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(54) Spacer element for panel radiator and method of making the same

(57) Spacer element (10) able to be inserted between the walls (32) of a panel (31) of a heat radiator (30) in correspondence with an aperture (34) for the transit of the heat carrier fluid circulating between the walls (32). The spacer element (10) comprises a substantially cylindrical body (11) provided both with an axial hole (13), which affects at least a part of its thickness and which faces towards the transit aperture (34), and also a lateral

aperture (15) which branches off radially from the axial hole (13) and communicates therewith. The body (11) in turn comprises two metal pieces (18,19) of substantially cylindrical shape, coaxially attached one on the other, of which at least one is made of sintered material and in which the lateral aperture (15) is made and which also comprises at least two radial holes (16) or hollows (17), each of which branches off radially from said axial hole (13) and communicates therewith.

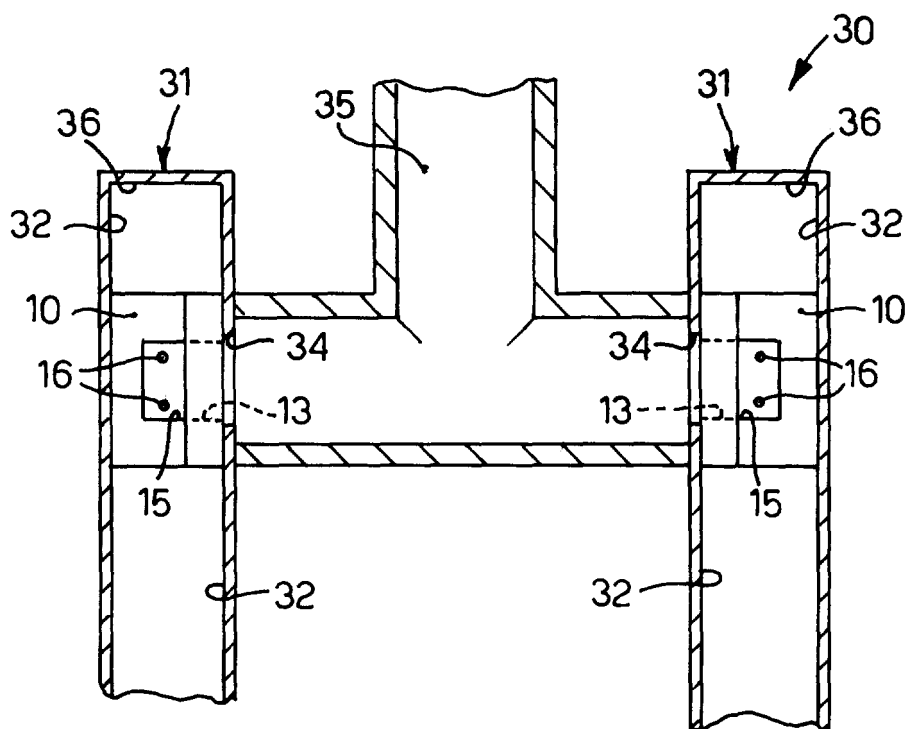


fig. 2

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method to make a spacer element and the spacer element thus made, able to be inserted between the walls of a panel of a heat radiator, so as to prevent said walls being crushed during the steps to connect them under pressure with a relative connection pipe.

BACKGROUND OF THE INVENTION

[0002] A heat radiator is known, such as for example a hot water heating plant, a heated towel rail or other, comprising one or more panels shaped so as to define inside them a compartment substantially closed by two walls, inside which a heat carrier fluid circulates.

[0003] Such panels are hydraulically connected by interposing, in twos, a connection element which is pressure welded to the relative panels, in order to guarantee the watertight seal of the connection.

[0004] To prevent the radiating panels from deforming during the pressure welding steps, it is known to insert inside them a spacer element which contrasts the pressure exerted, and thus prevent the walls of the panel from deforming.

[0005] This known spacer element has a cylindrical body, which has an axial hole that during use faces towards the connection element, and a lateral aperture arranged radially with respect to the axial hole and communicating therewith in order to achieve a hydraulic continuity between the connection element and the inner compartment of the panel.

[0006] It is known to achieve on said body a lateral aperture with a maximum extension equal to the half of the lateral surface of the body, so that by suitably orienting the spacer element in the panel, it is possible to direct and limit the flow of heat carrier fluid towards the central part of the compartment of the panel.

