

Capsule Piercing Module

5 The present invention relates to the field of producing beverages or other liquid comestibles (soups, etc.) on the basis of ingredients which are contained in a capsule.

10 The capsule is inserted into the beverage production module of a beverage production machine (coffee machine, etc.). The module is designed to inject a liquid such as for example hot water under pressure into the capsule in order to have the liquid interact with the ingredients contained in the capsule.

15 Note that some beverage production techniques ask for a pressurized injection, others such as e.g. brewing tea can be made at ambient pressure. The invention can find application in both brewing and extraction process.

20 The result of the interaction, i.e. the produced beverage or liquid comestible is then drained from the capsule and fed to a receptacle such as e.g. a coffee cup placed below an outlet for the beverage.

25 The invention preferably deals with capsules which are inserted into the beverage production module while being sealed. Therefore, the capsules have to be opened both at a fluid inlet side as well as at an outlet side after
30 being inserted into the beverage production module.

W0 2004/049878 A relates to a mechanically and hydrodynamically operated brewing unit for automatic beverage vending machines, comprising a rotatable base provided with a compartment that acts as a brewing
5 chamber, means to let water under pressure into said compartment, means to connect said compartment with the point at which the brewed beverage is dispensed, and a brewing head. This brewing head is comprised of a hollow containment structure, a first hollow piston that is
10 housed in said containment structure movably relative thereto, a second piston that is accommodated in said first piston movably relative thereto, and elastic means contrasting the movement of said second piston.

15 US 2002/148356 A1 relates to a brewer that brews a beverage by infusing heated liquid with a dry beverage medium contained in a single serve disposable cartridge. The device comprises a first engagement member respectively a housing having an interior formed to
20 rotatably fix the cartridge within the housing. The second engagement member is a vertically movable lid connected by means of a linking yoke to a pinion driven rack. In order to dislodge the capsule, the lid and the engagement member are separated from each other in a
25 linear movement, until a hook engages a pawl of the housing such that the housing is made to swivel.

EP 1 219 217 A1 relates to a beverage preparation device comprising a first engagement member that can be
30 displaced relatively to a second engagement member. Thereby, the engagement members are displaced by means of an additional hydraulic cylinder and a piston that

supports the first engagement member. The movable first engagement member comprises an outlet respectively spout.

In particular, capsules made of plastic materials are
5 difficult to pierce for injecting water in the capsule. The piercing means do not properly or reliably pierce or cut the plastic capsule and the plastic capsule wall tends to deform (plastically, elastically etc.) rather than pierce or cut when engaged by the piercing means.

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The invention now targets at a reliable perforation of the capsule inside the beverage production machine. The invention more particularly provides a reliable perforating solution for capsules in which a wall made
15 from plastics is designed to be opened by piercing means.

This object is achieved by means of the features of the independent claims. The dependent claims develop further the central idea of the present invention.

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In a first aspect, the present invention relates to a method for operating a beverage production system comprising a module and a capsule containing ingredients, wherein the module injects a liquid into the capsule in
25 order to produce a beverage, and wherein the module comprises at least a first capsule engagement member and a co-operating second engagement member, the method comprising the following steps:

– pre-positioning the capsule close to the second
30 engagement member before it is engaged by the first and second capsule engagement members.

— moving the first capsule engagement member relative to the second capsule engagement member into a closing position, in which the capsule is fixedly held in position by an engagement with an at least partially
5 conformal part of the first engagement member, and the capsule is opened by a capsule opening means, the first capsule engagement member comprising a hollow bell member and being provided with said capsule opening means, the relative displacement is a combined displacement
10 comprising a linear displacement when the first and second capsule engagement members are close together and a swivelling movement when they are distanced from each other, wherein the swivelling movement is designed to dislodge the capsule from one of the engagement members,
15 and injecting into the interior of capsule through said capsule opening means a liquid to produce the beverage.

"Conformal element" refers to an element which has a hollow shape defined in order to match at least a portion
20 of the outer shape of the capsule. Thus the conformal element can at least partially house the outer contour of the capsule.

After the capsule is safely retained in the defined
25 position, the capsule is opened.

In order to open the capsule, perforation means can be placed inside alternatively or additionally outside the capsule.

