

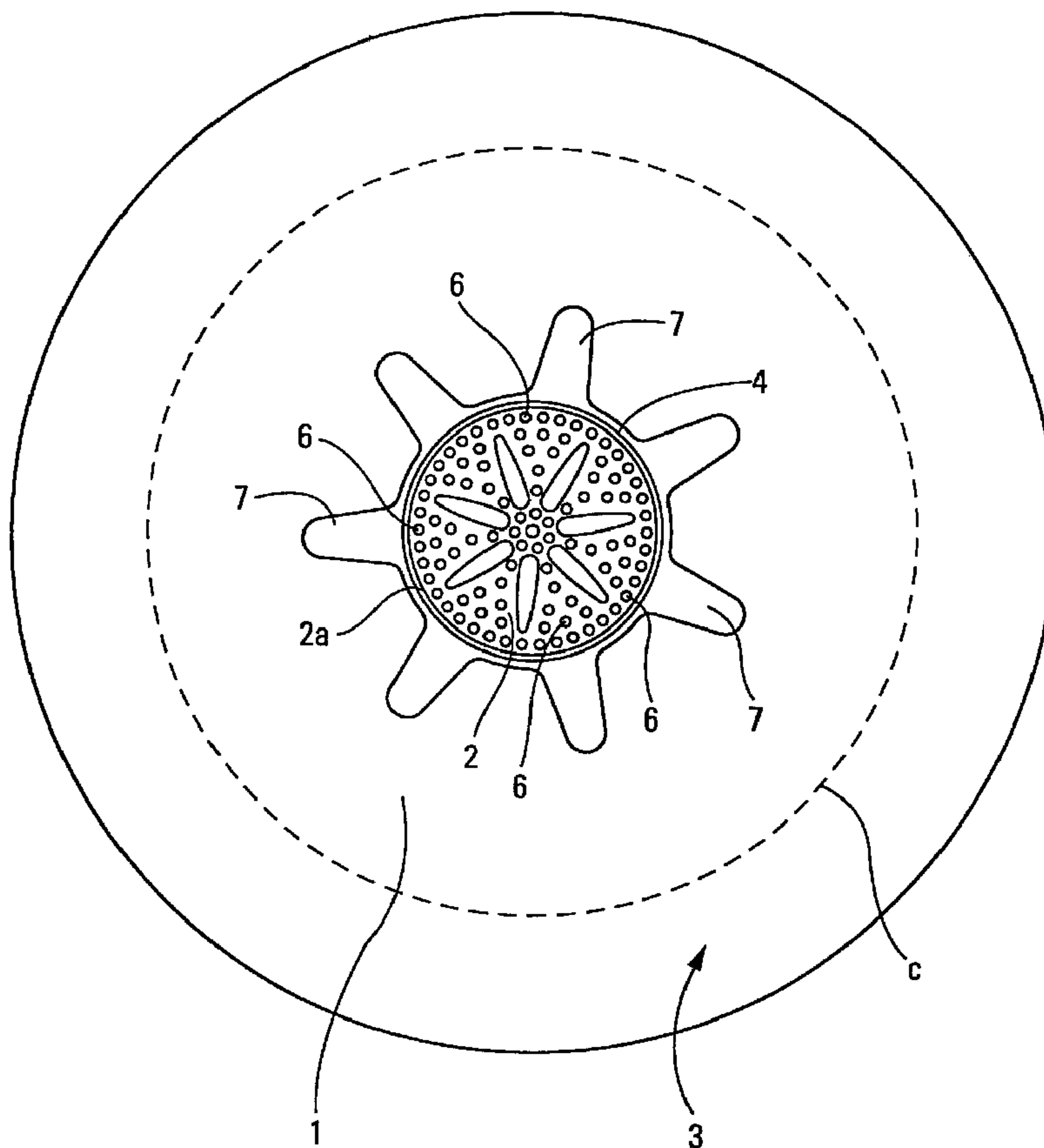


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(54) Titre : RECIPIENT POUR LA CUISSON DONT LE FOND EST RENFORCE PAR UNE PLAQUE ET DES RAINURES RADIALES

