Capsule for preparing a beverage by centrifugation in a beverage preparation device and device adapted therefore

The present ~~invention~~ disclosure relates to a capsule and a device for preparing a beverage from a beverage substance contained in the capsule by passing a liquid through the substance using centrifugal forces.

It is known to prepare beverages wherein a mixture consisting of brewed coffee and coffee powder is separated with centrifugal forces. Such a mixture is obtained by bringing hot water and coffee powder together for a defined time. The water is then forced through a screen, on which screen powder material is present.

Existing systems consist of placing the coffee powder in a receptacle which is usually a non-removable part of a machine such as in EP 0367 600B1. Such devices have many disadvantages. Firstly, the coffee powder must be properly dosed manually in the receptacle. Secondly, the centrifuged coffee waste becomes dry and it must be removed by scraping the surface of the receptacle. As a result, the coffee preparation requires a lot of manual handling and is so very time consuming. Usually coffee freshness can also vary a lot and this can impact on the cup quality because coffee comes generally from bulk package or coffee is ground from beans in the receptacle itself.

Also, depending on the manual dosage of coffee and the brewing conditions (e.g., centrifugal speed, receptacle size) the cup quality can vary a lot.

Therefore, these systems have never reached an important commercial success.

In German patent application DE 102005007852, the machine comprises a removable holder into which an open cup-

liquid. On the contrary, it serves to maintain a liquid-tight engagement between the rim and the injection part of the machine during the extraction of the beverage.

Therefore, there is a need for proposing a new capsule system adapted therefore for which the extraction parameters can be better and more independently controlled for improving quality of the delivered food liquid.

There is also a need for providing a solution enabling to improve the extraction characteristics, i.e., total solid content (Tc), level of foam/crema, of the existing systems, e.g., coffee preparation devices, using the principle of centrifugation.

At the same time, there is a need for a way of preparing a beverage which is more convenient and cleaner compared to the prior art centrifugal coffee preparation device, in particular a solution which does not require the hassle of removing coffee waste from the centrifuging receptacle.

For this, the invention relates to a capsule ~~insertable in a beverage production device for preparing a beverage from a substance contained in the capsule by introducing liquid in the capsule and passing liquid through the substance using centrifugal forces for producing the beverage which is centrifuged peripherally in the capsule relatively to a central axis of the capsule corresponding to an axis of rotation during the centrifuging operation comprising. The capsule comprises an enclosure containing an amount of beverage substance, a cup-like shaped body and an upper outer wall for closing the body. The capsule further comprises a flange-like rim extending outwardly from the body which comprises an annular raising portion forming a restriction for the centrifuged liquid flowpath when said portion is engaged by a pressing surface of the beverage production device~~according to independent claim 1.

Furthermore, as the valve means selectively block the flowpath for the centrifuged liquid, a preliminary wetting step of the beverage substance, e.g., ground coffee, can be carried out as no liquid is yet significantly discharged from the device. As a result of a prewetting and delayed release of the beverage, a thorough wetting of the substance is made possible and the interaction time between the liquid and the beverage substance, e.g., coffee powder, substantially increases and the extraction characteristics, e.g., coffee solid content and beverage yield, can be significantly improved.

In a mode of the invention, the annular raising portion extends in a direction substantially perpendicular to the transversal plane of extension of the flange-like rim. The orientation of the raising portion is thus configured to selectively block the flow of the centrifuged beverage that leaves the capsule along the flange-like rim when the capsule is rotated around its central axis.

Preferably, the annular raising portion extends outwardly and beyond an inward, comparatively lowered, annular portion of the flange-like rim and in a direction opposite to the bottom of the body.

The raising portion extends a certain height from an inner portion of rim. The inward portion of the rim is ~~preferably~~ flat. In certain embodiments, it may form an increase of thickness of the inner portion. The lowered annular portion merges with the sidewall and can be aligned with the upper wall, or alternatively, be placed in the capsule away a certain distance from the upper wall. The annular raising portion thus forms a step or protrusion extending of said distance from such (preferably flat) inward annular portion of the rim to ensure a surelevation independent from the thickness of the body of the capsule. As a result, the

formula), dehydrated fruit or plant, culinary powder and combinations thereof.

The capsule may include a gas with the food ingredients which is protective against oxidation of the ingredients such as nitrogen and/or carbon dioxide. The gas may be added in the capsule , e.g., by flushing, before sealing the upper wall on the body.

Preferably, the capsule comprises gas barrier materials enveloping the ingredients' compartment. However, in case the capsule is not gastight 'per se', an outer package can be used to pack the capsule individually or in group of several capsules. In this case, the package is removed before the capsule is inserted in the device.