The capsule can be retained in the defined position by a clamping engagement of the first and second engagement member.

- 5 At least one of the first and second engagement members and perforation means are mechanically coupled such that the perforation means open the capsule after the capsule is retained in the defined position.
- 10 At least one of the first and second engagement members and the perforation means can be controlled by a common actuator.

A further aspect of the present invention relates to a
15 beverage production machine designed for producing a beverage on the basis of ingredients contained in a capsule, the beverage production machine having a module comprising a first capsule engagement member which can be displaced relative to a second, co-operating capsule
20 engagement member between an opened capsule-insertion position and a closed capsule-engagement position wherein the module is designed for injecting water into a capsule and draining a beverage from the capsule while the capsule is in a beverage production position, wherein the
25 first engagement member comprises a hollow bell member and is provided with capsule opening means and a liquid supply which is in fluid connection with the opening means, wherein the relative displacement is a combined displacement comprising a linear displacement when the
30 first and second capsule engagement members are close together and a swivelling movement when they are distanced from each other, and wherein the swivelling

movement is designed to dislodge the capsule from one of the engagement members.

The beverage production module comprises means for
5 retaining the capsule in a defined position.

Opening means are designed to open the capsule while the capsule is retained in the defined position by the retaining means.

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The retaining means and the opening means can be mechanically coupled such that the opening means open the capsule after the capsule is safely retained in the fixed position by the retaining means.

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The retaining means can comprise a first and a second capsule engagement member which are supported relatively displaceable to each other such that they can immobilise the inserted capsule in the defined position.

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The opening means can be perforation means which are functionally associated with one of the first and second engagement members and designed to be displaced at least partially together with the associated engagement member.

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The retaining means and the opening means (perforation means) can be controlled by a common manual or electric actuator.

30 According to an independent aspect of the present invention, the module can comprises means for actively retracting the capsule from the beverage production

position to a capsule discharge position in which the capsule is discharged from the module and which is offset relative to the vertical of the beverage flow path.

5 As one implementation example for the capsule retraction, the capsule perforation means can be functionally associated with one of the first and the second engagement members such that the perforation means protrude into the capsule-enclosure space after the first
10 and second engagement members have reached the capsule engagement position, and the perforation means are transferred into a retracted position relative to the associated engagement member during or after the swivelling movement.

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Further advantages, features and objects of the present invention will become evident for the skilled person when going through the enclosed drawings.

Fig. 1a-1c show a sequence for illustrating
20 the transfer from a capsule insertion state, (Fig. 1a) to a capsule enclosure state (Fig. 1c),

Fig. 2a-2e show the complete cycle of
25 transferring a beverage production module according to the present invention from a capsule insertion state (Fig. 2a) to a capsule enclosure state (Fig. 2c) and back to the capsule insertion state (Fig. 2e).

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Fig. 4a-4e show the steps according to the sequence of Fig. 3, however, in a

representation illustrating the control and guiding means for the relative movements of the first and second engagement member and the perforation means, respectively.

Fig. 5a, 5b shows an isolated view of the first engagement member and the control means in the capsule insertion state (Fig. 5a) and the capsule engagement state (Fig. 5b), respectively, and

Fig. 6 shows in a sequence of steps from a capsule insertion state (Figs. 6a) to a figure enclosure state (Fig. 6c) illustrating the pre-fixation of the capsule before being engaged between the first and second engagement member.

Throughout the figures only the beverage production module 2 of a beverage production machine is shown.

Usually the beverage production module 2 is supplied with a liquid at a liquid inlet 14 which can be in fluid connection with means for heating and/or pressurising the supplied liquid.

At the outlet side, means for guiding a produced beverage or liquid comestible to a designated outlet of the beverage production machine is provided.

The beverage production module 2 as shown in the figures is preferably housed in a casing of the beverage production machine such that it assumes an essentially horizontal position as shown in figures 1-4.

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Note that other arrangements of the beverage production module 2 are equally possible, although the horizontal arrangement has the advantage that the insertion of the capsule and the subsequent pre-positioning are assisted
10 by gravity.