(54) Title: COOKING VESSEL WHOSE BOTTOM IS REINFORCED BY A PLATE AND RADIAL GROOVES



(57) Abrégé/Abstract:

A cooking vessel made from a pressed metal or light alloy sheet (3), having a bottom (1) adapted to be placed on a cooker hotplate, burner or the like, the bottom (1) being slightly concave and including a plate (2), possibly in several parts, covering only a

(57) **Abrégé(suite)/Abstract(continued):**

relatively small portion of the bottom and made from a metal or alloy having mechanical, thermal and physical properties different to those of the metal or alloy of said sheet (3), the plate (2) being embedded in said bottom (1) The surface of said bottom (1) between the plate (2) and the outside edge (C) of the bottom (1) comprises a plurality of radial grooves (7).

## ABSTRACT

**TITLE:** *Cooking vessel whose bottom is reinforced by a plate and radial grooves*

A cooking vessel made from a pressed metal or light alloy sheet (3), having a bottom (1) adapted to be placed on a cooker hotplate, burner or the like, the bottom (1) being slightly concave and including a plate (2), possibly in several parts, covering only a relatively small portion of the bottom and made from a metal or alloy having mechanical, thermal and physical properties different to those of the metal or alloy of said sheet (3), the plate (2) being embedded in said bottom (1)

The surface of said bottom (1) between the plate (2) and the outside edge (C) of the bottom (1) comprises a plurality of radial grooves (7).

**Cooking vessel whose bottom is reinforced by a plate and radial grooves**

The present invention concerns a cooking vessel in which deformation of the bottom due to the effects of heat and sudden variations in temperature to which it is subjected in use are controlled.

Cooking vessels are generally pressed from sheet aluminum.

During heating, the surface of the bottom of the container is exposed to a much higher temperature than the sides.

This results in differential thermal expansion leading to bulging of the bottom of the container.

To prevent this unwanted phenomenon, the bottom of the container is made slightly concave so that when heated the bottom does not become convex due to the effect of expansion.

However, experience shows that after a number of heating and cooling cycles the concavity of the bottom of the container is initially reduced and then disappears and finally the bottom bulges (becomes convex), making the container virtually unusable.

This result is explained by the characteristics of the materials used to manufacture the vessel.

During heating and cooling cycles the elastic limit is exceeded and this causes irreversible deformation.

To solve this problem, European patent 0 648 459 describes a cooking vessel whose bottom incorporates a plate which may be in several parts and which is centered, covering only a small portion of the bottom, and is made from a metal or alloy having mechanical, thermal and physical characteristics different to those of the metal or alloy of the sheet, this plate being embedded in the bottom. It may be partially or totally

embedded.

The plate embedded in a localized area of the bottom of the container and having mechanical, thermal and physical properties different to those of the metal or alloy of which, the remainder of the container is made, prevents irreversible convex deformation of the bottom of the container for a very large number of heating and cooling cycles.

The aim of the present invention is to delay further the time at which, after a very large number of heating and cooling cycles, deformation of the bottom causes it to become convex.

