BEVERAGE MACHINE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit under 35 U.S.C. § 119(e) of U.S. provisional application serial number 63/564,222, filed March 12, 2024, the disclosure of which is incorporated by reference in its entirety.

FIELD

[0002] Disclosed embodiments are related to beverage machines for forming beverages from package-free beverage tablets and methods of forming beverages with package-free beverage tablets.

BACKGROUND

[0003] Tablets of compacted beverage ingredients can be used for forming a beverage. In some arrangements, such beverage tablets are mixed directly with hot water to form a beverage. In some arrangements, water is permitted to percolate through beverage tablets to form a beverage.

SUMMARY

[0004] According to some aspects, a beverage machine is provided. The beverage machine comprises a liquid supply configured to provide a liquid for forming a beverage, and a brew chamber configured to hold, compress, and deform a beverage tablet having a beverage material for combining with liquid from the liquid supply to form the beverage, the beverage tablet comprising a body of compressed beverage material. The brew chamber comprises a brew chamber section configured to move between a first position and a second position, the brew chamber section configured to receive the beverage tablet when the brew chamber section is in the first position, and at least one gripper configured to grip the beverage tablet as the brew chamber section moves from the first position to the second position, and configured to release the beverage tablet after the brew chamber section is moved to the second position.

[0005] According to some aspects, a method of inserting a beverage tablet into a brew chamber of a beverage machine is provided. The method comprises placing a beverage tablet into a brew chamber section, moving the brew chamber section from a first position to a second position, engaging at least one gripper with a side of the beverage tablet to hold the

beverage tablet in the brew chamber section as the brew chamber section moves from the first position to the second position, and releasing the at least one gripper from the side of the beverage tablet after the brew chamber section is moved to the second position.

[0006] It should be appreciated that the foregoing concepts, and additional concepts discussed below, may be arranged in any suitable combination, as the present disclosure is not limited in this respect. Further, other advantages and novel features of the present disclosure will become apparent from the following detailed description of various non-limiting embodiments when considered in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF DRAWINGS

[0007] The accompanying drawings are not intended to be drawn to scale. In the drawings, each identical or nearly identical component that is illustrated in various figures may be represented by a like numeral. For purposes of clarity, not every component may be labeled in every drawing. In the drawings:

[0008] FIG. 1 shows a simplified cross-sectional view of a beverage machine according to an embodiment;

[0009] FIG. 2 shows a simplified cross-sectional view of a brew chamber of the beverage machine of FIG. 1 in an open configuration;

[0010] FIG. 3 shows a simplified cross-sectional view of the brew chamber of FIG. 2 in a partially closed configuration;

[0011] FIG. 4 shows a simplified cross-sectional view of the brew chamber of FIG. 2 in a partially closed configuration closer to the closed configuration than shown in FIG. 3;

[0012] FIG. 5 shows a simplified cross-sectional view of the brew chamber of FIG. 2 in a partially closed configuration closer to the closed configuration than shown in FIG. 4;

[0013] FIG. 6 shows a simplified cross-sectional view of the brew chamber of FIG. 2 in a closed configuration;

[0014] FIG. 7 shows a simplified cross-sectional view of the brew chamber of FIG. 2 with a beverage tablet in a compressed configuration;

[0015] FIG. 8 shows a simplified cross-sectional view of the brew chamber of FIG. 2 with a beverage tablet in an expanded configuration;

[0016] FIG. 9 shows a simplified cross-sectional view of the brew chamber of FIG. 2 with a beverage tablet in an ejected configuration;

[0017] FIG. 10 shows a perspective view of a first brew chamber section of a brew chamber holding a beverage tablet according to an embodiment;

[0018] FIG. 11 shows a perspective section view of a tip of a gripper of the first brew chamber section of FIG. 10;

[0019] FIG. 12 shows a bottom view of a brew chamber with a second brew chamber section in a retracted position;

[0020] FIG. 13 is a schematic representation of an upstream fluid system of a beverage machine according to an embodiment;

[0021] FIG. 14A is a side view of a portion of a beverage machine including a biasing element coupled to a lid in a lid closed position according to an embodiment;

[0022] FIG. 14B is the side view of the portion of the beverage machine of FIG. 14A including the biasing element coupled to the lid in a threshold biasing position according to an embodiment; and

[0023] FIG. 14C is the side view of the portion of the beverage machine of FIG. 14A and FIG. 14B including the biasing element coupled to the lid in a lid open position according to an embodiment.