[0007] This known spacer has the disadvantage however that it completely cancels the secondary flow of the heat carrier fluid in the zones opposite said lateral aperture, that is, towards the corners and edges of the panel, concentrating the distribution of the heat carrier fluid only in the central part of the compartment.

[0008] The method to achieve the known spacer provides operations to bend and draw a metal sheet and has the disadvantage that it requires many steps to work and deform the sheet.

[0009] From DE-A-25 06 778 it is known a spacer for a heating radiator constituted by a cylindrical metal piece, having a central hole and peripheral radial apertures, and by a metal washer which is connected to one lateral surface of the cylindrical metal piece to laterally close the peripheral radial apertures. This known spacer is quite complicated to be manufactured and requires a lot of working steps.

[0010] From GB-A-2 271 526 it is known a method to manufacture a spacer for a central heating radiator, by compacting particulate material in a die comprising a plate having a vertical cavity, a top punch and a bottom punch. An inner core rod forms a central passageway in the spacer and side core rods form the side holes. This known manufacturing method has the disadvantage to be too complicated and to require a lot of working steps.

[0011] One purpose of the present invention is to perfect a method to achieve a spacer element which is simple and requires a limited number of working steps in order to achieve it.

[0012] Another purpose of the present invention is to achieve a spacer element that, inserted inside a panel of a heat radiator, will allow to obtain a better distribution of the heat carrier fluid in the compartment of the panel, obtaining a greater heat yield with respect to that obtainable with the state of the art.

[0013] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0014] The present invention is set forth and characterized in the main claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0015] In accordance with the above purposes, a method according to the present invention is used to achieve a spacer element able to be inserted between the walls of a panel of a heat radiator in correspondence with a transit aperture.

[0016] The transit aperture is arranged in correspondence with a connection element, for example a connector, through which a heat carrier fluid flows, for example hot water, steam, or other hot fluid, which circulates between the walls of the panel.

[0017] According to a characteristic of the present invention, the method comprises at least the steps as indicated as follows.

[0018] In a first step, a first metal piece is made by sintering, substantially cylindrical in shape and comprising at least a first axial hole and at least a first part of a lateral aperture which branches off radially from the axial hole.

[0019] In a second step, a second metal piece is made with a substantially cylindrical shape and the diameter substantially equal to that of the first metal piece.

[0020] The first and the second step can be performed simultaneously, or one after the other irrespective of the order of performance.

[0021] In a third step, the first and the second metal piece are arranged one on the other and attached together, for example by welding, coaxially so as to define a body.

[0022] Thanks to the method according to the present

invention, by means of the sintering process it is possible to make a spacer element simply and with a number of working steps which is limited with respect to the state of the art.

[0023] The spacer element according to the present invention therefore comprises a body defined in turn by at least two substantially cylindrical metal pieces, attached coaxially one on the other and at least one of which is made of sintered material.

[0024] According to a variant of the invention, both the metal pieces are made of sintered material and, according to another variant of the invention, one of the two metal pieces consists of a metal washer.

[0025] The sintering process performed according to the invention provides to use metal particles which are pressed in two molds: a first mold to define the first metal piece, and a second to define the second metal piece.

[0026] The body comprises an axial hole, which affects at least a part of its thickness and can be blind or through, and a lateral aperture which branches off radially from the axial hole and which communicates with the latter.

[0027] According to a preferential embodiment of the invention, the spacer element also comprises, in addition to the lateral aperture, at least two radial holes made in the body, each of which branches off radially from the axial hole and communicates with the latter.

[0028] According to a variant of the present invention, on the upper surface of the first metal piece, which during use faces the second metal piece, instead of radial holes, at least two hollows are made, with a substantially semi-circular shape.

[0029] Each hollow branches off radially from the axial hole and communicates with the latter.

[0030] Each of the radial holes, or hollows, has a cross section of a size less than that of the lateral aperture.

[0031] Two semi-circular zones are defined on the body, separated from each other by a first median transverse plane "Y", so that the lateral aperture is arranged in a first semi-circular zone and the radial holes, or hollows, are arranged in a second semi-circular zone.

[0032] Moreover, the radial holes, or hollows, are arranged on opposite sides with respect to a second median transverse plane "X" passing through the lateral aperture and substantially orthogonal to the first median transverse plane "Y".

