

"Cooking vessel with controlled bottom deformation"

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

Cooking vessels are usually pressed from a sheet of aluminium.

During cooking the bottom surface of the vessel is in contact with a hotplate or a burner and is at a much higher temperature than the inside surface of said bottom.

This causes thermal expansion leading to bulging of the bottom of the vessel.

To avoid this unwanted phenomenon the bottom of the vessel is made slightly concave, so that on heating the expansion of the bottom makes it substantially flat. In theory the bottom becomes concave again when it cools.

However, experience shows that after a number of repeated heating and cooling cycles the bottom of the vessel becomes less concave, subsequently flat and eventually convex, at which point the vessel is in practice no longer usable.

This result is explained by the properties of aluminium.

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

An object of the present invention is to avoid the irreversible deformation of the bottom of cooking vessels made from a sheet of metal or light alloy such as aluminium.

The invention consists in a cooking vessel made by pressing a sheet of metal or light alloy, including a bottom adapted to be placed on a hotplate, a burner or

the like, this bottom being slightly concave.

In accordance with the invention, this cooking vessel is characterised in that said bottom includes a centred plate optionally comprising a plurality of separate sections, covering only a small portion of said bottom, made from a metal or an alloy having mechanical, thermal and physical properties different than those of the metal or alloy of said sheet, this plate being embedded in said bottom. This embedding can be partial or total.

Because this plate embedded in the localised area of the bottom of the vessel has mechanical, thermal and physical properties different from those of the metal or alloy from which the remainder of the vessel is made, irreversible deformation of the bottom of the vessel is prevented, even after a very large number of repeated heating and cooling cycles.

Trials have shown that it is important that the above plate is embedded in only a small portion of the surface of the bottom.

The concave shape of said bottom is preferably such that when it is placed on a hotplate the supporting surface of the bottom around the plate having different mechanical, thermal and physical properties touches the hotplate, whereas the aforementioned plate does not touch the hotplate.

The concave shape is formed during pressing of the disc of metal or light alloy in which said plate has previously been totally or partially embedded.

The metal or alloy of the vessel will usually be based on aluminium and the plate totally or partially embedded in the bottom will usually be of steel, preferably stainless steel.

Said plate preferably covers between 5% and 30% of the bottom surface.

A groove may be formed at the periphery of the plate.

The plate preferably has holes in it and is partially or totally embedded in the bottom so that the metal of said bottom totally fills said holes. Embedding it in this way causes the plate to project slightly above the bottom.

The plate can be embedded in the metal of the vessel bottom by cold stamping as described in European patent application 509 860 in the name of the applicant, or by welding, brazing or adhesive bonding.

In a preferred version of the invention the thickness of the plate is between 0.3 mm and 0.5 mm and the plate is embedded in the bottom to a depth between 0.05 mm and 0.15 mm in the case of an aluminium bottom between 2.5 mm and 5 mm thick.

Other features and advantages of the invention will emerge further from the following description.

In the appended drawings given by way of non-limiting example:

- figure 1 is a plan view of a disc intended to be pressed into the shape of a vessel in accordance with the invention;

- figure 2 is a sectional view of the aforementioned disc.

Figures 1 and 2 show a disc cut out from a sheet of metal or light alloy such as aluminium. The disc is intended to be pressed, by a pressing process familiar to the person skilled in the art, into the shape of a cooking vessel such as a frying pan or a saucepan having a bottom intended to be placed on a hotplate or a burner.

In figure 1, the dashed line circle C indicates the periphery of the bottom 1 of the vessel.

As will also be familiar to the person skilled in the art, the bottom is made slightly concave when the

disc 3 is pressed.

In accordance with the invention, the bottom 1 includes in its central part a plate 2 of a metal or an alloy having properties different from those of the metal or alloy of the disc 3.

Figure 2 shows that the plate 2 is embedded in the metal of the bottom 1 and that the periphery 2a of the plate 2 is adjacent a groove 4 in said bottom 1.

After the disc 3 is pressed, the concave shape of the bottom 1 is such that when it is placed on a hotplate the surface 5 of the bottom around the plate 2 touches the hotplate whereas the surface of the plate 2 does not touch the latter.

The disc 3 is preferably an aluminium disc between 2.5 mm and 5 mm thick.

The plate 2 is preferably of stainless steel.

The plate 2 preferably covers between 5% and 30% of the surface of the bottom 1. This relatively small portion of the bottom 1 covered by the plate 2 gives the best results, both with regard to resistance to deformation of the bottom 1 due to the effect of repeated heating and cooling cycles and with regard to transmission of heat and even distribution of temperature.