DETAILED DESCRIPTION

[0024] Aspects herein relate to a beverage machine configured to form beverages using beverage tablets such as the beverage tablets disclosed in embodiments below. Many brewed beverages are conventionally prepared by enclosing an amount of loose particles of beverage ingredient, such as loose coffee grinds or tea leaves, into a beverage machine. Use of loose particles of beverage ingredient to prepare brewed beverages may be inconvenient as it may require additional steps of measuring out a specific amount beverage of ingredient. Additionally, loose particles of beverage ingredient carries the potential for spillage while preparing and transporting the desired amount of beverage ingredient to and from the beverage machine. Additionally, many brewing machines that use loose particles of beverage ingredient require cleaning after each use to remove loose particles from the inside of the machine.

[0025] Single serve beverage pods have been implemented to alleviate some of these concerns. However, such beverage pods generally contain loose beverage ingredient in a disposable packaging. Utilizing such packaging may generate additional waste.

[0026] The inventors have therefore recognized benefits of providing package-less beverage consumables that can be used with a beverage machine to form a beverage. In some embodiments, a beverage consumable comprises a tablet which includes beverage ingredient compacted into a desired shape and density. The tablet may be at least partially surrounded

by a coating. Such beverage tablets may allow for the increased convenience of single-serve beverage consumables while reducing waste.

[0027] The beverage tablet may be able to hold its own shape, and thus may not require individual packaging to prevent dispersing of the beverage material prior to use in forming a beverage. The beverage tablet may be configured to be received within a beverage machine without packaging such that the beverage tablet (e.g. the beverage ingredients and/or coating) directly contacts the beverage machine (e.g. a brew chamber) during a brewing process (e.g. without requiring the beverage machine to pierce through or otherwise open packaging to access the beverage ingredients).

[0028] In some embodiments, the beverage tablet comprises a solid body comprising a beverage ingredient. For example, one or more beverage ingredients of the beverage tablet may be formed into a solid body by compression, adhesion, solidification in a mold, or any of a variety of other suitable methods for making a rigid body from one or more beverage ingredients.

[0029] In some embodiments, a package-less beverage consumable (e.g., a beverage tablet) may include a coating disposed along at least a portion of the outer surface at the periphery of the consumable. In some embodiments, the coating may bind the beverage ingredients within the interior of the consumable. In some embodiments, the beverage ingredients held within the coating may be loose, such as loose ground coffee, or compacted. The coating may be a food grade binder, an alginate, edible, soluble, or any other suitable material. In some embodiments, the coating may serve as a barrier to reduce infiltration of oxygen and/or moisture so as to maintain freshness of the beverage ingredients. Material of the package-less beverage consumable, including a coating of the consumable if one is present, may directly contact some portion of the beverage machine, such as the brew chamber, before brewing the beverage, without intervening packaging in-between.

[0030] In some embodiments, the beverage tablet may be formed in a variety of sizes, and the beverage machine may be capable of receiving and forming beverages from beverage tablets in the variety of sizes. In some embodiments, the beverage machine may be configured to form different styles of brewed beverages (e.g. espresso, double-shot espresso, drip coffee, iced coffee, etc.) from different sized beverage tablets. For instance, a smaller beverage tablet may be configured to form an espresso, while a larger beverage tablet may be configured to form drip coffee, and an even larger beverage tablet may be used to form iced coffee. In some embodiments, the beverage tablet may be generally cylindrical, and different sizes of beverage tablet may be formed by altering a height of the beverage tablet. In some

embodiments, the beverage tablet may have generally flat end surfaces. In some embodiments, the beverage tablet may have domed end surfaces.

[0031] In some embodiments, the beverage machine may include a brew chamber configured to receive a beverage tablet in an open configuration and to move to a closed configuration, where the beverage material inside the beverage tablet is mixed with water from a liquid supply to form a beverage. The brew chamber may be configured to receive beverage tablets having different heights. According to some aspects described herein, the beverage machine may have a moveable beverage tablet holder that moves a beverage tablet during a brew process. In some embodiments, the brew chamber includes a first brew chamber section rotatably disposed in a housing of the beverage machine, and a second brew chamber section slidably disposed in the housing. The first brew chamber section may be configured to receive the beverage tablet when the brew chamber is in the open configuration. As the brew chamber moves towards the closed configuration, grippers coupled to the first brew chamber section may grasp the beverage tablet, and the first brew chamber section may rotate into the housing, while the second brew chamber section may translate towards the first brew chamber section. The first and second brew chamber sections may meet, forming a sealed brew chamber, and the beverage tablet may be positioned inside of the sealed brew chamber between crush plates disposed on the first and second brew chamber sections. A brew chamber fluid system may then be used to perform various operations to form the beverage.