~~The invention also relates to the use of a capsule as aforementioned in a beverage preparation device wherein the capsule is centrifuged in the device.~~

The ~~invention~~ disclosure also relates to a beverage preparation device from a capsule as aforementioned, by passing a liquid through the beverage substance in the capsule, comprising:

a liquid injection head for injecting liquid in the capsule,

a capsule holder for holding the capsule in the device,

means for driving the capsule in centrifugation,

wherein it comprises a pressing surface for applying a determined closing force onto the annular raising portion of the flange-like rim for substantially closing the flowpath to the beverage.

The closing force can be determined to maintain the closure between the annular raising portion and the pressure surface, i.e., the valve means, until a sufficient pressure of the centrifuged liquid is reached directly upstream of the said

In a particular mode, the pressing surface forms a relatively flat annular surface onto which the annular raising portion of the capsule can press. Hence, a closing action is promoted by an engagement at the valve means under the form of an annular sealing line. Preferably, the surface is substantially parallel to the flange-like rim of the capsule. Of course, the pressing surface could also have a slightly concave or convex line of curvature in radial direction relative to the axis of centrifugation.

According to another feature of the device, the capsule holder can comprise a support surface for supporting the flange-like rim of the capsule and comprising an annular indentation indented to fit into an annular groove of the flange-like rim. As aforementioned, this configuration of the support surface of the capsule holder avoids the deformation of the capsule in the device when the injection head is engaged in compression against the flange-like rim of the capsule.

In another feature of the device, the injection head comprises a central injection needle. The needle is configured to perforate the lid membrane of the capsule. The needle may terminate by one or more liquid inlets for injecting liquid in the capsule. Preferably, the needle is centrally position, i.e., aligned with the axis of rotation. The needle could be omitted if the capsule has a central inlet port provided in its upper wall.

The invention ~~may~~ also relate<u>s</u> to a ~~system including the~~ combination of ~~one or more~~<u>a</u> capsule<u></u>~~s~~ ~~as aforementioned~~ and a device ~~as aforementioned~~<u>according to independent claim 14</u>~~,~~ ~~or a capsule inserted in a device as aforementioned~~.

Additional features of the invention will appear in the detailed description of the figures which follows:

CLAIMS:

1. ~~Capsule insertable~~Use of a capsule in a beverage production device wherein the capsule is centrifuged in the device for preparing a beverage from a substance contained in the capsule by introducing liquid in the capsule and passing liquid through the substance using centrifugal forces for producing the beverage which is centrifuged peripherally in the capsule relatively to a central axis of the capsule corresponding to an axis of rotation during the centrifuging operation, said capsule comprising:

an enclosure containing an amount of beverage substance,

a cup-like shaped body (2) comprising a sidewall (7),

an upper outer wall (3) for closing the body,

wherein ~~it~~ said capsule comprises a flange-like rim (4) extending outwardly from the body which comprises an annular raising portion forming a force-setting means of a valve means and a restriction for the centrifuged liquid flowpath ~~when said portion is engaged by a pressing surface~~ by the engagement of said portion with a pressing surface of the beverage production device~~.~~,

wherein the annular raising portion (8) extends in a direction opposite to the bottom (6) of the body,

wherein said capsule comprises a relatively flat annular inward portion (5) of the rim merging, at one end, to the annular raising portion (8) extending of a certain height ("d") therefrom, and, at its other end, to the sidewall (7) of the body.

~~2. Capsule according to claim 1, wherein the annular raising portion (8) extends in a direction opposite to the bottom (6) of the body.~~

~~3. Capsule according to claims 1 or 2, wherein the annular raising portion (8) extends of a certain height ("d") from a~~

~~relatively flat annular inward portion (5) of the rim (4) merging with the sidewall.~~

~~4~~2. Use of the ~~C~~capsule according to claim ~~3~~1, wherein the annular raising portion (8) forms an increase of thickness ("d + d1") of the inward portion (5).

~~5~~3. Use of the ~~C~~capsule according to claims ~~3 –~~1 or ~~4~~2, wherein the annular inward portion (5) forms a sealed portion for the upper wall (3).

~~6~~4. Use of the ~~C~~capsule according to any one of the preceding claims, wherein the annular raising portion extends in a direction substantially perpendicular to the transversal plane of extension of the flange-like rim.

~~7~~5. Use of the ~~C~~capsule according to any one of the preceding claims, wherein the annular raising portion is rigid.

~~8~~6. Use of the ~~C~~capsule according to any one of the preceding claims, wherein the annular raising portion is made integral with the flange-like rim.