Figure 1a shows a state of the beverage production module 2 in which a capsule 1 being at least partially filled with ingredients 5 can be inserted from the top through
15 an opening (slot) 8 of a casing 19 of the beverage production module 2.

Figure 1a shows the state in which the capsule 1 has been already manually inserted by a user from the top through
20 the opening 8 into the interior of the casing 19 of the beverage module 2.

Preferably in the state as shown in Fig. 1a the capsule 1 is held by pre-fixation means 12 which will be explained
25 later on in detail referring to Fig. 6.

As can be seen in Fig. 1a, in this pre-fixation position the capsule 1 is preferably held in an essentially vertical orientation, i.e. the symmetrical axis of the
30 capsule is essentially horizontal.

Other pre-positioning arrangements of the capsule 1 can be thought of in which the capsule 1 is held in an orientation which forms a small (acute) angle vis-à-vis the vertical axis.

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In the state as shown in Fig. 1a the capsule is pre-fixed close to a second engagement member 4 which can comprise means for opening (perforating, etc.) the face of the capsule adjacent to the second engagement member 4.

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The first engagement member 3 is in an opened state, i.e. as controlled by a manual actuator mechanism in the capsule insertion state as shown in Fig. 1a, the first capsule engaging member 3 is distanced from the second engagement member 4, wherein this distance is substantially larger than the corresponding dimensions of the capsule 1.

According to a further aspect which will be explained in detail later on, optionally the first engagement member 3 is not only distanced from, but also slightly rotated vis-à-vis the main plane formed by the second engagement member 4.

In the embodiment of Fig. 1 the first engagement member 3 is provided with capsule opening means, which can be perforation means such as a hollow needle 6. In Fig. 1a the perforation means 6 are in a position in which they are retracted such that they do not protrude into a half dome formed by a hollow bell member 13 of the first engagement member 3.

The hollow bell member 13 has an essentially matching shape to the contour of the capsule 1. The hollow bell member 13 thus represents an example of a conformal element designed to house at least partially the capsule 1. The conformal engagement secures the capsule against any displacement and can optionally give an additional support to the walls of the capsule such that they are less likely to deflect when engaged by the perforation member. This is of particular importance when the walls to be opened are made from plastics or comparable material.

The rear end of the first engagement member 3 is provided with a liquid supply 14 which is in fluid connection with the hollow needle (perforation member) 6.

The first engagement member 3 is connected to a manually operable lever handle 9 of an actuator mechanism 7 by means of a knee-joint mechanism 11 which can preferably comprise several axis 10 and intermediate levers 20.

The actuator mechanism 7 is designed to control both the displacements of the first engagement member 3 and the displacements of the perforation member 6. Note that alternatively or additionally an electric actuator can be used.

By operating the lever handle 9 of the actuator mechanism 7, the first engagement member 3 can be transferred into an intermediate stage as shown in Fig. 1b. The intermediate stage as shown in Fig. 1b is characterized in that the hollow bell member 13 has essentially fully

engaged the outer contour of the capsule 1, while the hollow needle (perforation member) 6 is still in its retracted position vis-à-vis the bell member 13 and correspondingly the perforation member 6 is not yet
5 interfering with the capsule 1.

Now, when turning the lever handle 9 further in the anti-clockwise direction, the beverage production module 2 can be transferred from the intermediate stage as shown in
10 Fig. 1b to a final closure state as shown in Fig. 1c. The final closure state as shown in Fig. 1c is characterized in that the hollow bell member 13 still fully engages the capsule 1, however, also mechanically controlled by manipulating the actuator mechanism 7, the perforation
15 member 6 has been actively pushed from its retracted position (Fig. 1a, 1b) to a protruding position as shown in Fig. 1c.

By being actively moved from the retracted position to
20 the protruding position as shown in Fig. 1c, the perforation member 6 will perforate the associated face of the capsule 1 and will at least partially protrude into the interior of the capsule 1.

25 In this state the liquid supplied to the liquid supply 14 of the first engagement member 3 can be injected into the interior of capsule 1 through the perforation member 6. Thus, in the state as shown in Fig. 1c the injected liquid can be made to interact with the ingredients of
30 the capsule 1 in order to produce a beverage or another liquid comestible.

