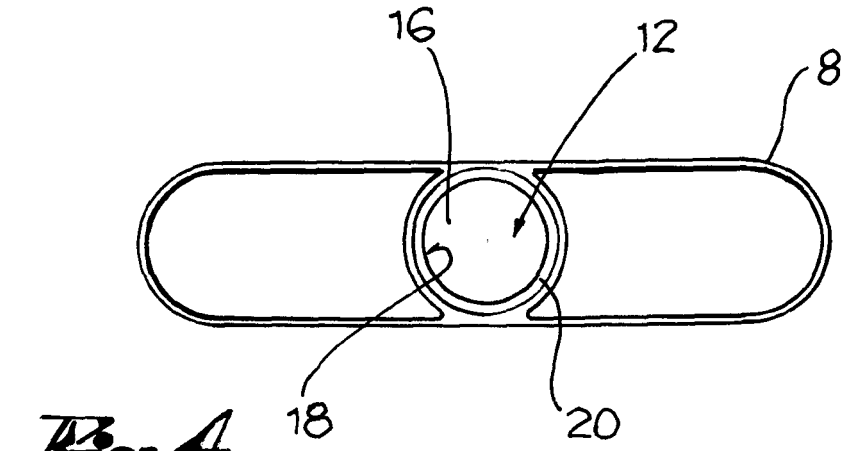

Fig. 4

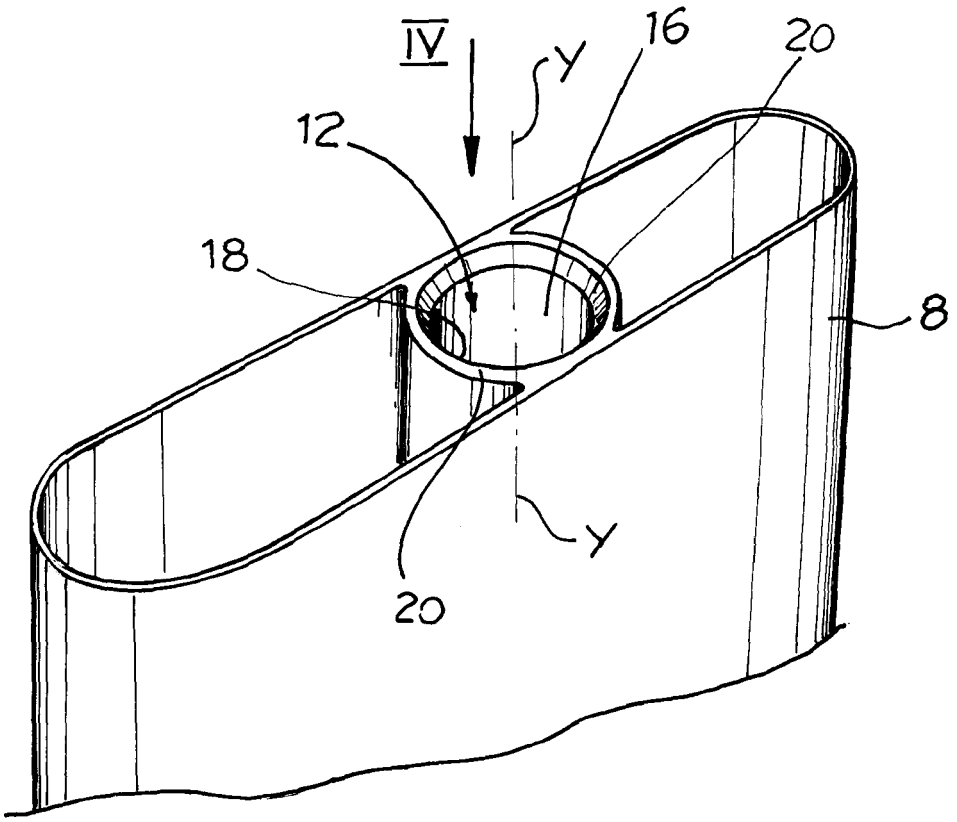

Fig. 3