These results are explained in part by the partial embedding of the plate 2 in the central area of the bottom of the container and by the different properties of steel compared to aluminium, which prevents irreversible deformation of the bottom due to the effect of repeated heating and cooling cycles.

In the embodiment shown in figures 1 and 2 the plate 2 has holes 6, for example circular holes, regularly spaced and distributed across all of the surface of the plate. The plate 2 is partially embedded in the bottom 1. The plate 2 can be embedded in the

bottom 1 by cold stamping, as described in European patent 509 860 in the name of the applicant.

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

It is sufficient for the plate 2 to be between 0.3 mm and 0.5 mm thick (for an aluminium bottom between 2.5 mm and 5 mm thick). It is sufficient for it to be embedded in the bottom 1 to a depth between 0.05 mm and 0.15 mm for excellent results to be obtained. Excessively deep embedding of the plate 2 in the metal of the bottom 1 has been found to have a negative effect.

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

The size of the holes 6 in the plate 2 is not critical. Nevertheless, it is preferable for the holes 6 in the plate 2 to have a diameter which is less than twice the distance between two holes.

For example, the holes 6 can have a diameter of about 3 mm and the distance between two holes can be about 2 mm.

There follow the results of comparative tests on two frying pans, one of a conventional type and the other in accordance with the invention.

The two frying pans were of exactly the same size and made from an aluminium disc 3.4 mm thick.

The frying pan in accordance with the invention had on its bottom a stainless steel disc 0.5 mm thick and 75 mm in diameter.

The two frying pans were subjected to repeated heating and sudden cooling cycles (heating to 250°C followed by cooling to about 20°C under running cold

water).

Irreversible deformation of the conventional frying pan was observed after 30 such cycles.

In the case of the frying pan in accordance with the invention, irreversible deformation of the bottom was not observed until after 300 repeated heating and cooling cycles.

The invention is naturally not limited to the examples just described and many modifications may be made to them without departing from the scope of the invention. For example, the plate 2 can be any shape and need not be centred on the bottom of the vessel.

The plate can be star-shaped, for example, with any number of points. The shape of the plate can be asymmetrical, for example with one branch extending in a particular direction, for example towards the handle of the vessel.



CLAIMS

1. Cooking vessel made by pressing a sheet (3) or metal or light alloy, including a bottom (1) adapted to be placed on a hotplate, a burner or the like, this bottom (1) being slightly concave, characterised in that said bottom (1) includes a plate (2) optionally comprising a plurality of separate sections, covering only a small portion of said bottom (1), made from a metal or an alloy having mechanical, thermal and physical properties different than those of the metal or alloy of said sheet (3), this plate (2) being embedded in said bottom (1).

2. Cooking vessel according to claim 1 characterised in that it is made from a sheet (3) of aluminium and said plate (2) is of steel.

3. Cooking vessel according to claim 1 or claim 2 characterised in that the concave shape of said bottom (1) is such that when it is placed on a hotplate the supporting surface (5) of the bottom around the plate (2) having different properties touches the hotplate whereas the aforementioned plate (2) does not touch the hotplate.

4. Cooking vessel according to any one of claims 1 to 3 characterised in that said plate (2) covers between 5% and 30% of the surface of the bottom (1).

5. Cooking vessel according to any one of claims 1 to 4 characterised in that the plate (2) has holes (6) in it and is partially embedded in the bottom (1).

6. Cooking vessel according to any one of claims 1 to 5 characterised in that the plate (2) has a thickness between 0.3 mm and 0.5 mm and is embedded in the bottom (1) to a depth between 0.05 mm and 0.15 mm for an aluminium bottom between 2.5 mm and 5 mm thick.

7. Cooking vessel according to any one of claims 1 to 6 characterised in that the plate (2) is adjacent a groove (4) in the bottom (1).



8. Cooking vessel according to any one of claims 1 to 7 characterised in that the plate (2) is in the shape of a disc or a ring optionally divided into a plurality of sectors.

9. Cooking vessel according to any one of claims 1 to 7 characterised in that the plate (2) is centred on the bottom of the vessel.

10. Cooking vessel according to any one of claims 1 to 7 characterised in that the plate (2) is not centred on the bottom of the vessel.

11. Cooking vessel according to any one of claims 5 to 8 characterised in that the holes (6) in the plate (2) have a dimension less than twice the distance between two holes.

12. Cooking vessel according to claim 11 characterised in that the holes (6) have a diameter of about 3 mm and the distance between two holes (6) is about 2 mm.