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(54) Method to make a spacer element to be inserted inside a radiating panel, and spacer element thus made

(57) Spacer element (13) able to be inserted between the walls (23, 22) of a radiating panel containing a heat carrier fluid. The spacer element (13) comprises a lower base circular in shape, an upper wall parallel to the lower base and a lateral wall (32), which define a compartment (24) substantially cylindrical in shape having a longitudinal axis (X). The spacer element (13) also comprises lateral apertures (15, 36, 37, 38) made on the lateral wall (32), each of which is defined by at least a lip (34) which is bent towards the inside of the compartment (24) and substantially parallel to the longitudinal axis.

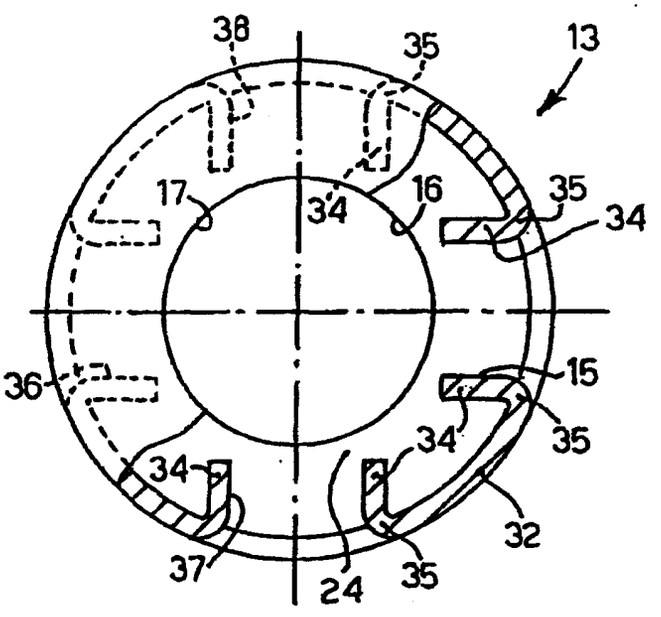

fig. 4

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method to make a spacer element able to be inserted inside a radiating panel of a heat radiator, so as to prevent the crushing of its lateral walls during the steps to connect it under pressure with a relative connection element.

BACKGROUND OF THE INVENTION

[0002] Heat radiators are known, such as for example a hot water heating plant, a heated towel rail or other, comprising one or more radiating panels shaped so as to define inside them a substantially closed compartment to contain a heat carrier fluid. Such radiating panels are hydraulically connected by interposing, in twos, a connection element. The connection element is pressure welded to the relative radiating panels, in order to guarantee the watertight seal of the connection.

[0003] 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 possible deformations.

[0004] A method is known, from the German patent DE-C2-3113208, to make a spacer element used to connect two or more radiating panels to a connection element. The conventional spacer element is substantially cylindrical in shape and comprises axial and lateral apertures, which allow the passage of the heat carrier fluid from and towards the radiating panels. To be more exact, this method provides that the lateral apertures are made by holing or shearing, with subsequent removal of material, and can be circular, square, oval or rectangular in shape.

[0005] One disadvantage of DE'208 is that the lateral apertures reduce resistance to compression, since they weaken the structure of the spacer element itself.

[0006] To overcome this shortcoming it is known to increase the thickness of the spacer element, but this obviously entails an increase in the quantity of raw material needed to make it, with a consequent increase in the times and costs of production.

[0007] One purpose of the present invention is to perfect a method to make a spacer element which is resistant to compression, without needing to increase the raw material.

[0008] 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

[0009] 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.

[0010] In accordance with the above purpose, a method according to the present invention is applied to make a spacer element able to be inserted between an outer wall and an inner wall of a radiating panel, containing a heat carrier fluid.