[0032] In some embodiments, the grippers may be configured to grip the beverage tablet as the first brew chamber section rotates into the housing, and configured to release the beverage tablet after the first brew chamber section finishes rotating. In some embodiments, each gripper includes a tip formed of a flexible material with a leading edge configured to contact the beverage tablet when gripping the beverage tablet.

[0033] In some embodiments, water may be delivered to the brew chamber to pre-wet the beverage tablet via a pre wet flow path. Pre-wetting the beverage tablet may soften the coating of the beverage tablet. After the beverage tablet is pre-wet, the water may be drained from the brew chamber into a disposal unit. Water may then be pumped into a hydraulic chamber adjacent to the brew chamber via a hydraulic chamber flow path. As water is pumped into the hydraulic chamber, the chamber expands to accommodate the water. A wall of the brew chamber may be operatively connected to the second crush plate, such that the wall and the second crush plate are pushed towards the first crush plate as the hydraulic chamber is filled. Movement of the second crush plate towards the first crush plate may

compress and deform the beverage tablet between the first crush plate and the second crush plate. In some embodiments, as the beverage tablet is compressed and deformed, the body of beverage material in the beverage tablet is fractured and breaks into smaller pieces. It should be appreciated that, in some embodiments, the beverage tablet may have a coating that contains the pieces of the fractured tablets within an enclosed space such that the tablet pieces do not disperse into the brew chamber. In some embodiments, an inlet piercing mechanism (e.g. inlet piercing needles) may pierce the beverage tablet as the beverage tablet is compressed and deformed. Water may then be pumped into the beverage tablet though the inlet needles via an inlet needle flow path and mix with the beverage material to form the beverage.

[0034] In some embodiments, introducing water into the beverage tablet may cause the beverage tablet to expand until the beverage tablet contacts an outlet piercing mechanism (e.g. outlet piercing needles), which may then pierce the beverage tablet and allow the beverage to exit the beverage tablet. The outlet piercing mechanism may be fluidly connected to a brew chamber outlet, allowing the beverage to exit the brew chamber. In other embodiments, the outlet piercing mechanism may contact the tablet at the same time as the inlet piercing mechanism. In yet other embodiments, the outlet piercing mechanism may contact the tablet after the inlet piercing mechanism, but before the beverage tablet is expanded.

[0035] In some embodiments, the beverage machine may be configured to automatically eject the beverage tablet from the brew chamber after a brew operation is completed. In some embodiments, the second brew chamber section may translate away from the first brew chamber section, exposing an opening below the brew chamber. The used beverage tablet may fall through the opening into a disposal unit.

[0036] In some embodiments, the beverage machine may include an upstream fluid system configured to condition and deliver water to the brew chamber fluid system. The upstream fluid system may be capable of delivering water with different parameters (e.g. pressure, temperature, volume, etc.)

[0037] Turning to the figures, specific non-limiting embodiments are described in further detail. It should be understood that the various systems, components, features, and methods described relative to these embodiments may be used either individually and/or in any desired combination as the disclosure is not limited to only the specific embodiments described herein.

Brew chamber Structure and Operation

[0038] FIG. 1 shows a simplified cross-sectional view of a beverage machine in an open configuration according to an embodiment. As discussed above, it may be desirable for beverage machine 100 to be capable of forming a beverage from beverage tablets comprised of compressed beverage material, as such beverage tablets may be more convenient than loose beverage material, but may require less packaging than conventional beverage cartridges. Beverage machine 100 may include a brew chamber 200 configured to receive a beverage tablet 400 and form a beverage using the beverage tablet 400. As will be discussed below, brew chamber 200 may be configured to receive a beverage tablet in an open configuration and form the beverage in a closed configuration. Beverage machine 100 may also include an upstream fluid system 300 configured to condition and deliver water from a liquid supply 302 to operate the brew chamber 200 and mix with beverage material in the beverage tablet 400 to form the beverage. In some embodiments, brew chamber 200 and upstream fluid system 300 may be at least partially contained in housing 108.

