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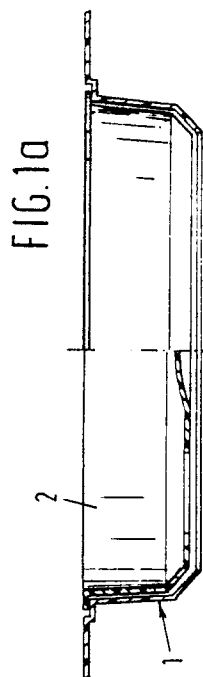
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54 **An apparatus for preparing hot beverages.**

57 An apparatus for making one or more consumption units of a hot beverage, such as coffee, comprising a combination of a filter pan and a disposable filter cartridge with filters of fibrous web material, fitting therein, said pan and cartridge being provided with coating walls ensuring a water seal between the said portions when the cartridge is being introduced into the pan and water is being infused. The filter pan and the filter cartridge are made of materials having different coefficients of expansion and the portions coating for sealing purposes are dimensioned in such a manner that, upon insertion of the cartridge, it rests without clamping or loosely in the pan and the water seal is obtained by means of the capillary forces and/or the clamping effect occurring when the hot water is being infused.



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An apparatus for preparing hot beverages

The present invention relates to an apparatus for making or preparing one or more consumption units of a hot beverage, in particular coffee, comprising a combination of a filter pan and a disposable filter cartridge with filters of fibrous web material fitting therein, with the filter pan and the filter cartridge being provided with coating walls which ensure a water seal between the said portions when the filter cartridge has been introduced into the filter pan and water is being infused.

In a similar apparatus disclosed in Dutch patent application 83.00213 the filter cartridges and the filter pan are dimensioned in such a manner that the seal is obtained by means of the capillary forces occurring during the infusion of water in the space between the said coating walls, thus achieving that practically all of the water infused participates in the extraction.

A major drawback of the known apparatus, however, is that for obtaining the desired capillary effect, a very close tolerance of the cartridge and the filter pan is required. On the other hand, it is also known (see French patent 1,347,892 and German Auslegeschrift 1,207,866) to effect the combination in such a manner that the filter cartridge has to be pushed into the filter pan with some force, however, with the risk of damaging the top filter, as well as of soiling one's fingers upon removal of the cartridge after use.

It is an object of the present invention to remove these drawbacks.

The apparatus is characterized to that end in that the filter pan and the filter cartridge are made of materials having different coefficients of expansion and the portions coating for sealing purposes are dimensioned in such a manner that, on insertion of the filter cartridge, it rests without clamping or loosely in the cartridge and the water seal is obtained by means of capillary forces and/or clamping occurring during the infusion of the hot water owing to the difference in coefficients of expansion.

It is thus achieved that the filter cartridge can have a larger tolerance relative to the filter pan than is the case in the known construction, for either by the capillary effect or by clamping or both, a water seal is obtained between the filter pan and the cartridge. Besides, the cartridge will have a loose position in the filter pan at ambient temperature, so that said pan can be removed without manual contact.

Naturally, it is clear that the disposable filter cartridge should be made of a material having a larger coefficient of expansion than that of the filter pan material. An example of a suitable combination is a filter pan of aluminum and a disposable filter cartridge of polypropylene.

Another solution for the above tolerance problem is that the filter cartridge and the filter pan are conical and that the angle between said conical side walls and the axis of the cartridge is 3-10°, preferably 6°.

It has been experimentally found that when the angle is too small, there is produced too large a clamping force between the coating conical walls, so that the removal of the cartridge from the filter pan gives problems.

It has also been found that when the angle between the coating, conical peripheral walls and the vertical is too large, the cartridge will float when water is being infused, which is a result of leakage water penetrating between the two conical walls. This results in a major part of the water not participating in the extraction.