[0011] The method according to the invention comprises at least the following steps:

- a first step during which a metal disk is deformed in order to make a cup-shaped element and having its own longitudinal axis, a lower base, and a substantially cylindrical lateral wall, and
- a second step during which an upper portion of the lateral wall is bent towards the inside in order to make an upper wall substantially parallel to the lower base, so that the lower base, the upper wall and the lateral wall define a compartment, substantially cylindrical in shape.

[0012] According to a characteristic feature, the method according to the present invention also comprises a third step during which the lateral wall is cut, so as to make at least a lip. This is subsequently bent towards the inside of said compartment so as to define a first lateral aperture on the lateral wall.

[0013] The bending towards the inside occurs with respect to an axis substantially parallel to said longitudinal axis "X".

[0014] This solution allows each lip to define a support for the lower base and the upper wall, increasing resistance to a compression applied along the longitudinal axis "X" of the spacer element, made according to the invention, with respect to spacer elements of a conventional type.

[0015] In a preferential form of embodiment, the lateral aperture is substantially rectangular in shape, and comprises two sides parallel to said longitudinal axis and two other sides substantially orthogonal to said longitudinal axis. The two sides parallel to the longitudinal axis have the same length as, or less than, the inner height of the compartment.

[0016] According to a variant, during the third step a plurality of lips are made, in order to define a corresponding plurality of lateral apertures.

[0017] According to another variant, on the lateral wall at least a longitudinal dishing is made, able to improve the spacer element's resistance to crushing.

[0018] According to another variant, during the second step an upper central aperture is defined on the upper wall, able during use to allow the passage of the heat carrier fluid.

[0019] According to another variant, the method according to the present invention comprises a fourth step during which, in the lower base, a lower central aperture is made, concentric to the longitudinal axis "X", and a fifth step during which said upper central aperture is sized, so as to give it a substantially circular shape with

its center on the longitudinal axis "X". The fourth step can be performed between the first and the second step or, alternatively, after the second step. According to another variant, the fourth step and the fifth step can be performed simultaneously.

[0020] According to another variant, said first step comprises at least a sub-step, during which said cup-shaped element is deformed, so as to increase the height of the lateral wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] 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 detail of a heat radiator, in which a spacer element according to the present invention is inserted;
- fig. 2 shows a detail of the assembly of the heat radiator in fig. 1;
- fig. 3 is a partly sectioned lateral view of the spacer element in fig. 1;
- fig. 4 is a partly sectioned plane view of the spacer element in fig. 1;
- fig. 5 shows a sequence of operations, according to the method of the invention, to make the spacer element in fig. 1;
- fig. 6 is a sectioned plane view of a variant of the spacer element in fig. 1;
- fig. 7 is a sectioned plane view of another variant of the spacer element in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0022] With reference to fig. 1, a heat radiator 10 comprises two radiating panels 11, only partly shown, parallel to each other, and a connection element 12 located between the two radiating panels 11 and connected sealingly thereto, so as to form a hydraulic circuit. Each radiating panel 11 comprises two walls, respectively inner 22 and outer 23 which define between them a compartment 18, able to contain a heat carrier fluid which, in this case, consists of a flow of hot water.

[0023] The connection element 12 is connected to the inner wall 22 of each of the two radiating panels 11 by pressure welding. This operation takes place by means of the reciprocal bringing together of a first electrode 20 and a second electrode 21 (fig. 2), respectively positioned in contact with the relative outer walls 23 of the two radiating panels 11.

[0024] Inside the compartments 18 of each radiating panel 11 a spacer element 13 is inserted, able to contrast the pressure exerted by the two electrodes 20 and 21, to prevent said two inner and outer walls 22 and 23 from deforming, so as to keep the width of each radiating panel 11 unchanged.

[0025] The spacer element 13 is made according to the steps described hereafter.

[0026] Starting from a metal disk 30 (fig. fig. 5a) with a thickness s (fig. 5b), obtained for example by cutting a round piece, or a bar with a round section, a deformation is made of said metal disk 30, in order to make a cup 31; the cup 31 has a lower base 26, a lateral wall 32 and its own longitudinal axis X.