[0039] In some embodiments, beverage machine 100 may include a lid 102. Lid 102 may be configured to move between a lid open position to permit a beverage tablet to be placed in the brew chamber 200, and a lid closed position in which the brew chamber 200 is in a closed configuration. In some embodiments, when the lid is in the lid closed position, the brew chamber 200 is fully enclosed in the housing 108. In some embodiments, lid 102 is operatively connected to the brew chamber 200 via linkages, such that moving the lid from the lid open position to the lid closed position moves at least a portion of the brew chamber 200 between an open configuration and a closed configuration.

[0040] In some embodiments, an imaging device 104 may be disposed on lid 102 and configured to image a portion of the beverage tablet 400. This portion of beverage tablet 400 may include surface indicia configured to be read by controller 301 and interpreted as corresponding to a type of beverage tablet 400 (e.g. size, roast level, etc.). Controller 301 may then present brew parameter options (e.g. volume, brew pressure, brew strength, brew temperature) to a user on a user interface 110 and/or otherwise control the upstream fluid system according to the type of beverage tablet detected.

[0041] In some embodiments, the beverage machine 100 may include a dispensing flow path 106 configured to receive the beverage from the brew chamber 200 and allow the beverage to exit the housing 108 through a dispensing outlet disposed at an end of the dispensing flow path 106. In some embodiments, dispensing flow path 106 may include

various conditioning chambers configured to condition various fluid parameters (e.g. temperature, turbulence, flow rate, etc.) of the beverage prior to dispensing the beverage.

[0042] As mentioned above, beverage tablet 400 may include a body 402 formed of compacted beverage material. Body 402 may be generally cylindrical, with first end 406 and second end 408. It should be understood that in some embodiments, the ends of the beverage tablet 400 may be substantially identical, such that either end may be the first end 406 or the second end 408. In some embodiments, first and/or second ends are domed. In some embodiments, beverage tablet 400 includes at least one coating 404 configured to at least partially encapsulate the body 402. Coating 404 may be configured to soften when wetted, permitting the coating to stretch without ripping or fracturing.

[0043] FIGS. 2-6 show simplified cross section views of a brew chamber in various stages of closing. In some embodiments, it may be desirable for the brew chamber 200 to receive the beverage tablet 400 in a vertical orientation (as seen in FIG. 2), and then rotate the beverage tablet 400 to a horizontal orientation for performing a brew operation (as seen in FIG. 6). Such a configuration may allow for capturing an image of surface indicia on the first or second end 406 or 408 when a beverage tablet is first received into the brew chamber by the imaging device 104. Such a configuration may also ensure proper positioning and alignment of the beverage tablet during a brew operation. In some embodiments, such a configuration may allow for redirection of compressive forces on the beverage tablet away from the lid 102 to avoid requiring lid 102 to be strong enough to resist these compressive forces.

[0044] Brew chamber 200 may include first brew chamber section 202 and second brew chamber section 204. Brew chamber 200 may have an open configuration, where first brew chamber section 202 is disconnected from the second brew chamber section 204, and a closed configuration, where the first brew chamber section 202 is connected to the second brew chamber section 204 to form an enclosed brew chamber volume 201, as seen in FIG. 6.

[0045] First brew chamber section 202 may be rotatably disposed in the housing 108, such that the first brew chamber section 202 rotates from a first, vertical-facing position (FIG. 2) to a second, horizontal-facing position (FIG. 6) as the brew chamber moves from the open configuration to the closed configuration. In some embodiments, the first brew chamber section may rotate approximately 90° between the first position and the second position. Second brew chamber section 204 may be slidably disposed in the housing 108, such that the second brew chamber section 204 translates from a retracted position (FIG. 2) to an extended

position (FIG. 6) as the brew chamber moves from the open configuration to the closed configuration.