During the transition from the capsule insertion state of Fig. 1a to the final closure state as shown in Fig. 1c, the first capsule engagement member 3 has been moved along a composite trajectory vis-à-vis the second engagement member 4. The composite trajectory preferably comprises a rotational movement at the beginning in order to align the front contour 21 of the first engagement member 3 with the vertical plane of the second engagement member 4.

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Both in the intermediate stages shown in Fig. 1b and the final closure state as shown in Fig. 1c the capsule 1 is held safely in a defined position by having a flange-like rim portion of the capsule 1 being clamped between the rim of the front contour 21 of the first engagement member 3 and in associated clamping surface 23 of the second engagement member 4.

This clamping engagement in which the flange-like rim portion 22 of the capsule 1 is clamped or pinched between the first and the second engagement member 3, 4, respectively, is assumed (see Fig. 1b) before the perforation member 6 is moved from its retracted position (Fig. 1b) to its protruding position (Fig. 1c).

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In other words, according to one aspect of the present invention, the capsule 1 finds itself already in a defined perforation position before the perforation member 6 will start its opening or perforation action on the associated wall of the capsule 1. Therefore, when the perforation member 6 will perforate the associated wall

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of the capsule 1 this can be done with a high precision as the capsule 1 is not moving relative to the main elements of the beverage production module 2 when it encounters the opening action of the perforation member
5 6.

This is of importance e.g. in case the wall to be opened is made from a material such as e.g. plastics, i.e. a material which is prone to an elastic or plastic
10 deformation instead of a defined opening.

This leads to a higher position of the opening action and preferably both the location and the timing of the opening can be finely adjusted.
15

Preferably the perforation position of the capsule 1 also corresponds to the beverage production position in which the liquid is injected into the capsule 1.

20 The co-operation of the first and second engagement members 3, 4 in the perforation and beverage production position is such that the capsule 1 is contained in a pressure tight manner in a space defined by the hollow bell member 13 of the first engagement member 3 on the
25 one hand and the second engagement member 4 on the other hand. Thus, liquid injected into the interior of the capsule 1 under pressure can only flow through the capsule 1, but can not leak outside the capsule walls. Preferably the sealing engagement occurs at the flange-
30 like rim of the capsule pinched between the first and second engagement members 3, 4.

Figures 2a to 2c essentially show the same transition from the capsule insertion state of the beverage production module 2 to the final closure state of Fig. 2c, which is only also the beverage production state of the beverage production module 2.

After the end of the beverage production, the actuator means 7 can again be manually and/or electrically operated in order to transfer the beverage production module 2 back to the opened capsule insertion state (Fig. 2e).

However, according to the invention, the transition from the beverage production state (Fig. 2c) to the capsule insertion state according to Fig. 2e is not simply a reversal of the closing movement, i.e. the transfer of Fig. 2a to Fig. 2c.

As it is shown in Fig. 2d and Fig. 2e, when manually moving the lever handle 9 of the actuator mechanism 7 in the clockwise direction of the embodiment of Fig. 2, in a first step the first engagement member 3 is linearly retracted and distanced from the second engagement member 4.

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Essentially due to the friction between the perforation member 6 and the surrounding walls of the opening in the capsule 1 the perforation member 6 remains in the protruded state and thus holds the capsule 1 in the hollow bell member 13 of the first engagement member 3 when the first engagement member 3 is transferred to the intermediate state as shown in Fig. 2d.

This holding-back function of the perforation member 6 of the first engagement member 3 thus leads to a separation of the capsule 1 from the second capsule engagement member 4.

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Starting from the intermediate state as shown in Fig. 2d the first engagement member 3 is controlled to carry out a swivelling movement. During the final transition to the capsule insertion state as shown in Fig. 2e the
10 perforation member 6 is finally made to be retracted from the hollow bell member 13. The capsule 1 which has been hitherto retained by the frictional engagement with the perforation member 6, will drop from the first capsule engagement member 3 and will be discharged from the
15 beverage module 2 through an opening 24 at the lower side of the beverage production module 2.

Thus, the swivelling movement at the end of the trajectory of the first capsule engagement member 3
20 facilitates the discharge of the capsule 1 in the retracted position e.g. towards a waste container placed inside the beverage production machine and below the beverage production module 2.