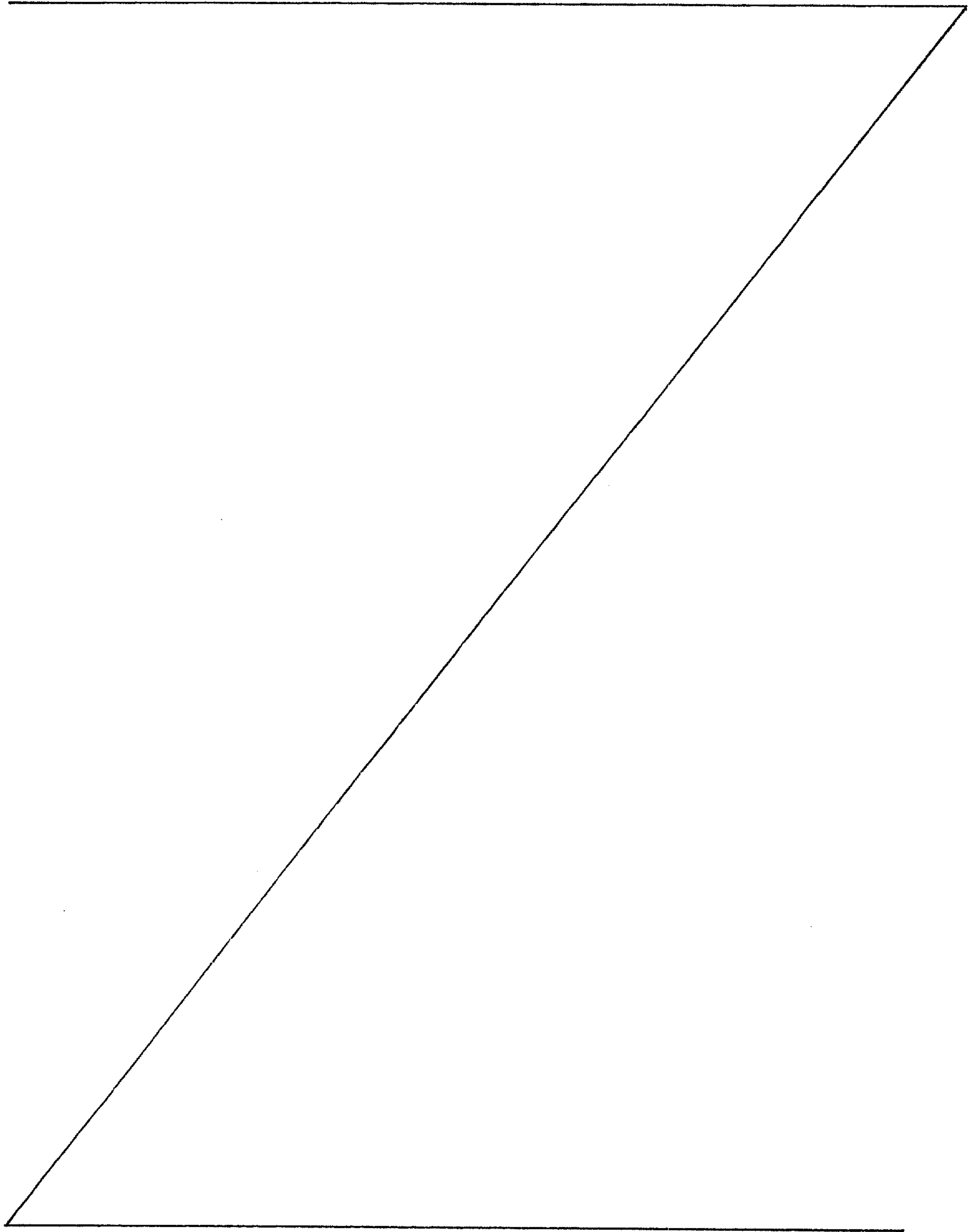
According to the present invention there is provided a cooking vessel made from a pressed metal or light alloy sheet, having a bottom provided with an outside edge and adapted to be placed on a cooker hotplate or burner, the bottom being, slightly concave and including a plate, said plate having a periphery and being made from a metal or alloy having mechanical, thermal and physical properties different to those of the metal or alloy of said sheet, the plate being embedded in said sheet, characterized in that the plate covers only a relatively small central portion of the bottom and in that the surface of said sheet between the periphery of the plate and the outside edge of the bottom comprises a plurality of radial grooves thus having one end adjacent to the periphery of the plate and their other end adjacent to the outside edge of the bottom.

Trials have shown that the simultaneous presence on the bottom of the container of an embedded plate and radial grooves limits deformation of the bottom and thereby delays the time at which such deformation becomes irreversible.

European patent 0 474 850 describes a cooking vessel whose bottom is provided with radial grooves that are not associated with an embedded plate.

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The presence of the radial grooves is described in the abovementioned patent as limiting deformation of the bottom of the container. However, neither the teaching of the above European patent nor that of European patent



0 648 459 gives reason to think that the simultaneous presence on the bottom of the container of an embedded plate and radial grooves could have a synergistic effect, that is to say an anti-deformation effect greater than  
5 the sum of the effects of the plate alone and the radial grooves alone.

The container is preferably made of sheet aluminum and the plate is preferably made of stainless steel.

The radial grooves are preferably identical and  
10 evenly distributed over the surface.