[0033] Thanks to this characteristic, the spacer element according to the invention, inserted inside a panel of a heat radiator, allows to obtain a more efficient distribution of the heat carrier fluid both in the central zone of the compartment of the panel, and also in the zones opposite the lateral aperture, that is, towards the corners and edges of the panel.

[0034] According to the invention, the lateral aperture has a substantially polygonal or curvilinear cross section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] These and other characteristics of the present

invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a lateral section of a panel of a heat radiator in which a spacer element according to the present invention is inserted;
- fig. 2 is a detail of fig. 1;
- fig. 3 is a lateral view of the spacer element;
- fig. 4 is a plane view of the spacer element;
- fig. 5 is an exploded view of a variant of the spacer element;
- fig. 6 is a section of the variant from VI to VI of fig. 4.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0036] With reference to figs. 1 and 2, a spacer element 10 according to the present invention is inserted between the walls 32 of a panel 31 of a heat radiator 30 in correspondence with a transit aperture 34.

[0037] A connection 35, through which a heat carrier fluid passes, for example hot water or steam, is connected to said transit aperture 34.

[0038] The spacer element 10 (figs. 3 and 4) comprises a body 11, substantially cylindrical, having an axial hole 13 which passes through the body 11.

[0039] The spacer element 10 is able to be mounted in the panel 31 in such a manner that the axial hole 13 faces the transit aperture 34 so as to define a channel for the heat carrier fluid.

[0040] The body 11 is defined by two metal pieces, respectively first 18 and second 19 (fig. 3).

[0041] The first metal piece 18 comprises a first part 13a of the axial hole 13 and, on its upper surface 23 facing towards the second metal piece 19, has four studs 21 shown in fig. 5.

[0042] The two metal pieces 18 and 19 are attached to each other by means of welding, performed in a known manner, for example projection, during which the studs 21 are melted.

[0043] The second metal piece 19 also comprises a second part 13b of the axial hole 13.

[0044] Alternatively, it is provided to make the second metal piece 19 without the second part 13b of the axial hole 13, therefore obtaining a blind axial hole 13.

[0045] A lateral aperture 15 (figs. 3 and 4) is made in the first metal piece 18, and also two radial holes 16, which branch off radially from the axial hole 13 and communicate therewith.

[0046] The lateral aperture 15 has a rectangular cross section and has three walls made in the first metal piece 18 and the fourth wall defined by the lower surface 24 of the second metal piece 19 (shown in fig. 5), when the two metal pieces 18, 19 are located one on the other.

[0047] It is provided that the section of the lateral aperture 15 can have another polygonal shape, or also cur-

vilinear.

[0048] It is also provided that the zone of the lower surface 24, which during use defines a wall of the lateral aperture 15, can also be non plane.

[0049] The two radial holes 16 are smaller in size than those of the lateral aperture 15 and have a preferably circular cross section.

[0050] The two radial holes 16 are arranged symmetrical with respect to a second median plane "X" transverse to the body 11 and passing through the lateral aperture 15. The longitudinal axis of each radial hole 16 forms an angle α of about 45° with said second median plane "X".

[0051] It is provided that said angle α can be different from 45° , and it is also provided that the two radial holes 16 can be asymmetrical with respect to the second median plane "X".

[0052] According to a variant shown in figs. 5 and 6, on the upper surface 23 of the first metal piece 18, instead of the radial holes 16, shown by dashes in fig. 6, there are two hollows 17, substantially semi-circular in shape.

[0053] In another variant solution not shown here, it is provided to make the two radial holes 16, or hollows 17, in the second metal piece 19.

[0054] According to one embodiment of the invention, the lateral aperture 15 (figs. 3 and 4) is arranged in a first zone of the body 11 and the two radial holes 16, or hollows 17, are arranged in a second zone of the body 11, where the first and the second zone are separated by a first median transverse plane "Y" substantially orthogonal to the second median plane "X".

[0055] The spacer element 10 (figs. 1 and 2), inserted between the walls 32 of the panel 31, is positioned so that the lateral aperture 15 is oriented to direct the main flow of heat carrier fluid towards the central part of the inner compartment of the panel 31.

[0056] Consequently, the two radial holes 16, or hollows 17, face towards the edges 36 of the panel 31, so as to direct the secondary flow to said zones.