25 This arrangement constitutes just an unlimiting example as how the capsule, after the beverage production, can be actively displaced off the beverage production position. After this active displacement the discharging can be at least assisted by gravity.

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This is in contrast to known designs in which the capsule is passively (i.e. only via gravity) discharged from the beverage production position.

5 The active (e.g. rearward) displacement has the advantage that the discharge position is distanced (remote) from the beverage flow path. In the prior art, the capsule is discharged passively, i.e. by gravity, but this is a disadvantage when the drained beverage flows directly
10 from the capsule.

Thus the invention proposes to provide means for actively retracting the capsule 1 from the beverage production position to a capsule discharge position in which the
15 capsule is discharged from the module and which is offset relative to the vertical of the beverage flow path.

While Fig. 2 in the above explanation mainly serve to illustrate the functionality of the present invention,
20 further implementation details will now be explained with reference to Figs. 3, 4 and 5.

As shown in Fig. 5a and 5b, the actuator mechanism 7 comprises a lever handle 9 acting on a knee-joint
25 mechanism 11, wherein the extremity of the actuator mechanism 7 being at the opposite end of the lever handle 9 comprises a first control curve 17.

This first control curve 17 cooperates with a guiding pin
30 16 which is fixed to a U-shaped support member 25 which in its centre portion supports the perforation member 6 and the fluid supply 14.

Each of the two outer legs 26 of the U-shaped support member 25 are respectively provided with a guiding pin 16.

- 5 The U-shaped support member 25 can be linearly displaced vis-à-vis the bell-shaped member 13 by having a further control pin 27 cooperate with an axial slot 28 respectively provided at each of the side surfaces of the hollow bell member 13.

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Therefore, the cooperation of the first guiding curve 17 with the guiding pin 16 is designed to selectively displace the first engagement member 3, comprising essentially the U-shaped support member 25 and the
15 attached perforation member 6 as well as the bell-shaped member 13. On the other hand, the guiding curve 17 is designed to selectively control a relative displacement of the U-shaped support member 25 vis-à-vis the dome member 13 and thus a displacement of the perforation
20 member 6 attached to the U-shaped support member 25 vis-à-vis the dome-shaped member 13.

As can be seen in Figs. 3 to 5, the first guiding curve 17 is essentially composed of a first linear section 29
25 and a second linear section 30, being shorter than the first linear section 29 and forming an obtuse angle vis-à-vis the first linear section 29.

When starting from the capsule insertion position (Fig.
30 3a, 4a), the guiding pin 16 is made to cooperate with the first linear section 29 which is designed to linearly and integrally displace the first engagement member 3.

On the other hand, in the final phase, i.e. when the first engagement member 3 approaches the beverage production state (transition from Figs. 3b to 3c, 4b to 4c), the guiding pin 16 is made to cooperate with the
5 second linear section 30 of the guiding curve 17. This second linear section 30 is designed to essentially control a relative displacement of the U-shaped support member 25 and the fixedly attached perforation member 6 vis-à-vis the dome ship member 13.

10

Therefore, it is due to this specific design of the guiding curve 17 (having at least two different sections) that (cooperation with the first linear segment 29) the capsule is held in a defined position before (cooperation
15 with the second linear segment 30) the perforation member 6 is made to open the capsule.

Other functional couplings between the motion control of the perforating means and at least one of the engagement
20 members can be thought of which also guarantee a immobilisation of the capsule in the perforation position before it is perforated at its liquid inlet face.

As can be seen particularly from figures 3d, 4a, c, d and
25 e, the guiding pin 16 is not only made to cooperate with the first guiding curve 17 (being part of the actuator mechanism 7), but also with a second guiding curve 18 provided in the lateral walls of the casing 19 of the beverage production module 2.

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As can be seen from the figures, also the second guiding curve 18 is composed of at least two different segments,

such as for example an essentially horizontal linear segment 21 and an inclined linear segment 20 being raised to the rear end of the module.