[0046] First brew chamber section 202 may include a first crush plate 206 configured to receive the beverage tablet 400 in a generally vertical orientation when the first brew chamber section 202 is in the vertical-facing position. In some embodiments, first crush plate 206 may be an annular surface configured to contact a perimeter of first end 406 of beverage tablet 400. Second brew chamber section 204 may include a plunger assembly 205, back wall 208, and sidewalls 210. The plunger assembly 205 may be slidably disposed inside the second brew chamber section, such that the plunger assembly may slide relative to the back wall and sidewalls. The plunger assembly may include a plunger 212, with a plunger head 214 and a plunger shaft 216, a second crush plate 207 operatively connected to the plunger head 214, and a spring 218 connecting the plunger shaft 216 to the back wall 208. However, it is also contemplated that the spring 218 may be disposed between any portion of the plunger assembly and the second brew chamber section 204 which allows the plunger assembly to be biased towards the extended position shown in FIG. 2, as the disclosure is not so limited. For instance, in some embodiments, a hydraulic wall 228 may be fixed relative to the second brew chamber section 204 (rather than movable within the second brew chamber section, as shown in FIGs. 1-9), and the spring 218 may be disposed in the hydraulic chamber 226 between the hydraulic wall 228 and the plunger head 214.

[0047] As seen in FIGs. 3 and 4, as the first brew chamber section 202 rotates, the second brew chamber section 204 may translate towards the extended position. Any suitable means may be used to translate the second brew chamber section 204 to the extended position. In some embodiments, the second brew chamber section 204 may be operatively coupled to the lid 102 and/or a lid actuator such as a handle via one or more linkages, such that closing of the lid (or otherwise operating a lid actuator) causes the second brew chamber section 204 to translate towards the extended position. In some embodiments, a separate actuator, such as a motor or a hydraulic actuator, causes the second brew chamber section to translate towards the extended position. In some embodiments, as seen in FIG. 3, the first brew chamber section 202 begins rotating before the second brew chamber section 204 begins translating. In some embodiments, the second brew chamber section 204 begins translating as soon as the first brew chamber section 202 begins rotating. In some embodiments, the second brew chamber section 204 begins translating after the first brew chamber section 202 finishes rotating. As the first brew chamber section 202 rotates from the vertical-facing position to the horizontal-facing position, grippers 220 may contact the

beverage tablet 400 to hold the beverage tablet 400 against the first crush plate 206. As a result, as the first brew chamber section rotates from the first, vertical-facing position to the second, horizontal-facing position, the beverage tablet 400 also rotates from the vertical orientation to a horizontal orientation. In some embodiments, the horizontal orientation of the beverage tablet is approximately perpendicular to the vertical orientation of the beverage tablet. In some embodiments, the grippers 220 are held in a partially open position when the first brew chamber section 202 is in the vertical orientation, such that the grippers 220 do not hold the beverage tablet 400 until after the first brew chamber section 202 begins rotating.

[0048] As mentioned above, it may be desirable for the beverage machine 100 to be configured to accept beverage tablets having different volumes to allow for more flexibility in beverage parameters such as volume or brew strength. In some embodiments, beverage tablets 400 may therefore be scalable along a height H. This allows for an increase in volume of the beverage tablet 400, while maintaining the same surface area of first and second ends 406 and 408. This allows the beverage tablet 400 to align with first crush plate 206 and be grasped by the grippers 220, regardless of the height (and thus the size) of the beverage tablet 400 inserted.

[0049] As seen in FIG. 5, in some embodiments, the first brew chamber section 202 reaches the horizontal-facing position before the second brew chamber section 204 reaches the extended position. In some embodiments, the second brew chamber section does not begin translating to the extended position until after the first brew chamber section reaches the horizontal-facing position shown in FIG. 5. As or after the first brew chamber section 202 reaches the horizontal-facing position, second crush plate 207 contacts second end 408 of the beverage tablet 400. As the second brew chamber section 204 continues to translate towards the extended position, the plunger assembly 205 stops translating due to the contact between the second crush plate 207 and the second end 408. Because back wall 208 continues to translate towards the extended position, spring 218 is compressed between back wall 208 and plunger shaft 216. Spring 218 thus pushes second crush plate 207 against the second end 408 of the beverage tablet, resulting in a compressive force exerted on the beverage tablet 400 due to contact between the first and second crush plates 206 and 207. This compressive force may be sufficient to hold the beverage tablet 400 between the first crush plate 206 and second crush plate 207, but not sufficient to significantly deform the beverage tablet. Because a shorter beverage tablet would cause the spring 218 to compress less than a taller beverage tablet would, spring 218 may have mechanical properties (e.g. stiffness and length) sufficient to allow for beverage tablets having different heights to be inserted. The mechanical

properties of the spring 218 may be selected such that the shortest desired beverage tablet is held with sufficient force between the first and second crush plates, and such that the tallest desired beverage tablet is not held with a compressive force sufficient to cause significant deformation of the beverage tablet.

