

Title: Method, system and receptacle for preparing a beverage.

The invention relates to a method and a system for preparing a predetermined quantity of beverage, such as coffee, using an extractable product contained in an exchangeable capsule. The invention also relates to a receptacle for holding such an exchangeable capsule and for use in an
5 apparatus for preparing, out of the extractable product, such a predetermined quantity of beverage. More in particular, the invention relates to such a method in which the capsule is pierced by at least one blade for letting fluid flow into the capsule, as well as to such a system and receptacle, wherein the receptacle has at least one blade arranged for piercing the capsule.

10 Such a method, system and receptacle are known, for example from EP1299022B1.

As to the exchangeable capsules, several embodiments thereof do exist, both in terms of shape and materials used. However, one of the problems still unsolved of the capsules at issue is represented by the optimization of brewing
15 conditions, and in particular by the option of obtaining, through the capsule, a fluid flow even and optimal from the standpoint of the resulting beverage. For this purpose, a drawback often found is represented by the fact that the fluid passes through privileged portions of the capsule only, instead of throughout the internal housing receiving the infusion. Moreover, the significant
20 parameters of the flow passing through the capsule, like, e.g., speed and direction, may variously be affected by its shape, often even in a way and to an extent a priori unforeseeable, to the detriment of the quality of the end beverage and of the repeatability of its features, e.g. in terms of taste and density.

25 Embodiments of the present invention seek to provide a solution according to which the process of extracting the extractable product in the exchangeable capsule is improved.

For that purpose, the invention provides a method according to claim 1, a system according to claim 4, as well as a receptacle according to claim 7. Specific embodiments of the invention are set forth in the dependent claims.

Thus, for a method and a system according to the invention, a length of
5 the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 80% (preferably less than 75%, more preferably less than 70%) of said
overall axial capsule length, while, for a receptacle according to the invention,
10 a length of the at least one blade is chosen such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface and the at least one blade in the internal cavity is less than 80% (preferably less than 75%, more preferably less than 70%) of said overall axial cavity length.

15 Therefore, for a method, system and receptacle according to the invention, a corresponding high penetration depth of the at least one blade piercing the capsule is obtained. Since the blade or blades deeply penetrate the capsule, optimal flow conditions are obtained for the fluid passing through the capsule itself, to the advantage of the quality and repeatability of the end
20 beverage and also of the correct operation of the associated machines, which are not subject to unforeseeably variable flow conditions. In fact, the deeply penetrating blade or blades act as divider plates within the capsule, and prevent the occurring of preferential flow paths through the extractable product. In addition to this advantage of obtaining optimal flow conditions, the
25 deeply penetrating blade or blades provide the further advantage that the extractable product within the capsule is more intensively compacted just prior to the extraction process, which also is favourable from the standpoint of the resulting beverage.

It is remarked that the said favourable "divider plate" and "compacting"
30 effects will even be higher in cases of still higher penetration depths than the

penetration depths that correspond to the mentioned percentages 80%, 75% and 70%. That is, even higher improvements are achieved for a method and a system according to the invention, when a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 60% (preferably less than 50%, more preferably less than 40%, or even more preferably less than 30%) of said overall axial capsule length. Similarly, even higher improvements are achieved for a receptacle according to the invention, when a length of the at least one blade is chosen such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface and the at least one blade in the internal cavity is less than 60% (preferably less than 50%, more preferably less than 40%, or even more preferably less than 30%) of said overall axial cavity length.

According to a first aspect of the present invention, there is provided a method for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, comprising: providing an exchangeable capsule, comprising a circumferential first wall, a second wall closing the circumferential first wall at a first end, and a third wall closing the circumferential first wall at a second end opposite the second wall, wherein the first, second and third wall enclose an inner space comprising the extractable product, wherein the capsule has a longitudinal central capsule axis and an overall axial capsule length measured along said central capsule axis; piercing the second wall of the capsule by means of at least one blade; supplying, via the pierced second wall of the capsule, an amount of fluid, such as water, under a pressure to the inner space of the capsule; and draining through the third wall of the capsule the prepared beverage; **characterized in that** a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 80% of said overall axial capsule length.