5 Due to the co-operation of the guiding pin 16 with this particular design of the second guiding curve 18, the first engagement member 3 carries out an essentially linear relative movement vis-à-vis the second engagement member 4 when the first and the second engagement member
10 are close together, while the upwards inclined second linear segment 20 of the control curve 18 results in the swivelling movement of the first engagement member 3 such that the half dome defined by the bell member 13 is rotated slightly downwards, as it is illustrated in
15 figure 3e.

Other mechanical or electric implementations can be thought of for guaranteeing a composite trajectory of the first engagement member such that in and close to the
20 beverage production state the two engagement members 3, 4 are moved in a linear relative trajectory, while they are moved relative to each other in a different trajectory (different angle an/or curvature) when distanced from each other.

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With reference to figures 6a to 6c now a further aspect of the present invention will be explained.

According to this aspect the capsule 1 is pre-positioned
30 by pre-fixation means, such as for example flexible capsule pre-fixation arms 12. When seen from above

(figure 6) the arms 12 are provided at the lateral sides of the capsule.

The flexible arms 12 respectively present a vertical
5 groove 31 made to engage with the rim of the capsule 1.

Therefore, when the capsule 1 is inserted manually by a user from the top of the beverage production module, it will be initially pre-positioned and held in place by the
10 flexible arms 12. Note that this pre-fixation position as shown in figure 6 is not the same position as the final beverage production position (figure 6c).

Actually, when the first engagement member 3 is made to
15 approach the second engagement member 4, the front side of the bell-shaped member 13 of the first engagement member 3 will push against the rim of the capsule 1, will make the capsule leave the pre-fixation position in the vertical grooves 31 and will displace (push) the capsule
20 1 to the final beverage production position as shown in figure 6c.

To this regard means can be provided to actively disengage the rim of the capsule 1 with the pre-fixation
25 means (flexible arms) 12. As shown particularly in figure 6b, the first engagement member 3 can be operatively connected to disengagement means 32 which cooperate with a slanted surface 33 of the flexible arms 12 in order to push the flexible arms 12 to the outside and thus to
30 disengage the vertical grooves 31 of the flexible arms 12 from the rim of the capsule 1.

Thus, when the front surface of the bell-shaped member 13 of the first engagement member 3 is taking over the positioning of the capsule 1, the capsule 1 is made to be disengaged from the flexible arms 12 serving as pre-
5 fixation means.

In the beverage production position as shown in figure 6c, the rim of the capsule 1 is pushed behind the grooves 31 of the flexible arms 12.

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Now, when after completion of the beverage production the first engagement member 3 is moved rearwards (to the top in figure 6) and the capsule 1 is only held by a frictional engagement of the perforation member 6, the
15 disengagement member 32 of the first engagement member 3 will again cooperate with specifically designed surfaces of flexible arms 12 in order to spread these arms 12 and thus have the capsule 1 pass these arms 12 without being engaged by the arms 12.

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To summarize, where the design as shown in figure 6 the capsule 1 can be pre-positioned in a position which is horizontally offset from the beverage production position. The capsule 1 is pre-positioned in this
25 position until the front surfaces of the bell-shaped member 13 engages the rim of the capsule 1.

List of reference signs

30

- 1 Capsule
- 2 Beverage production module
- 3 1st engagement member

	4	2 nd engagement member
	5	ingredients
	6	perforation member
	7	actuator mechanism
5	8	capsule insertion slot of (2)
	9	lever handle
	10	axis
	11	knee joint mechanism
	12	capsule pre-fixation arms
10	13	Conformal element (bell-shaped dome) of (3)
	14	fluid supply for (6)
	15	Coupling of (3) and (6)
	16	Guiding pin
	17	1 st Control curve
15	18	2 nd Control curve, arranged in (19)
	19	Casing of (2)
	20	Rotation part of (18)
	21	Linear part of (18)
	22	Flange-like rim of (1)
20	23	Holding flange of (4)
	24	Discharge opening of (19)
	25	U-shaped support member
	26	Legs of (25)
	27	Guiding pin
25	28	Axial slots in (13)
	29	1 st linear section of (17)
	30	2 nd linear section of (17)
	31	groove of (12)
	32	disengagement member
30	33	slanted surface of (12)