Other features and advantages of the invention will become more apparent in the course of the following description.

In the accompanying drawings, which are given by  
15 way of non-limiting example only:

- figure 1 is a plan view of a disc adapted to be pressed into the shape of a container in accordance with the invention, and

- figure 2 is a view of the aforementioned disc in  
20 cross section.

Figures 1 and 2 show a disc cut from a sheet of metal or metal alloy such as aluminum. The disc is adapted to be pressed, in a manner that is well known to the skilled person, into the shape of a cooking vessel,  
25 such as a frypan or a saucepan having a bottom adapted to be placed on a cooker hotplate or burner.

In figure 1 the dashed line C represents the periphery of the bottom 1 of the container.

As is also well known in this art, the bottom 1 is  
30 made slightly concave when the disc 3 is pressed.

The central part of the bottom 1 carries a plate 2 made of a metal or alloy having properties different to those of the metal or alloy of the disc 3.

As shown in figure 2, the plate 2 is embedded in  
35 the metal of the bottom 1 and the periphery 2a of the

plate 2 is adjacent a groove 4 in the bottom 1.

After the disc 3 is pressed, the concavity of the bottom 1 is such that when it is placed on a cooker hotplate the circumference of the surface 5 of the bottom  
5 around the plate 2 touches the hotplate but that of the plate 2 does not touch it.

The disc 3 is preferably an aluminum disc having a thickness in the range from 2 mm to 6 mm.

The plate 2 is preferably a stainless steel plate.

10 The plate 2 preferably covers a proportion of the surface of the bottom 1 in the range from 5% to 40%. This relatively small proportion of the bottom 1 covered by the plate 2 gives the best results, both with regard to resistance to and the amplitude of deformation of the  
15 bottom 1 due to the effect of heating and cooling cycles and with regard to heat transmission and temperature distribution.

These results are explained in particular by the embedding of the plate 2 in the central area of the  
20 bottom of the container and by the different properties of steel compared to those of aluminum, and this prevents the convex deformation of the bottom becoming irreversible due to the effect of heating and cooling cycles.

25 In the embodiment shown in figures 1 and 2 the plate 2 has holes 6, for example circular holes, uniformly spaced and distributed over all of the surface of the plate. The plate 2 is embedded in the bottom 1. The plate 2 can be embedded in the bottom 1 by cold  
30 pressing, as described in European patent 0 590 860.

In this way, the plate 2 is firmly attached to the bottom 1 of the container at a large number of points and controls deformation of the bottom 1 because of the steel from which the plate is made.

35 It is sufficient for the plate 2 to have a

thickness in the range from 3/10 mm to 6/10 mm (for an aluminum bottom having a thickness in the range from 2 mm to 6 mm). Embedding it in the bottom 1 to a depth in the range from half its thickness to its full thickness is sufficient to obtain excellent results.

As shown in figure 1, the plate 2 is in the shape of a disc. However, the plate 2 could have a polygonal shape or an annular shape. The plate 2 could be divided into a number of sectors or form a grid.

In accordance with the present invention, the surface of the bottom 1 between the plate 2 and the outside edge C of the bottom includes a plurality of radial grooves 7 evenly distributed over the bottom.

In the example shown in figure 1, the end of the radial grooves 7 adjacent the plate 2 is wider than their end adjacent the outside edge C of the bottom 1.

Also, the end of the radial grooves 7 adjacent the plate 2 opens into a circular groove 4 surrounding the plate 2.

The diameter within which the radial grooves 7 are formed is in the range from 40% to 60% of the diameter of the bottom.

The depth of the radial grooves 7 is in the range from 0.3 mm to 1 mm.

A single cold pressing operation can fix the plate 2 to the aluminum disc and form the radial grooves 7.

The results of comparative tests of two saucepans are given below, one being a conventional saucepan and the other a saucepan in accordance with the invention.

The two saucepans were of exactly the same size and made from a 3.4 mm thick aluminum disc.

The saucepan of the invention had on its bottom a 0.5 mm thick stainless steel disc 75 mm in diameter.

Both saucepans were subjected to heating and fast cooling cycles (heating to 250°C followed by cooling with

tap water to around 20°C).