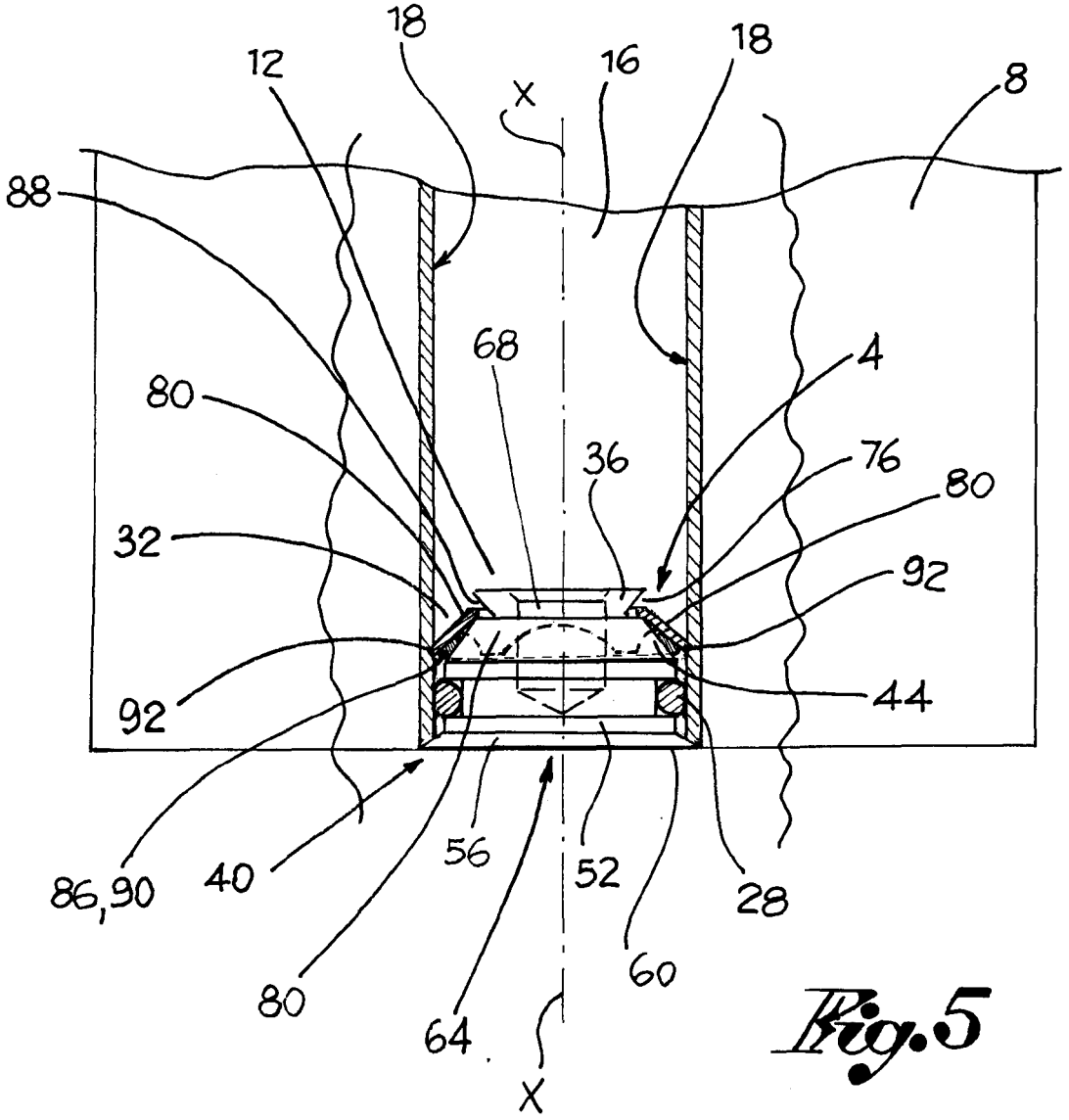
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Fig.5