[0027] Subsequently, the cup 31 is deformed, for example by means of a dishing operation, so as to increase the height of the lateral wall 32 (fig. 5c).

[0028] An upper portion of the lateral wall 32 is subjected in sequence to a first bending (fig. 5d). Subsequently, a second bending is made (fig. 5e) so as to make an upper wall 25, substantially parallel to the lower base 26. The second bending also defines an upper central aperture 17 on the upper wall 25, which during use allows the passage of the heat carrier fluid from the connection element 12 to the corresponding radiating panel 11.

[0029] At the end of this second bending, the upper central aperture 17 is subjected to a sizing operation, to give it a circular shape with its center on the longitudinal axis X. After this operation, the lower base 26 can be holed in order to obtain a lower central aperture 16, circular in shape and having its center on the longitudinal axis X. According to a variant the lower central aperture 16 may not be made, or alternatively it may be made before said sizing operation.

[0030] The lower base 26, the upper wall 25 and the lateral wall 32 define inside them a compartment 24 substantially cylindrical in shape and with an inner height t.

[0031] In the lateral wall 32, in this case, four lateral apertures 15, 36, 37 and 38 (figs. 3 and 4) are also made, as described hereafter.

[0032] Initially the lateral wall 32 is cut in a longitudinal direction with respect to the axis X, and subsequently in a direction transverse to the axis X, so as to obtain an H-shaped notch rotated by 90°.

[0033] In this way two lips 34 are made, each of which is associated with the lateral wall 32 in a connection zone 35. Subsequently, each lip 34 is bent with respect to its connection zone 35 towards the inside of the compartment 24 so as to make a first lateral aperture 15.

[0034] This step is performed, in this case, three more times, so as to simultaneously make the other three lateral apertures 36, 37 and 38, arranged angularly equidistant by about 90°.

[0035] The spacer element 13 thus obtained is substantially cylindrical in shape and comprises the lower central aperture 16, the upper central aperture 17 and four lateral apertures 15, 36, 37 and 38, able to allow the circulation of the heat carrier fluid inside the compartment 18 of the radiating panel 11 and between the latter and the connection element 12.

[0036] Moreover, each lip 34 has a height h with a

length substantially equivalent to, or slightly less than, that of the inner height t. In this way, the spacer element 13 is more resistant to the pressures applied in directions substantially parallel to its longitudinal axis X, since the upper wall 25 and the lower base 26 are supported not only by the lateral wall 32, but also by the lips 34, which are therefore able to reinforce the structure of the spacer element 13.

[0037] It is clear that modifications and/or additions of parts may be made to the spacer element 13 as described heretofore, without departing from the field and scope of the present invention.

[0038] According to a variant, the number of lateral apertures made can be other than four. Moreover, the lateral apertures can also be arranged not angularly equidistant from each other.

[0039] It also comes within the field of the present invention to provide that the lower central aperture 16 and the upper central aperture 17 can be made in a single step, provided after the double bending of the upper portion of the lateral wall 32.

[0040] According to another variant shown in fig. 6, a plurality of longitudinal dishings 39 are made, for example by means of a punch or other pressing tool, on the lateral wall 32. These longitudinal dishings 39 are able to improve the resistance to crushing of the spacer element 13.

[0041] According to another variant, shown in fig. 7, on the lateral wall 32, apart from the lateral aperture 15, two radial holes 40 are made, for example by cutting the lateral wall 32 longitudinally and making corresponding lips 34, which are bent towards the inside of the compartment 24. Each radial hole 40 has a cross section of smaller size than that of the lateral aperture 15.

[0042] In this way, the body of the spacer element 13 is divided into two semicircular zones, separated from each other by a transverse median plane A, in one of which there is the lateral aperture 15, while in the other there are the two radial holes 40.