Irreversible deformation of the bottom of the conventional saucepan was noted after 30 cycles.

5 Deformation of the bottom of the saucepan of the invention was noted only after around 500 heating and cooling cycles.

10 Of course, the invention is not limited to the examples just described and many modifications can be made to these without departing from the scope of the invention.

Thus the plate 2 can be any shape and need not be centered on the bottom of the container.

15 The plate can be star-shaped, for example, with any number of branches. The plate can be asymmetric in shape, for example having one branch extending in one direction, for example that of the handle of the vessel.

The radial grooves can have different shapes, lengths and depths.

**WHAT IS CLAIMED IS:**

1. A cooking vessel made from a pressed metal or light alloy sheet (3), having a bottom (1) provided with an outside edge (C) and adapted to be placed on a cooker hotplate or burner, the bottom (1) being, slightly concave and including a plate (2), said plate (2) having a periphery (2a) and being made from a metal or alloy having mechanical, thermal and physical properties different to those of the metal or alloy of said sheet (3), the plate (2) being embedded in said sheet (3), characterized in that the plate (2) covers only a relatively small central portion of the bottom (1) and in that the surface of said sheet (3) between the periphery (2a) of the plate (2) and the outside edge (C) of the bottom (1) comprises a plurality of radial grooves (7) thus having one end adjacent to the periphery (2a) of the plate (2) and their other end adjacent to the outside edge (C) of the bottom (1).  
10
2. A cooking vessel according to claim 1, characterized in that it is made from an aluminum sheet (3) and said plate (2) is made of stainless steel.
3. A cooking vessel according to claim 1 or 2, characterized in that said radial grooves (7) are identical and evenly distributed on said surface.
4. A cooking vessel according to any one of claims 1 to 3, characterized in that said radial grooves (7) vary in length and diameter along the diameter of the bottom (C) of the vessel.  
20
5. A cooking vessel according to any one of claims 1 to 3, characterized in that the end of the radial grooves (7) adjacent the periphery (2a) of the plate (2) is wider than their end adjacent the outside edge (C) of the bottom (1).

6. A cooking vessel according to any one of claims 1 to 4, characterized in that the end of the radial grooves (7) adjacent the periphery (2a) of the plate (2) opens into a circular groove (4) which surrounds the plate (2).