[0057] Thanks to the presence of the two radial holes 16, or hollows 17, the efficiency of the heat radiator 30, in which the spacer element 10 according to the present invention is mounted, is greater than that of other known solutions.

[0058] According to the present invention, the size and position of the two radial holes 16, or the two hollows 17, can advantageously vary according to the construction characteristics of the panel 31.

[0059] The body 11 is made of sintered material by molding metal particles in two molds, wherein a first mold defines the first metal piece 18, achieving the first part 13a of the axial hole 13, the three walls of the aperture 15, the two radial holes 16, or hollows 17, and the studs 21.

[0060] The second mold defines the second metal piece 19 of the body 11, achieving the second part 13b of the axial hole 13.

[0061] The spacer element 10 is made according to a

method according to the invention which comprises at least the steps indicated as follows.

[0062] In a first step, the first metal piece 18 is made by sintering, substantially cylindrical in shape and comprising the first axial hole 13a, the lateral aperture 15 and the studs 21.

[0063] In a second step, the second metal piece 19 is made by sintering, with the diameter substantially equal to that of the first metal piece 18.

[0064] Alternatively, the second metal piece 19 can also consist of a simple washer made of iron, molded or turned, with a thickness such as to guarantee sufficient resistance to the compression that the spacer element 10 is subjected to during the welding step between the connection 35 and the panels 31.

[0065] The first and the second step can be performed simultaneously, or one after the other irrespective of the order.

[0066] In a third step, the first and the second metal piece 18, 19 are arranged one on the other and attached together coaxially by welding, so as to define the body 11.

[0067] The method also comprises another step, during which the two radial holes 16, or hollows 17, are made in the body 11. This step can be performed during the first step, or between the first and the third step, or directly on the body 11 after the third step.

[0068] According to a variant that is not shown here, during the first step only one part of the aperture 15 is made on the first metal piece 18 and, during the second step the second part of the aperture 15 is made on the second metal piece 19.

[0069] According to one embodiment of the invention, during the second step the second axial hole 13b is made on the second metal piece 19; during the third step, said second axial hole 13b is arranged coaxial with the first axial hole 13a.

[0070] It is clear that modifications and/or additions of parts or steps may be made to the spacer element 10 and relative method as described heretofore, without departing from the field and scope of the present invention.

[0071] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of methods to make spacer elements for a panel of a heat radiator, and spacer elements thus made, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Spacer element able to be inserted between the walls (32) of a panel (31) of a heat radiator (30) in correspondence with an aperture (34) for the transit of the heat carrier fluid able to circulate between said walls (32), comprising a substantially cylindrical body which is provided both with an axial hole (13),