[0043] Moreover, the radial holes 40 are arranged on opposite sides with respect to another transverse median plane B passing through the lateral aperture 15 and substantially orthogonal to the transverse median plane A.

[0044] Thanks to this arrangement of the radial holes 40 with respect to the lateral aperture 15, the spacer element 13, inserted inside the radiating panel 11 of the heat radiator 10, allows to obtain a more effective distribution of the heat carrier fluid, both in the central zone of the compartment 18 and also in the zones opposite the lateral aperture 15, that is, towards the corners and edges of the panel 11.

[0045] 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 make many other equivalent forms of method to make a spacer element to be inserted inside a radiating panel, and spacer element thus made, having the characteristics as set forth in the claims and therefore all coming within the field of protection defined thereby.

Claims

1. Method to make a spacer element (13), able to be inserted between the walls (22, 23) of a radiating panel (11) able to contain a heat carrier fluid, comprising the following steps:

   - a first step during which a metal disk (30), having a determinate thickness (s), is deformed to make a cup-shaped element (31), having a longitudinal axis (X), a lower base (26) and a substantially cylindrical lateral wall (32);
   - a second step during which an upper portion of said lateral wall (32) is bent towards the inside in order to make an upper wall (25) substantially parallel to said lower base (26), so that said lower base (26), said upper wall (25) and said lateral wall (32) define a compartment (24) substantially cylindrical in shape;

   characterized in that it also comprises:

   - a third step during which said lateral wall (32) is cut, so as to make at least a lip (34), and that said lip (34) is subsequently bent towards the inside of said compartment (24) so as to define a first lateral aperture (15) on said lateral wall (32).

2. Method as in claim 1, **characterized in that** said first step comprises at least a sub-step during which said cup-shaped element (31) is deformed to increase the height of the lateral wall (32).

3. Method as in claim 1 or 2, **characterized in that** during said second step an upper central aperture (17) is defined on the upper wall (25).

4. Method as in any claim hereinbefore, **characterized in that** it also comprises a fourth step during which in said lower base (26) a lower central aperture (16) is made substantially concentric to said longitudinal axis (X).

5. Method as in claim 3, **characterized in that** it also comprises a fifth step during which said upper central aperture (17) is sized to give to said upper central aperture (17) a substantially circular shape substantially coaxial to said longitudinal axis (X).

6. Method as in claim 4, **characterized in that** said fourth step is performed between said first step and said second step.

7. Method as in claim 4, **characterized in that** said fourth step is performed after said second step.

8. Method as in claims 4 and 5, **characterized in that** said fourth step and said fifth step are performed simultaneously.

9. Method as in claims 4 and 5, **characterized in that** said fourth step is performed after said fifth step.

10. Method as in any claim hereinbefore, **characterized in that** said lip (34) is bent in such a manner as to be parallel to said longitudinal axis (X).

11. Method as in any claim hereinbefore, **characterized in that** in said third step a plurality of lips (34) are made, in order to define a corresponding plurality of lateral apertures (36, 37, 38).

12. Method as in any claim hereinbefore, wherein said compartment (24) has an inner height (t), **characterized in that** said lip (34) has a height (h) with a size substantially equivalent to that of said inner height (t).

13. Method as in any claim from 1 to 11, wherein said compartment (24) has an inner height (t), **characterized in that** said lip (34) has a height (h) less than said inner height (t).

14. Method as in any claim from 11 to 13, **characterized in that** each of said lateral apertures (15, 36, 37, 38) is substantially polygonal in shape.

15. Method as in any claim from 11 to 14, **characterized in that** each of said lateral apertures (15, 36, 37, 38) is defined by two lips (34).

16. Method as in any claim from 11 to 15, **characterized in that** each of said lateral apertures (15, 36, 37, 38) comprises first sides substantially parallel to said longitudinal axis (X), and second sides substantially orthogonal to said longitudinal axis (X).