7. A cooking vessel according to any one of claims 1 to 4, characterized in that the plate (2) has holes (6).

8. A cooking vessel according to any one of claims 1 to 7, characterized in that the plate (2) includes several parts.

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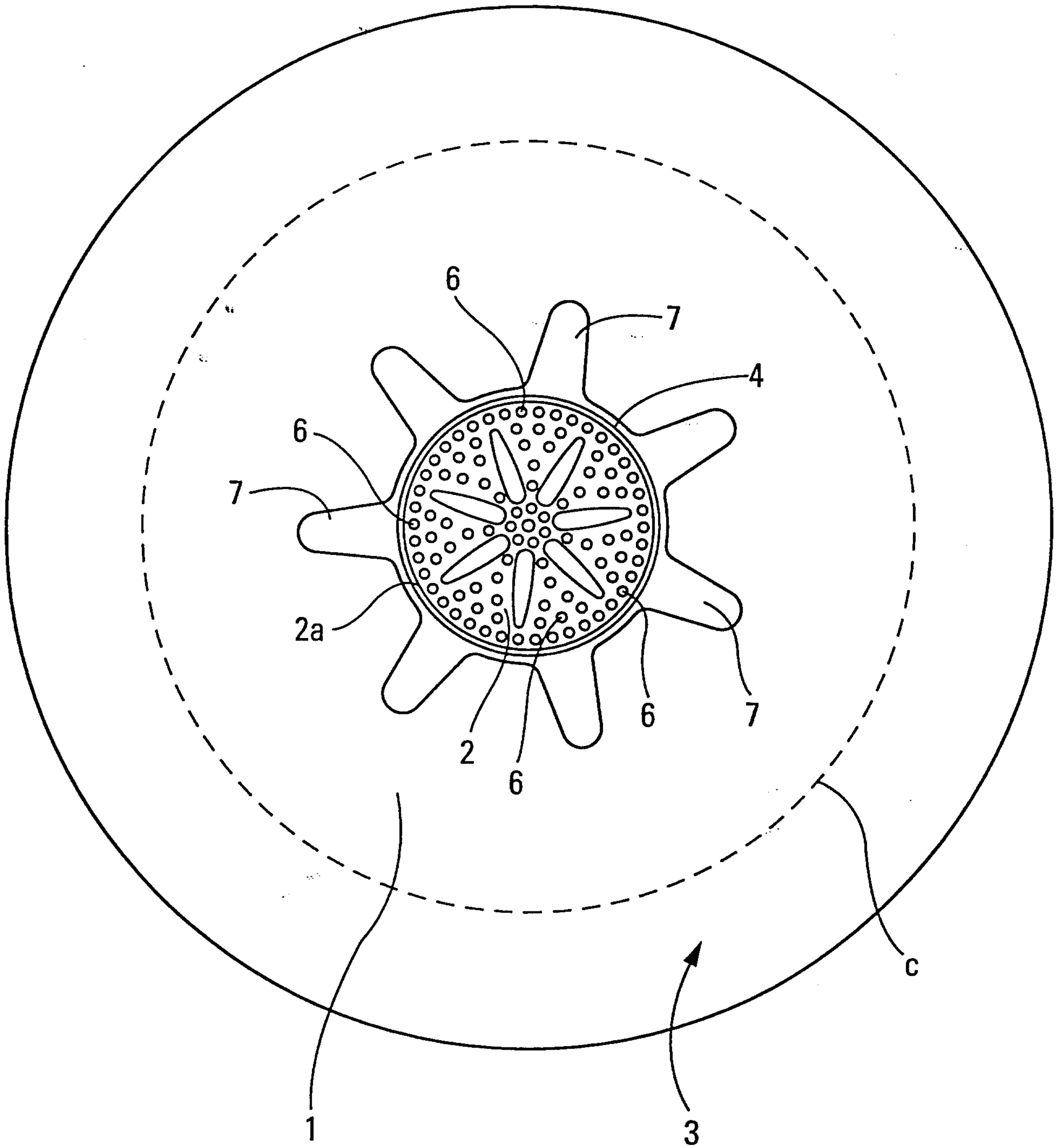


Fig. 1

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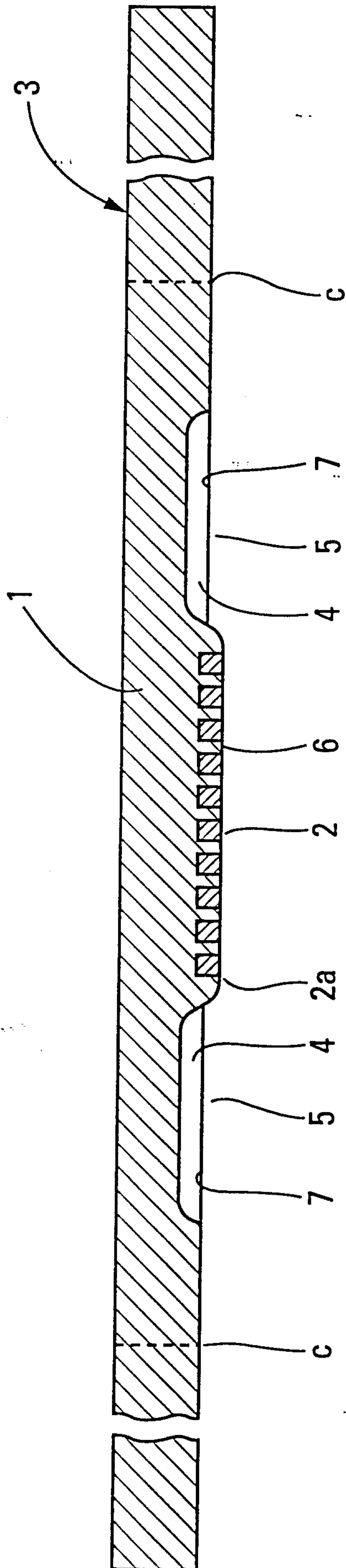


Fig. 2