- which affects at least a part of its thickness and which, during use, is able to face towards said transit aperture (34), and also with at least a lateral aperture (15) which branches off radially from said axial hole (13) and communicates therewith, **characterized in that** said body (11) comprises at least two metal pieces (18, 19) of substantially cylindrical shape, coaxially attached one on the other, and of which at least one is made of sintered material, **in that** said lateral aperture (15) is made in at least one of said metal pieces (18, 19), and **in that** in addition to said lateral aperture (15) said body (11) also comprises at least two radial holes (16) or hollows (17), each of which branches off radially from said axial hole (13) and communicates therewith.
2. Spacer element as in claim 1, **characterized in that** both metal pieces (18, 19) are made of sintered material.
 3. Spacer element as in claim 1 or 2, **characterized in that** one of the two metal pieces (18, 19) consists of a metal washer.
 4. Spacer element as in claim 1, 2 or 3, **characterized in that** each of said hollows (17) is made on a surface (23) of one of said metal pieces (18) which during use faces the other metal piece (19).
 5. Spacer element as in any claim hereinbefore, wherein said body (11) comprises two semi-circular zones divided from each other by a first median transverse plane (Y), **characterized in that** said lateral aperture (15) is arranged in a first of said zones of said body (11) and that said radial holes (16), or said hollows (17), are arranged in a second of said zones of said body (11).
 6. Spacer element as in claim 5, **characterized in that** said radial holes (16) or said hollows (17) are arranged on opposite sides with respect to a second median transverse plane (X) passing through said lateral aperture (15) and substantially orthogonal to said first median transverse plane (Y).
 7. Spacer element as in any claim hereinbefore, **characterized in that** each of said radial holes (16), or of said hollows (17), has a cross section of a smaller size than that of said lateral aperture (15).
 8. Spacer element as in any claim hereinbefore, **characterized in that** said lateral aperture (15) has a substantially polygonal or curvilinear cross section.
 9. Spacer element as in any claim hereinbefore, **characterized in that** said first and said second metal piece (18, 19) are attached to each other by means of welding.
 10. Spacer element as in any claim hereinbefore, **characterized in that** said axial hole (13) is blind or through.
 11. Method to make a spacer element (10) able to be inserted between the walls (32) of a panel (31) of a heat radiator (30) in correspondence with a transit aperture (34) of the heat carrier fluid circulating between said walls (32), **characterized in that** it comprises at least the following steps.
 - a first step, during which a first metal piece (18) is made by sintering, substantially cylindrical in shape and comprising at least a first axial hole (13a) and at least a first part of a lateral aperture (15) which branches off radially from said axial hole (13a);
 - a second step, during which a second metal piece (19) is made, substantially cylindrical in shape and with the diameter substantially equal to that of said first metal piece (18);
 - a third step, during which said first and said second metal piece (18, 19) are arranged one on the other and attached together coaxially so as to define a body (11).
 12. Method as in claim 11, **characterized in that** during said second step, said second metal piece (19) is made by sintering.
 13. Method as in claim 11 or 12, **characterized in that** it comprises at least another step, during which at least two radial holes (16) or at least two hollows (17) are made in said body (11), each of which branches off radially from said axial hole (13).
 14. Method as in claim 13, wherein said body (11) comprises two semi-circular zones divided from each other by a first median transverse plane (Y), **characterized in that** said lateral aperture (15) is made in a first of said zones of said body (11), and **in that** said radial holes (16) or said hollows (17) are made in a second of said zones of said body (11).
 15. Method as in claim 14, **characterized in that** said radial holes (16) or said hollows (17) are made on opposite sides with respect to a second median transverse plane (X) passing through said lateral aperture (15) and substantially orthogonal to said first median transverse plane (Y).
 16. Method as in any claim from 11 to 15 inclusive, **characterized in that** during said second step a second part of said aperture (15) is made on said second metal piece (19).
 17. Method as in any claim from 11 to 16 inclusive, **characterized in that**, during said second step, on said

second metal piece (19) a second axial hole (13b) is made which, during said third step, is arranged coaxial with said first axial hole (13a).