Some embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1a is a part-sectional lateral view of a first embodiment at ambient temperature;

Fig. 1b shows the apparatus shown in Fig. 1 but during use, i.e. after hot water has been infused;

Figs. 2a and 2b are views similar to Fig. 1a and 1b, respectively and showing a second embodiment of the apparatus according to the present invention;

Fig. 3 is a view similar to Figs. 1 and 2 of a third embodiment;

Fig. 4 is a cross-sectional view on the line IV-IV of Fig. 3; and

Figs. 5 and 6 show an embodiment of a coating filter pan and filter cartridge with, successively, too small an angle between the vertical and the conical walls (Fig. 5), and too large an angle between the conical walls and the vertical (Fig. 6).

In Figs. 1a, 1b, 2a and 2b, the same parts have identical reference numerals.

As shown in Fig. 1a, a filter pan 1 partly shown accommodates a disposable filter cartridge 2. Since such a filter pan and cartridge are known per se (see e.g. Dutch patent application 83.00213, mentioned in the introduction), these will not be further described hereinafter.

In the combination shown at the ambient temperature in Fig. 1, there is a slight clearance between cartridge and pan, as shown in the figure, to the effect that the cartridge at ambient temperature has a loose, at least non-clamping, position in the filter pan.

Fig. 1b shows the situation after the infusion of hot water, so that the pan and cartridge are expanded, on the understanding that as a result of the larger coefficient of expansion of the cartridge, this now rests clamping in the filter pan.

Fig. 2a shows a combination of cartridge and pan at ambient temperature with a considerably larger clearance being present than in the assembly shown in Fig. 1a. After infusion of hot water, in the combination shown in Fig. 2a, the situation shown in Fig. 2b will occur, wherein the clearance between the coating walls of the filter pan and the cartridge is substantially reduced. It is true that as a result, there will be no clamping effect, but the clearance between the said walls has become of such a nature that a water seal is obtained through capillary forces.

The embodiment shown in Figs. 3 and 4 shows a filter cartridge 3 received in a filter pan 4, wherein the cartridge does not rest with an upper peripheral edge on the pan, as in the embodiments shown in Figs. 1 and 2, but wherein the cartridge 3 with its inclined side wall 5 (Fig. 3 left hand part) rests on the corresponding side wall 6 of pan 4.

The embodiment shown in Figs. 3 and 4 shows a filter cartridge with a given unroundness: the cartridge has such a position in the filter pan that this is clampingly received in the pan in the places indicated at 7, while in the places indicated at 8, there is provided such a space between the said edges that this produces a capillary seal only after infusion of hot water due to expansion in the above places. In this manner, leakage will be prevented even in the case of unroundness.

It will be clear that the admissible tolerances of the dimensions of the filter pan and cartridge depend on the materials of which the parts in question are made. Naturally, a great many different combinations are possible: as an example was already mentioned hereinbefore a filter pan of aluminum and a filter cartridge of polypropylene. The combination may also consist of e.g. a filter cartridge of polypropylene (coefficient of expansion 0.0015 mm/mm/°C) and a filter pan of polystyrene (coefficient of expansion 0.0008 mm/mm/°C) or a filter cartridge of polypropylene or polystyrene and a filter pan of polycarbonate (coefficient of expansion 0.0007 mm/mm/°C).

In the embodiment shown in Figs. 5 and 6, a filter pan 11 shown only partly is provided with a conically bulged portion 12 wherein fits a filter cartridge 13 having a conical peripheral wall 14. The angle between the conical wall and the vertical is indicated at α .

When in both cases the filter cartridge is dropped either from a given height into the cavity of the filter pan, or is pressed into it at a given force, this will arrive therein at a given force K. It will be clear that at a smaller angle, the chance of further depression is larger than when angle α is larger. This implies that at a smaller angle α , the force necessary for removal is likewise larger than when angle α is larger.

Summarizing the above, it can be stated that in the first case (Fig. 5), a very large clamping force is produced, which may result in problems on removal of the filter cartridge from the filter pan. In the second case (Fig. 6), the clamping force will be insufficient to ensure that during the infusion of water, no floating will occur as a result of the penetration of water between the two conical walls.