17. Method as in any claim hereinbefore, **characterized in that** on said lateral wall (32) at least a longitudinal dishing (39) is made to improve the resistance to crushing of said spacer element (13).

18. Method as in any claim hereinbefore, **characterized in that** in said third step a plurality of lips (34) are made, in order to define a corresponding plurality of radial holes (40) each of which has a cross section of smaller size than that of said lateral aperture (15).

19. Method as in claim 18, **characterized in that** said lateral aperture (15) is made in a first semicircular zone and said radial holes (40) are made in a second semicircular zone, said first semicircular zone and said second semicircular zone being separated by a first transverse median plane (A).

20. Method as in claim 19, **characterized in that** said radial holes (40) are disposed on opposite sides with respect to a second transverse median plane (B) passing through said lateral aperture (15) and substantially orthogonal to the first transverse median plane (A).

21. Spacer element, able to be inserted between the walls (22, 23) of a radiating panel (11) and able to contain a heat carrier fluid, **characterized in that** it is made by means of a method as in any claim from 1 to 20.

22. Spacer element, able to be inserted between the walls (22, 23) of a radiating panel (11) able to contain a heat carrier fluid, said spacer element comprising a lower base (26) substantially circular in shape, an upper wall (25) substantially parallel to said lower base (26), and a lateral wall (32), which define a compartment (24), having a longitudinal axis (X) and substantially cylindrical in shape, **characterized in that** it also comprises a plurality of lateral apertures (15, 36, 37, 38) made on said lateral wall (32), each of which is defined by at least a lip (34) bent towards the inside of said compartment (24) and substantially parallel to said longitudinal axis (X).

23. Spacer element as in claim 22, **characterized in that** said upper wall (25) comprises at least a through upper central aperture (17).

24. Spacer element as in claim 22 or 23, **characterized in that** on said lateral wall (32), apart from said lateral aperture (15), it also comprises at least two radial holes (40), each of which has a cross section of smaller size than that of said lateral aperture (15).

25. Spacer element as in claim 24, **characterized in that** said lateral aperture (15) is arranged in a first semicircular zone and said radial holes (40) are disposed in a second semicircular zone, said first semicircular zone and said second semicircular zone being separated by a first transverse median plane (A).

26. Spacer element as in claim 25, **characterized in that** said radial holes (40) are disposed on opposite sides with respect to a second transverse median plane (B) passing through said lateral aperture (15) and substantially orthogonal to said first transverse median plane (A).

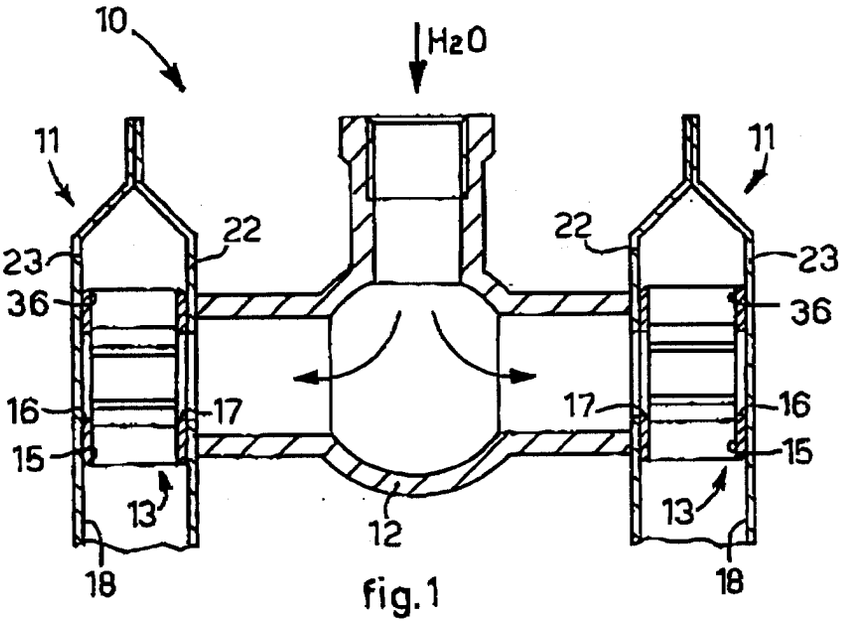
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fig.1