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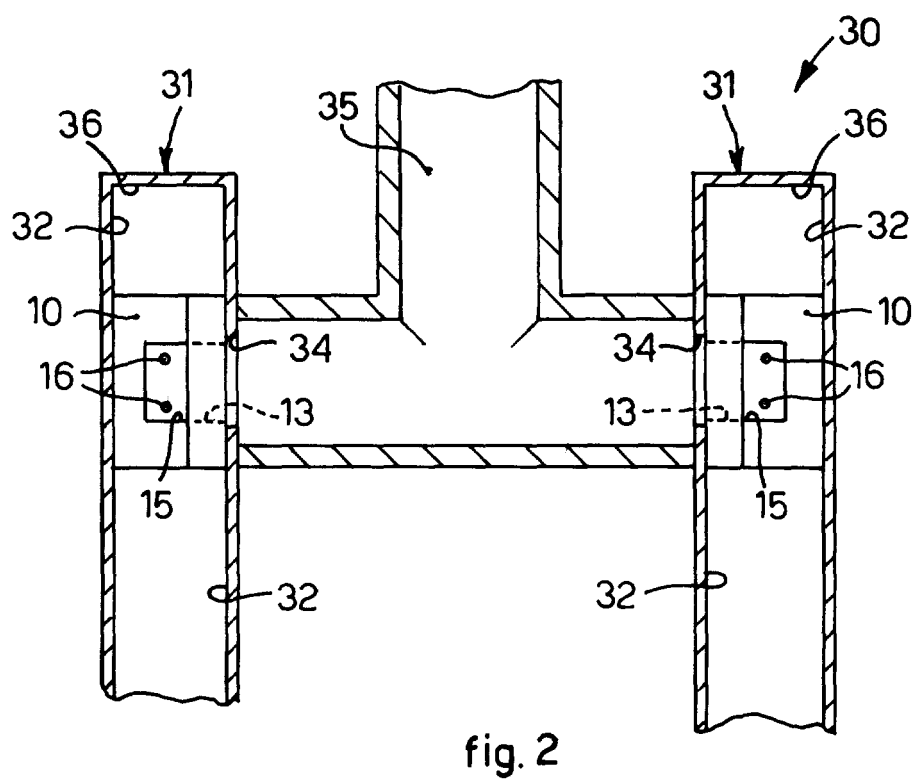
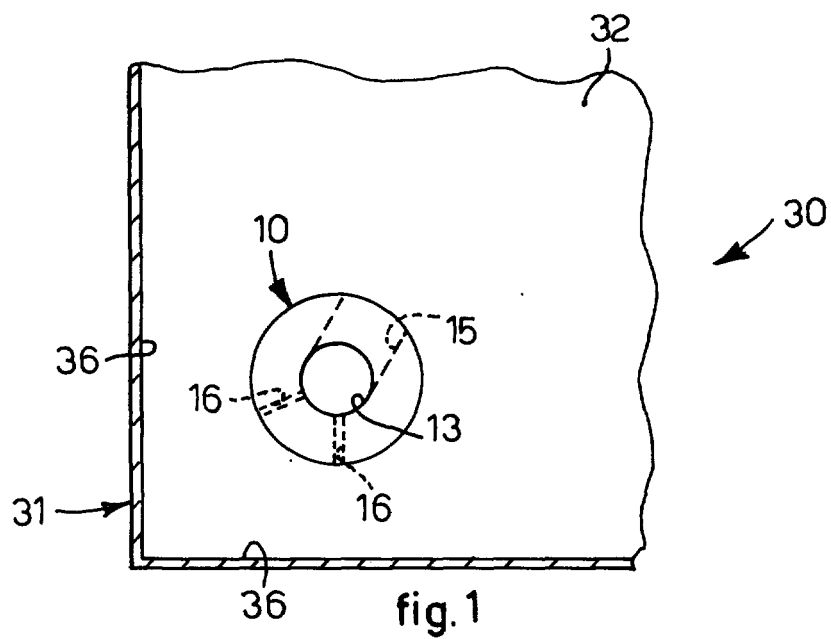
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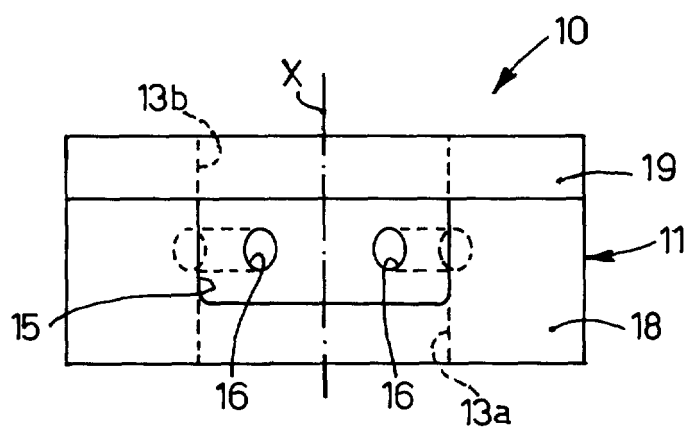