It is observed in this respect that mostly a slight pushing force will be sufficient, although in the latter case the nominal force is insufficient to seal existing high spots between pan and cartridge; these forces will become sufficiently large when heating takes place during use to ensure a proper sealing; in cold condition, the nominal force will again be sufficiently small to allow an easy removal of the cartridge.

As already stated earlier, the materials used will be of influence for the filter cartridge or the filter pan.

Claims

1. An apparatus for making one or more consumption units of a hot beverage, such as coffee, comprising a combination of a filter pan and a disposable filter cartridge with filters of fibrous web material, fitting therein, said pan and cartridge being provided with coating walls ensuring a water seal between the said portions when the cartridge is being introduced into the pan and water is being infused, characterized in that the filter pan and the filter cartridge are made of materials having different coefficients of expansion and the portions coating for sealing purposes are dimensioned in such a manner that, upon insertion of the cartridge, it rests without clamping or loosely in the pan and the water seal is obtained by means of the capillary forces and/or the clamping effect occurring when the hot water is being infused.

2. An apparatus for making one or more consumption units of a hot beverage, such as coffee, comprising a combination of a filter pan and a disposable filter cartridge with filters of fibrous web material fitting therein, said pan and cartridge being provided with coacting conical side walls ensuring a water seal between them when the cartridge is being introduced into the pan and brewing water is being infused, characterized in that the angle between the said conical side walls and the axis of the cartridge ranges between 3° and 10° .