According to a second aspect of the present invention, there is provided a system for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, the system comprising: an exchangeable capsule comprising a circumferential first wall, a second wall closing the circumferential first wall at a first end, and a third wall closing the circumferential first wall at a second end opposite the second wall, wherein the first, second and third wall enclose an inner space comprising the extractable product, wherein the capsule has a longitudinal central capsule axis and an overall axial capsule length measured along said central capsule axis; and an apparatus, the apparatus comprising: a receptacle for holding the exchangeable capsule, the receptacle comprising a first holding part and a second holding part, wherein the second holding part in use is movable in the apparatus relative to the first holding part from an open position at which the two parts are distant relative to one another to enable the insertion of the capsule between the two parts and a closed position at which the first and second holding parts together are defining an internal cavity of the receptacle for containing the capsule to be extracted with the first and second holding parts closed about the capsule, wherein the second holding part comprises a fluid intake channel arranged for supplying an amount of fluid, such as water, under a pressure to the internal cavity, and a blade system comprising at least one blade arranged for piercing the second wall of the capsule in the internal cavity for letting the fluid flow into the capsule, and wherein the first holding part comprises a support surface arranged to abut against the third wall of the capsule in the internal cavity for draining through that third wall and through the support surface the prepared beverage; and a fluid dispensing device for said supplying of fluid to said fluid intake channel; **characterized in that** a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 80% of said overall axial capsule length.

According to a third aspect of the present invention, there is provided a receptacle for holding an exchangeable capsule containing an extractable product and for use in an apparatus for preparing, out of the extractable product, a

predetermined quantity of beverage, such as coffee, the receptacle comprising a first holding part and a second holding part; wherein the second holding part in use is movable in the apparatus relative to the first holding part from an open position at which the two parts are distant relative to one another to enable the insertion of the capsule between the two parts and a closed position at which the first and second holding parts together are defining an internal cavity of the receptacle for containing the capsule to be extracted with the first and second holding parts closed about the capsule, wherein the internal cavity has a longitudinal central cavity axis and an overall axial cavity length measured along said central cavity axis; wherein the second holding part comprises: a fluid intake channel arranged for supplying an amount of fluid, such as water, under a pressure to the internal cavity, and a blade system comprising at least one blade arranged for piercing the capsule in the internal cavity for letting the fluid flow into the capsule; and wherein the first holding part comprises a support surface arranged to abut against a wall of the capsule in the internal cavity for draining through that wall and through the support surface the prepared beverage; **characterized in that** a length of the at least one blade is chosen such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface and the at least one blade in the internal cavity is less than 80% of said overall axial cavity length.

According to a fourth aspect of the present invention, there is provided an apparatus for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, comprising: a receptacle in accordance with the third aspect; and a fluid dispensing device for supplying an amount of fluid, such as water, under a pressure to the fluid intake channel of the receptacle.

The invention will now be further elucidated by means of, non-limiting, examples referring to the schematic figures in the enclosed drawing, in which:

Fig. 1 shows, in partial longitudinal section, an example of an embodiment of a receptacle according to the invention, wherein holding parts of the receptacle are in open position;

Fig. 2 shows the example of Fig. 1 once again, wherein, however, the holding parts are in closed position;

Fig. 3 shows, in perspective view, an example of a variant of at least one blade for use in a method, system and receptacle according to the invention.

Fig. 4 shows, in perspective view, an example of another variant of at least one blade for use in a method, system and receptacle according to the invention.

In Figs. 1 and 2 there is shown a receptacle for holding an exchangeable capsule 20 containing an extractable product and for use in an apparatus for preparing, out of the extractable product, a predetermined quantity of

beverage, such as coffee. The receptacle comprises a first holding part 11 and a second holding part 12.