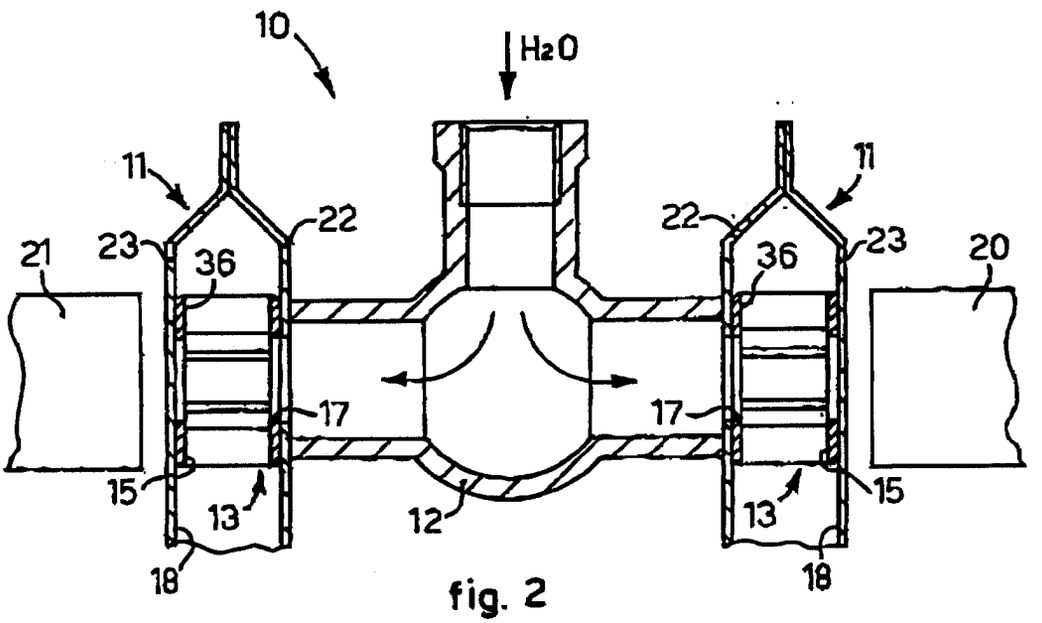
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fig. 2

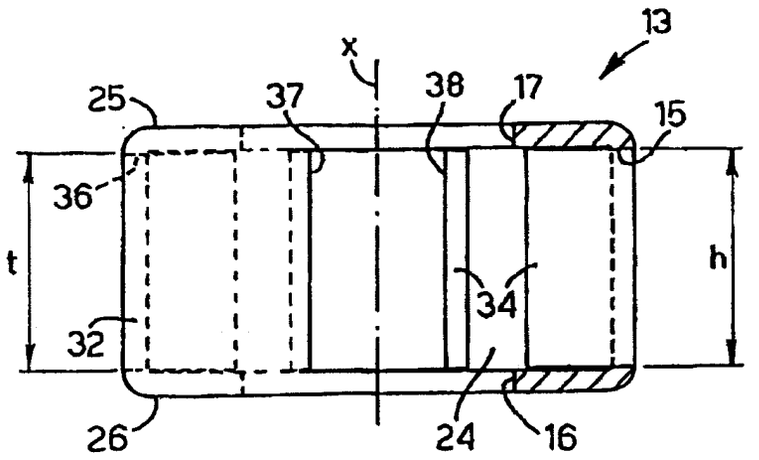
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fig. 3