Claims

1. A beverage production machine (2) designed for producing a beverage from a capsule (1), the beverage
5 production machine having a module (2) comprising a first capsule engagement member (3) which can be displaced relative to a second, co-operating capsule engagement member (4) between an opened capsule-insertion position and a closed capsule-engagement position wherein the
10 module is designed for injecting water into a capsule and draining a beverage from the capsule while the capsule is in a beverage production position,
wherein the first engagement member (3) comprises a hollow bell member (13) and is provided with capsule
15 opening means (6),
wherein the relative displacement is a combined displacement comprising a linear displacement when the first and second capsule engagement members (3, 4) are close together and a swivelling movement when they are
20 distanced from each other, and
wherein the swivelling movement is designed to dislodge the capsule (1) from one of the engagement members (3,4), the beverage production machine (2) being characterized in that the first engagement member (3) is provided with
25 a liquid supply (14) which is in fluid connection with the opening means (6).

2. The machine according to claim 1,
wherein the first and the second capsule engagement
30 members (3, 4) comprise an element which is conformal to at least a portion of the outer shape of the capsule (1).

3. The machine according to any of the preceding claims,

wherein the module (2) further comprises pre-fixation means (12) which are provided at a lateral side of the capsule (1) and which are designed to engage with a rim of the capsule (1) for fixation of the capsule (1) close to the second engagement member (4).

4. The machine according to any of the preceding claims,

wherein the second engagement member (4) comprises means for opening the face of the capsule (1) adjacent to the second engagement member (4).

5. The machine according to any of the preceding claims, wherein the module (2) comprises means for actively retracting the capsule (1) from the closed capsule-engagement position to a capsule discharge position in which the capsule (1) is discharged from the module and which is offset relative to the vertical of the beverage flow path.

6. The machine according to claim 5, wherein the retracting means are designed to linearly retract the capsule (1) from the beverage production position and dislodge the capsule (1) from one of the engagement members (3,4), and wherein the retracting means are further designed to retract the capsule in a swivelling end movement.

7. The machine according to any of claims 5 to 6,

wherein the retracting means comprise at least one abutting means engaging the capsule (1) when linearly retracting the capsule from the beverage production position so that the capsule (1) is forced to leave one
5 (3) of the capsule engagement members (3,4).

8. The machine according to any of the preceding claims,
wherein the opening means are perforation means which are
10 functionally associated with one of the first and second engagement members (3, 4) and designed to be displaced at least partially together with the associated engagement member (3, 4).

15 9. The machine according to any of claims 2 to 8,
wherein the opening means (6) are controlled to open the capsule (1) while the capsule (1) is retained in the defined position by the conformal element of the engagement members (3, 4).

20 10. The machine according to any of the preceding claims,
wherein in the closed capsule-engagement position, a portion of the beverage outlet of the capsule (1) is
25 uncovered or protrudes out of the module so that the beverage flow path of the capsule (1) is not intersecting parts of the module.

11. A method for operating a beverage production system
30 comprising a module (2) and a capsule (1) containing ingredients (5),

wherein the module (2) injects (6) a liquid into the capsule (1) in order to produce a beverage, and wherein the module (2) comprises at least a first capsule engagement member and a co-operating second engagement member (3, 4), the method comprising the following steps:

- pre-positioning the capsule (1) close to the second engagement member (4) before it is engaged by the first and second capsule engagement members,
- moving the first capsule engagement member (3) relative to the second capsule engagement member (4) into a closing position, in which the capsule (1) is fixedly held in position by an engagement with an at least partially conformal part of the first engagement member (3), and the capsule (1) is opened by a capsule opening means (6), the first capsule engagement member comprising a hollow bell member (13) and being provided with said capsule opening means (6),

the relative displacement is a combined displacement comprising a linear displacement when the first and second capsule engagement members (3, 4) are close together and a swivelling movement when they are distanced from each other,

wherein the swivelling movement is designed to dislodge the capsule (1) from one of the engagement members (3,4), and

injecting into the interior of capsule (1) through said capsule opening means (6) a liquid to produce the beverage.

12. Method according to claim 11,

wherein the capsule is pre-positioned horizontally offset from the beverage production position.

13. The method according to claim 11 or 12,
wherein the opening means (6) are designed to be
displaced at least partially together with the associated
engagement member.