The second holding part 12 in use is movable in the apparatus relative to the first holding part 11 from an open position (shown in Fig. 1) at which the two parts are distant relative to one another to enable the insertion of the capsule 20 between the two parts and a closed position (shown in Fig. 2) at which the first and second holding parts together are defining an internal cavity 9 of the receptacle for containing the capsule 20 to be extracted with the first and second holding parts closed about the capsule 20. The internal cavity 9 has a longitudinal central cavity axis C1 and an overall axial cavity length L1 measured along said central cavity axis C1.

The second holding part 12 comprises a fluid intake channel 3 arranged for supplying an amount of fluid, such as water, under a pressure to the internal cavity 9, and a blade system 7 comprising at least one blade 8 arranged for piercing the capsule 20 in the internal cavity 9 for letting the fluid flow into the capsule 20.

The first holding part 11 comprises a support surface 4 arranged to abut against a wall 23 of the capsule in the internal cavity 9 for draining through that wall 23 and through the support surface 4 the prepared beverage.

A length of the at least one blade is chosen such that in the said closed position (see Fig. 2) the shortest possible axial distance D1, measured along said central cavity axis C1, between the support surface 4 and the at least one blade 8 in the internal cavity 9 is less than 80% of said overall axial cavity length L1, preferably less than 75% of said overall axial cavity length L1, and more preferably less than 70% of said overall axial cavity length L1.

In the shown example, the second holding part 12 has a thread 15 so that it can be screwed onto a part 16 (see Fig. 2) of an apparatus for preparing a beverage. A housing 17 may be used in order to arrange a seal in it to permit good leaktightness. Furthermore, in view of good leaktightness, the second holding part 12 may comprise a dynamic seal 14, that is to say a seal having a

certain flexibility. This seal is made of any plastic. This seal if preferably made of elastomer.

Arranged directly at the outlet of the channel 3 is the blade system 7. The blade system 7 comprises three openworked blades 8 connected to a ring 31 with a central opening 32 (see Fig. 1) which permits intake of water. The blades 8 are able to make slits in the top of the capsule to be extracted. For that purpose, the blades 8 are provided with cutting edges 38 (see Fig. 1). Apertures 18 in the blades 8 permit a good passage of water into the capsule 20.

Note, that various blade systems may be used. For example, Fig. 3 shows an example of another blade system 107 that comprises three openworked blades 108 connected to a ring 131 with a central opening 132, and having apertures 118 and cutting edges 38. Furthermore, Fig. 4 shows an example of yet another blade system 207 that comprises three openworked blades 208 connected to a ring 231 with a central opening 232, and having cutting edges 238. Note, that the blades 208 are not openworked. In the shown examples, each blade system has three identical blades which are equally spaced within the blade system. According to the invention it is however possible to apply in a blade system other types of blade spacings, other numbers of blades, such as one, two, four, five, six, etcetera, and/or blades which mutually differ in shape and/or size.

The above described receptacle is for use in an apparatus for preparing a predetermined quantity of beverage, such as coffee, using an extractable product. Such an apparatus comprises such a receptacle, as well as a fluid dispensing device for supplying an amount of fluid, such as water, under a pressure to the fluid intake channel of the receptacle. In Fig. 2 there is shown, in a highly schematical way, such a fluid dispensing device 30.

A system for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, comprises such an apparatus, as well as

an exchangeable capsule comprising an inner space comprising the extractable product.