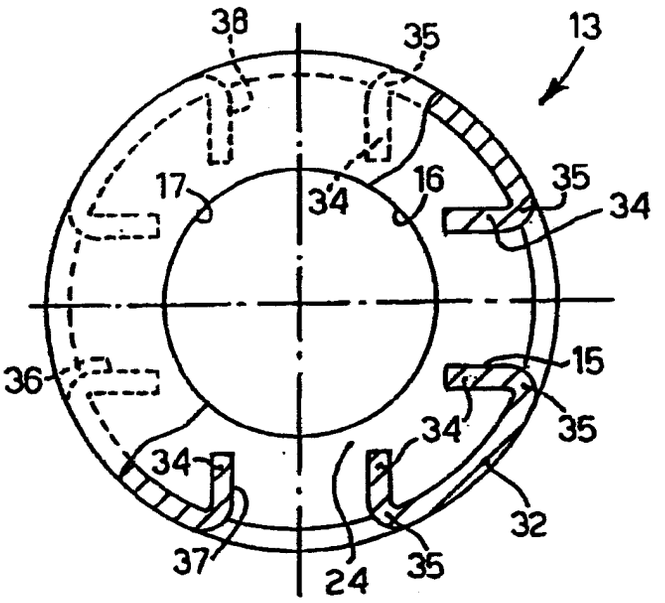
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fig. 4