3. An apparatus according to claim 2, characterized in that the said angle is about 6° .

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FIG. 1a

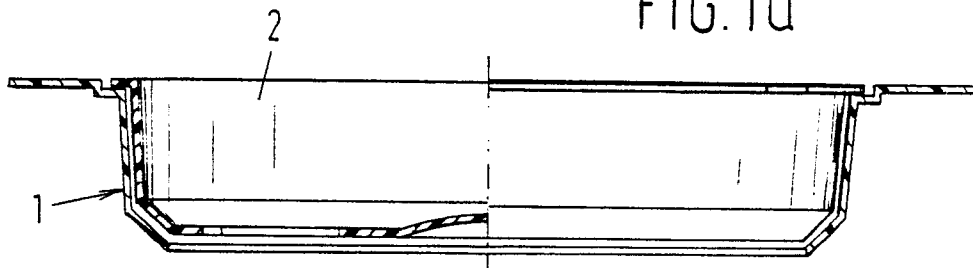


FIG. 1b

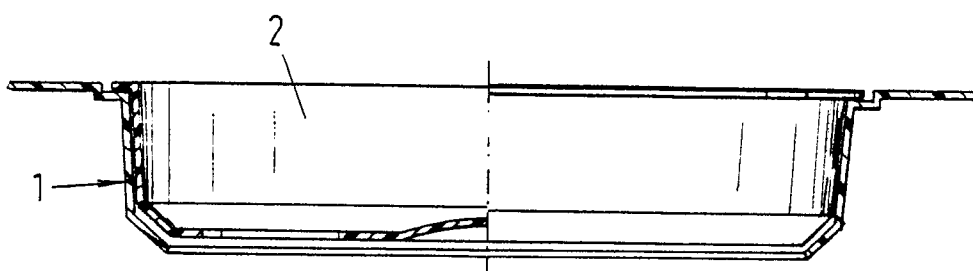


FIG. 2a

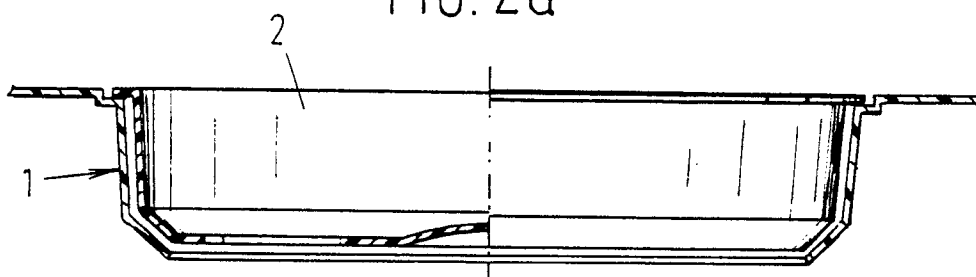


FIG. 2b

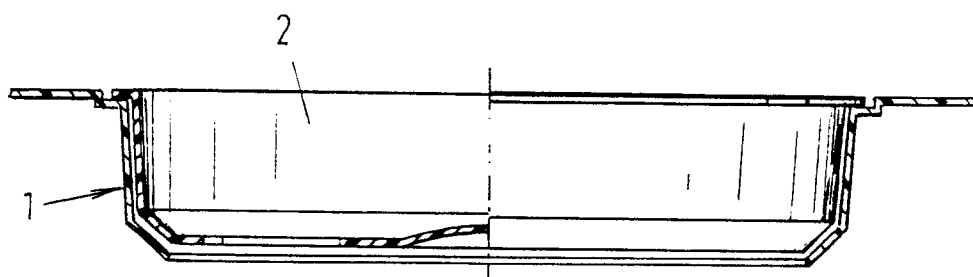


FIG.3

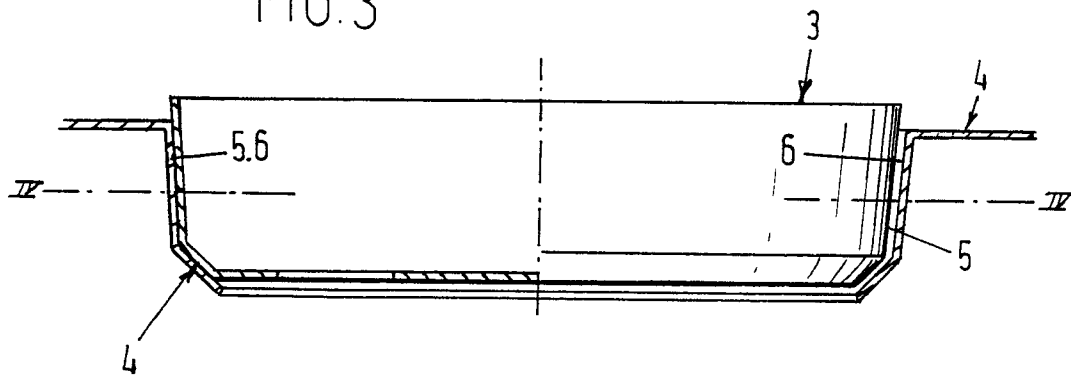


FIG.4

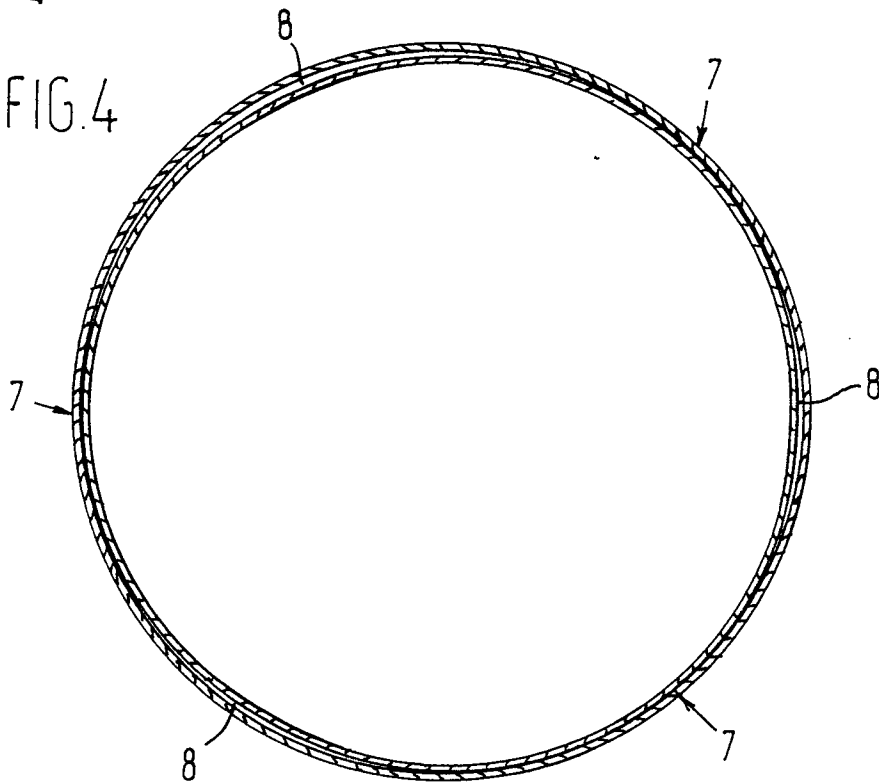


FIG.5

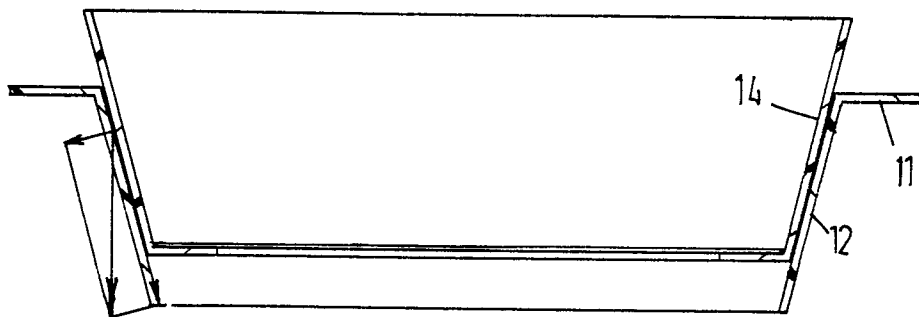
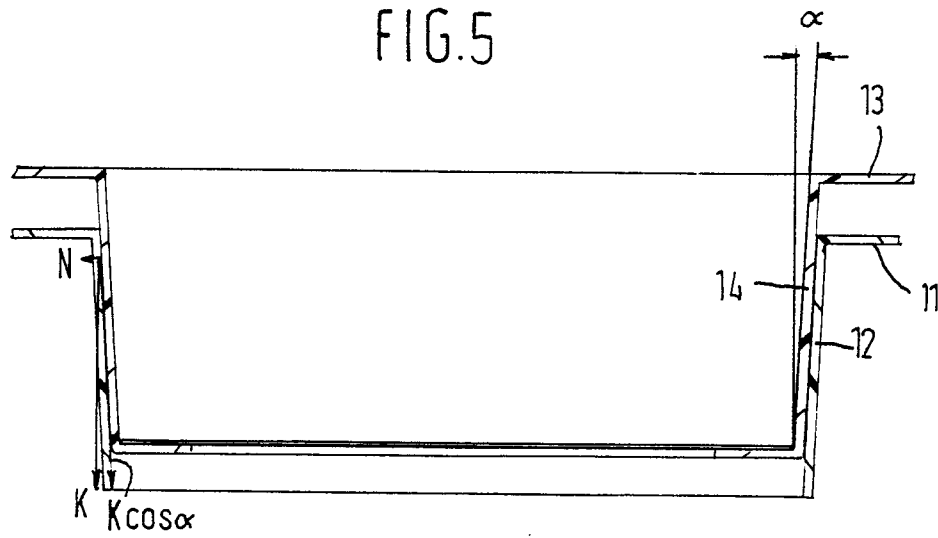


FIG.6



EP 86 20 2342

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4) |
| D, A | EP-A-0 114 717 (DOUWE EGBERTS) * Whole document * | 1 | B 65 D 81/34 |
| A | --- US-A-3 083 101 (NOURY) * Column 2, line 65 - column 3, line 7; figure 3 * | 1 | |
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| A | --- GB-A-2 156 662 (ENGLISH) | | |
| A | --- GB-A-1 064 010 (MIKO) | | |
| A | --- US-A-3 823 656 (VANDER VEKEN) ----- | | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 24-03-1987 | Examiner SCHARTZ J. |
| CATEGORY OF CITED DOCUMENTS | | | |
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