As mentioned above, the invention provides a method for preparing a predetermined quantity of beverage, such as coffee, using an extractable
5 product. Such a method, which may be performed with or without a receptacle according to the invention, is now elucidated with reference to the examples shown in the Figures 1-4. Such a method comprises: providing an exchangeable capsule 20, comprising a circumferential first wall 21, a second wall 22 closing the circumferential first wall at a first end, and a third wall 23
10 closing the circumferential first wall 21 at a second end opposite the second wall, wherein the first, second and third wall enclose an inner space 19 comprising the extractable product, wherein the capsule 20 has a longitudinal central capsule axis C2 and an overall axial capsule length L2 measured along said central capsule axis C2; piercing the second wall 22 of the capsule 20 by
15 means of at least one blade 8 or 108 or 208; supplying, via the pierced second wall 22 of the capsule 20, an amount of fluid, such as water, under a pressure to the inner space 19 of the capsule 20; and draining through the third wall 23 of the capsule 20 the prepared beverage; wherein a length of the at least one blade 8 or 108 or 208 is chosen such that during the said fluid supplying the
20 shortest possible axial distance D2, measured along said central capsule axis C2, between the third wall 23 and the at least one blade 8 or 108 or 208 in the inner space 19 is less than 80% of said overall axial capsule length L2, preferably less than 75% of said overall axial capsule length L2, and more preferably less than 70% of said overall axial capsule length L2.

25 In the shown example, the fluid may for example be hot water and the extractable product may for example be coffee. After the hot water arrives and passes through the bed of coffee via the openings made by the blades, as a result of a rise in pressure in the capsule, the third wall 23 of the capsule 20 may for example tear on raised and recessed elements of the first holding part

11 and the capsule opens and the coffee may flow into a cup placed downstream of the receptacle 11, 12.

In the foregoing specification, the invention has been described with reference to specific examples of embodiments of the invention. It will, however, be evident that various modifications and changes may be made therein without departing from the broader scope of the invention as set forth in the appended claims.

The fluid intake channel may for example be connected to the internal cavity at different other locations, for example distant from the blade system, in which case there may be no need for the blade system to have an opening such as the shown central opening 32 of the ring 31.

Various materials may be used for the blades. It is preferable to have blades which have good resistance to piercing of aluminium capsules. The blades are thus preferably made of metal (iron, brass, chromium-plated brass) or of steel, preferably stainless steel. They may be made by stamping and folding, which makes them easy and inexpensive to produce and they have a service life equivalent to the service life of the machine on which they are fitted. The configuration of the blades may be such that it is possible to make small openings or larger openings in the capsule to be extracted. In case of slit-like openings, the shape of the slits is preferably not square, but instead substantially rectangular: the length-to-width ratio of said slits or said blades is preferably between 2 and 8.

The overall axial capsule length of the capsules to be extracted is normally of the order of 30 mm, in which case the length of the at least one blade, measured along the central capsule or cavity axis, normally is larger than 15 mm, preferably larger than 18 mm, more preferably larger than 21 mm, while the width of the blade is between 2 and 8 mm and its thickness between 0.2 and 1 mm.

The setting of the receptacle according to the invention in the apparatus is not critical. It is equally possible to provide for the water to arrive from above or from below, or any other possibility.

5 The capsule and parts thereof may be made of various materials, or various combinations of various materials. Also, the capsule may have various shapes. For example, the circumferential first wall may have any shape such as cylindrical, hemispherical, frustoconical or polygonal, such as hexagonal or octagonal. Also the second and third walls may have various forms, including forms which are non-flat.

10 However, other modifications, variations and alternatives are also possible. The specifications, drawings and examples are, accordingly, to be regarded in an illustrative rather than in a restrictive sense.

In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word 'comprising' does not exclude the
15 presence of other features or steps than those listed in a claim. Furthermore, the words 'a' and 'an' shall not be construed as limited to 'only one', but instead are used to mean 'at least one', and do not exclude a plurality. The mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. Method for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, comprising:

- providing an exchangeable capsule, comprising a circumferential first wall, a second wall closing the circumferential first wall at a first end, and a third wall closing the circumferential first wall at a second end opposite the second wall, wherein the first, second and third wall enclose an inner space comprising the extractable product, wherein the capsule has a longitudinal central capsule axis and an overall axial capsule length measured along said central capsule axis;

- 10 - piercing the second wall of the capsule by means of at least one blade;
- supplying, via the pierced second wall of the capsule, an amount of fluid, such as water, under a pressure to the inner space of the capsule; and
- draining through the third wall of the capsule the prepared beverage;

characterized in that a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 80% of said overall axial capsule length.