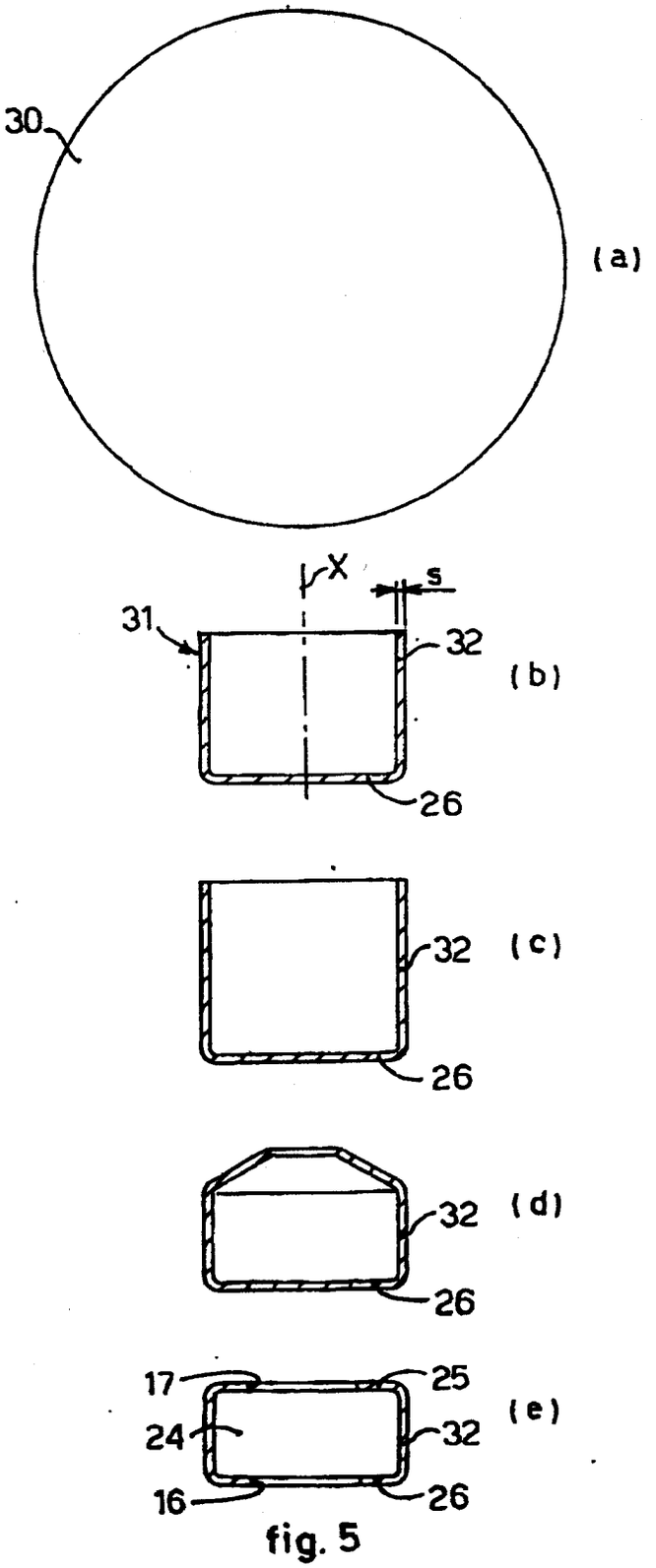

fig. 5

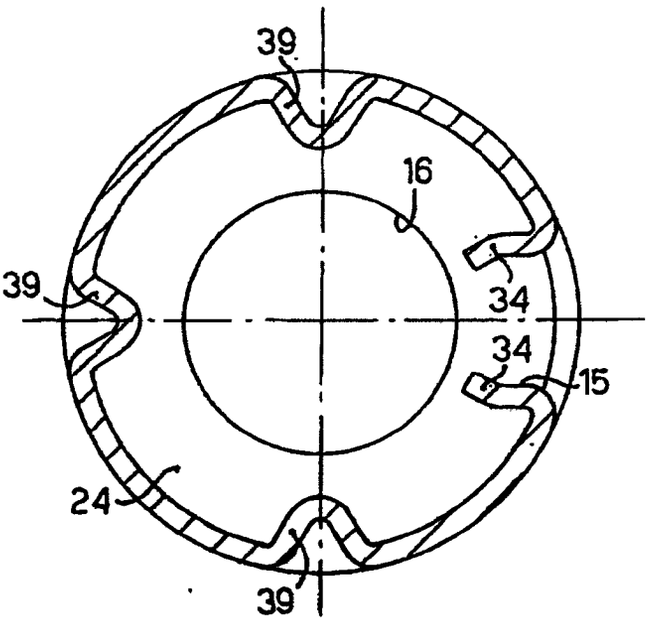

fig. 6

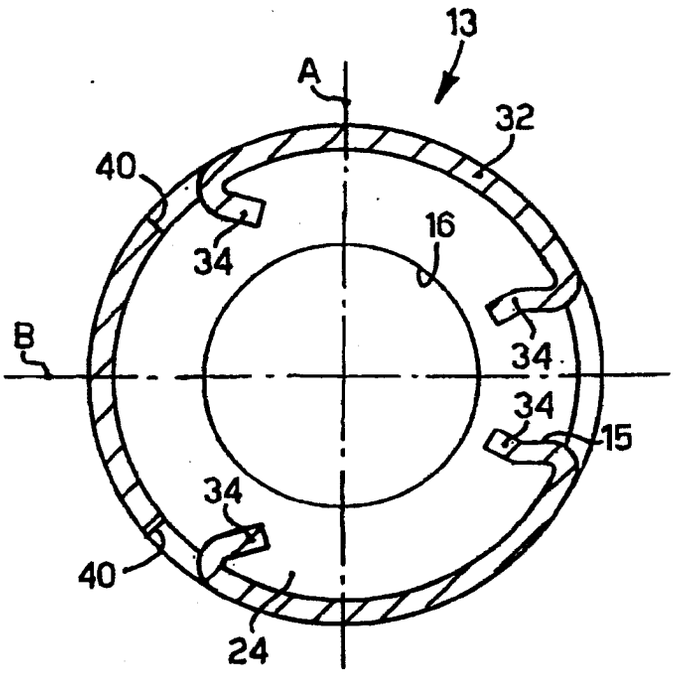

fig. 7