fig. 3

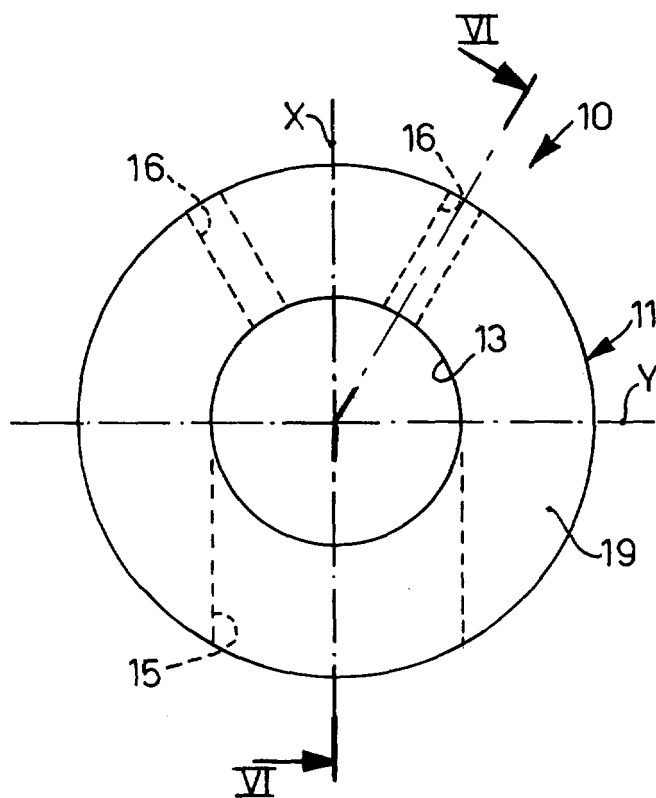


fig. 4

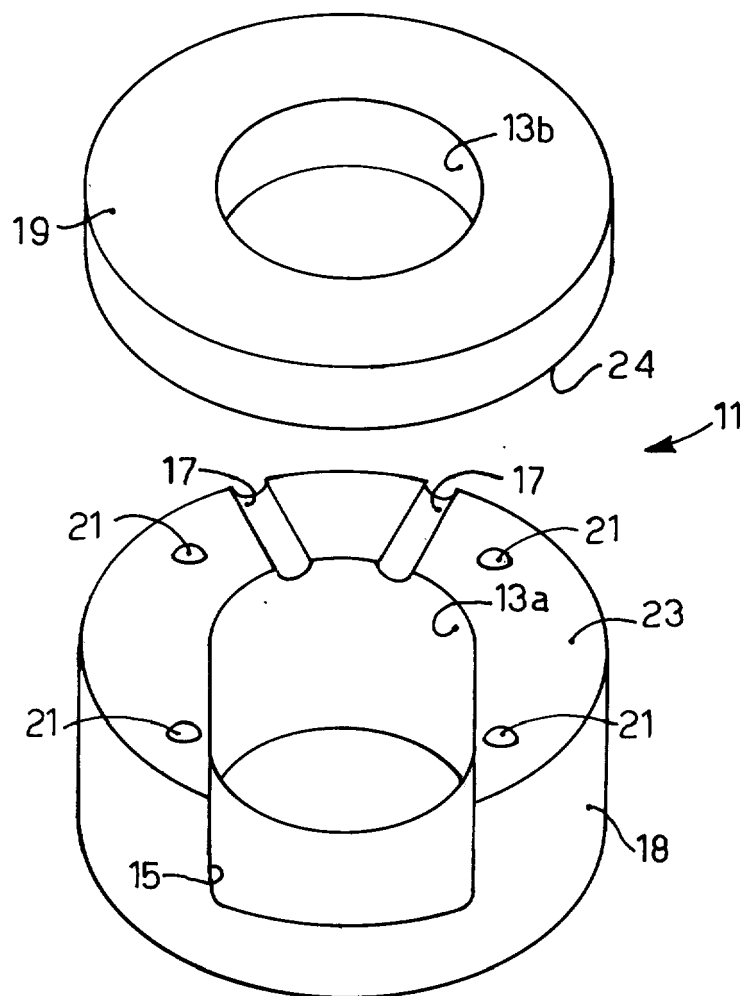


fig. 5

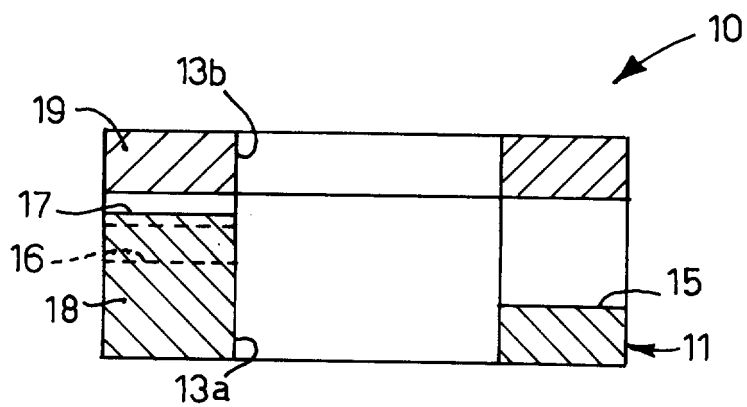


fig. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 10 0321

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 April 2006	Examiner Mootz, F
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 10 0321

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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