- 20 2. Method according to claim 1, wherein a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 75% of said overall axial capsule length.

3. Method according to claim 2, wherein a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 70% of said overall axial capsule length.

4. System for preparing a predetermined quantity of beverage, such as coffee, using an extractable product, the system comprising:

- an exchangeable capsule comprising a circumferential first wall, a second wall closing the circumferential first wall at a first end, and a third wall closing the circumferential first wall at a second end opposite the second wall, wherein the first, second and third wall enclose an inner space comprising the extractable product, wherein the capsule has a longitudinal central capsule axis and an overall axial capsule length measured along said central capsule axis; and

- an apparatus, the apparatus comprising:

- a receptacle for holding the exchangeable capsule, the receptacle comprising a first holding part and a second holding part, wherein the second holding part in use is movable in the apparatus relative to the first holding part from an open position at which the two parts are distant relative to one another to enable the insertion of the capsule between the two parts and a closed position at which the first and second holding parts together are defining an internal cavity of the receptacle for containing the capsule to be extracted with the first and second holding parts closed about the capsule, wherein the second holding part comprises a fluid intake channel arranged for supplying an amount of fluid, such as water, under a pressure to the internal cavity, and a blade system comprising at least one blade arranged for piercing the second wall of the capsule in the internal cavity for letting the fluid flow into the capsule, and wherein the first holding part comprises a support surface arranged to abut against the

third wall of the capsule in the internal cavity for draining through that third wall and through the support surface the prepared beverage; and

- a fluid dispensing device for said supplying of fluid to said fluid intake channel;

5 **characterized in that** a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 80% of said overall axial capsule length.

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5. System according to claim 4, wherein a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third wall and the at least one blade in the inner space is less than 75% of said
15 overall axial capsule length.

6. System according to claim 5, wherein a length of the at least one blade is chosen such that during the said fluid supplying the shortest possible axial distance, measured along said central capsule axis, between the third
20 wall and the at least one blade in the inner space is less than 70% of said overall axial capsule length.

7. Receptacle for holding an exchangeable capsule containing an extractable product and for use in an apparatus for preparing, out of the
25 extractable product, a predetermined quantity of beverage, such as coffee, the receptacle comprising a first holding part and a second holding part;

 wherein the second holding part in use is movable in the apparatus relative to the first holding part from an open position at which the two parts are distant relative to one another to enable the insertion of the capsule
30 between the two parts and a closed position at which the first and second

holding parts together are defining an internal cavity of the receptacle for containing the capsule to be extracted with the first and second holding parts closed about the capsule, wherein the internal cavity has a longitudinal central cavity axis and an overall axial cavity length measured along said central
5 cavity axis;

wherein the second holding part comprises:

- a fluid intake channel arranged for supplying an amount of fluid, such as water, under a pressure to the internal cavity, and
- a blade system comprising at least one blade arranged for piercing the

10 capsule in the internal cavity for letting the fluid flow into the capsule; and

wherein the first holding part comprises a support surface arranged to abut against a wall of the capsule in the internal cavity for draining through that wall and through the support surface the prepared beverage;

characterized in that a length of the at least one blade is chosen
15 such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface and the at least one blade in the internal cavity is less than 80% of said overall axial cavity length.

20 8. Receptacle according to claim 7, wherein a length of the at least one blade is chosen such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface and the at least one blade in the internal cavity is less than 75% of said overall axial cavity length.

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9. Receptacle according to claim 8, wherein a length of the at least one blade is chosen such that in the said closed position the shortest possible axial distance, measured along said central cavity axis, between the support surface

and the at least one blade in the internal cavity is less than 70% of said overall axial cavity length.

10. Apparatus for preparing a predetermined quantity of beverage, such
5 as coffee, using an extractable product, comprising:
- a receptacle according to any one of claims 7-9; and
 - a fluid dispensing device for supplying an amount of fluid, such as water,
under a pressure to the fluid intake channel of the receptacle.