~~9~~7. Use of the ~~C~~capsule according to any one of claims 1 to ~~8~~6, wherein the lower surface (82) of the flange-like rim merging with said sidewall (7) of the body is free of any projection in the direction opposed to the annular raising portion (8).

~~10~~8. Use of the ~~C~~capsule according to any of the preceding claims, wherein the flange-like rim comprises an annular groove (81) on its surface directly opposed to the annular raising portion.

~~11~~9. Use of the ~~C~~capsule according to claim ~~10~~8, wherein the annular raising portion is embossed in the flange-like rim.

~~12~~10. Use of the ~~C~~capsule according to claims ~~10~~ 8 or ~~11~~9, wherein the cup-like shaped body comprises aluminium and/or plastics.

~~13~~11. Use of the ~~C~~capsule according to claim 1, wherein the annular raising portion is a separate element which is attached to the flange-like rim.

~~14~~12. Use of the ~~C~~capsule according to claim ~~13~~11, wherein the annular raising portion is made of rubber elastic material.

~~15~~13. Use of the ~~C~~capsule according to any of the preceding claims, wherein the raising portion comprises a gas vent means (80).

~~16. Use of a capsule according to any of the preceding claims in a beverage preparation device wherein the capsule is centrifuged in the device.~~

~~17. Beverage preparation device from a capsule according to any of the preceding claims, by passing a liquid through the beverage substance in the capsule, comprising:~~

~~a liquid injection head for injecting liquid in the capsule,~~

~~a capsule holder for holding the capsule in the device,~~

~~means for driving the capsule in centrifugation,~~

~~wherein it comprises a pressing surface for applying a determined closing force onto the annular raising portion of the flange-like rim for substantially closing the flowpath to the beverage.~~

~~18. Device according to claim 17, wherein the pressing surface and/or the capsule holder is/are associated to spring-loading means for enabling the opening of a restriction flowpath for the centrifuged liquid by the pressing surface moving relatively away from the annular raising portion.~~

~~19. Device according to claim 18, wherein the pressing surface forms a surface of a valve part (49b) which is separately moveable from the injection part (49a) of the head (49).~~

~~20. Device according to claim 19, wherein the injection part (49a) comprises outlet perforating members (53) forming filtering means when in perforating engagement in the capsule for the centrifuged liquid when engaged in the capsule.~~

~~21. Device according to claims 17 to 20, wherein the pressing surface forms a relatively flat annular surface.~~

~~22. Device according to any of claims 17 to 21, wherein the capsule holder comprises a support surface for supporting the flange-like rim of the capsule and comprising an annular indentation indented to fit into an annular groove of the flange-like rim.~~

~~23. Device according to any of claims 17 to 22, wherein the injection head comprises a central injection needle.~~

~~24. Capsule system comprising a capsule for the preparation of a beverage according to any one of the claims 1 to 15 and a device according to any one of the claims 17 to 23, wherein the annular raising portion (8) of the capsule is engaged against a pressing surface (83) of the device for providing a valve means (51) acting to delay and/or restrict the flow of the centrifuged liquid leaving the capsule.~~

14. Combination of a capsule insertable in a beverage production device for preparing a beverage from a substance contained in the capsule by introducing liquid in the capsule and passing liquid through the substance using centrifugal forces for producing the beverage which is centrifuged peripherally in the capsule relatively to a central axis of the capsule corresponding to an axis of rotation during the centrifuging operation comprising:

an enclosure containing an amount of beverage substance,

a cup-like shaped body (2) comprising a sidewall (7),

an upper outer wall (3) for closing the body,

wherein it comprises a flange-like rim (4) extending outwardly from the body which comprises an annular raising portion forming a force-setting means of a valve means and a restriction for the centrifuged liquid flowpath by the engagement of said portion with a pressing surface of the beverage production device,

wherein the annular raising portion (8) extends in a direction opposite to the bottom (6) of the body,

wherein it comprises a relatively flat annular inward portion (5) of the rim merging, at one end, to the annular raising portion (8) extending of a certain height ("d") therefrom, and, at its other end, to the sidewall (7) of the body and,

a beverage production device for preparing a beverage by passing a liquid through the beverage substance in the capsule,

wherein the device comprises a liquid injection head for injecting liquid in the capsule,

a capsule holder for holding the capsule in the device,

means for driving the capsule in centrifugation,

wherein it comprises a pressing surface for applying a determined closing force onto the annular raising portion of the flange-like rim for substantially closing the flowpath to the beverage.

15. Combination according to claim 14, wherein the annular raising portion (8) forms an increase of thickness ("d + d1") of the inward portion (5).