[0050] In some embodiments, once the beverage tablet is held against the first crush plate 206 by the second crush plate 207, the grippers 220 may release from the beverage tablet 400. In some embodiments, as seen in FIG. 5, the sidewalls 210 of the second brew chamber section 204 may push the grippers 220 away from the beverage tablet 400 and out of the brew chamber volume 201. In some embodiments, the grippers 220 may be configured to lock into a gripper open position, such that the grippers 220 are prevented from moving back towards the beverage tablet 400 until the brew chamber 200 is moved back towards the open configuration.

[0051] The second brew chamber section 204 then slides to the fully extended position, where sidewalls 210 contact sealing ring 211 on the first brew chamber section, forming a brew chamber volume 201 as seen in FIG. 6. It should be understood that second brew chamber section 204 may press against a face surface of first brew chamber section 202 to form a face seal, as shown in FIG. 6, or may overlap with first brew chamber section 202 to form an overlapping seal, as the disclosure is not so limited.

[0052] Because the beverage tablet 400 may be held against the first crush plate either by the grippers or by the crush plates as the brew chamber moves to the closed configuration, beverage tablet 400 may be approximately centered inside brew chamber volume 201 when in the closed configuration, such that an approximately equal gap G extends from an outer perimeter of the beverage tablet 400 to an inner perimeter of the sidewalls 210 along the entire outer perimeter of the beverage tablet 400.

[0053] In some embodiments, first brew chamber section 202 includes a brew chamber outlet 222 configured to connect to dispensing flow path 106 when the first brew chamber section 202 is in the horizontal-facing position, and to disconnect from the dispensing flow path 106 when the first brew chamber section 202 is not in the horizontal-facing position. Such a configuration may allow the brew chamber 200 to be connected to the dispensing flow path 106 without requiring flexible tubing or some other bending channel structure. In some embodiments, a sealing gasket may be positioned between brew chamber outlet 222 and dispensing flow path 106 to prevent the beverage from leaking.

[0054] FIGS. 6-9 show simplified cross section views of a brew chamber 200 in various stages of a brew operation. In some embodiments, as will be discussed further below,

the beverage machine 100 may include a brew chamber fluid system 500. The brew chamber fluid system 500 may be configured to control the flow of water throughout the brew chamber 200 to perform various aspects of the brew operation.

[0055] Once the brew chamber 200 is in the closed configuration, the beverage tablet 400 may be pre-wet with liquid (e.g. water). Pre-wetting the beverage tablet allows for the coating 404 of the beverage tablet 400 to soften, allowing the coating 404 to be pierced and stretched without significant cracking or fracturing.

[0056] To pre-wet the tablet, liquid (e.g. water) is introduced into the brew chamber 200. In some embodiments, liquid is introduced into the brew chamber 200 through inlet puncture needles 232. In other embodiments, liquid is introduced into the brew chamber 200 via a different inlet. In some embodiments, the brew chamber may include a vent 246, which may be disposed in an upper portion of the sidewalls 210. The vent is configured to be opened while liquid is being introduced into the brew chamber 200. Such a vent 246 may allow ambient air in the brew chamber 200 to escape the brew chamber, allowing liquid to flow into the brew chamber. The beverage tablet 400 is then soaked for a suitable amount of time. In some embodiments, the suitable amount of time is 1-5 seconds. The liquid is then at least partially drained from the brew chamber via a drain 248, which may be disposed in a lower portion of the sidewalls 210. In some embodiments, the drain leads to a disposal unit. In some embodiments, as discussed further below, liquid is introduced into the brew chamber 200 and drained from the brew chamber 200 via the brew chamber fluid system 500.

[0057] Once the beverage tablet is prewet, the plunger 212 is configured to move towards the beverage tablet. This causes first and second crush plates 206 and 207 to exert a compressive force on the beverage tablet 400 and causes the beverage tablet 400 to deform, as seen in FIG 7. In some embodiments, the vent 246 and drain 248 are open during deformation of the beverage tablet 400 in order to allow any remaining liquid from pre-wetting to exit the brew chamber 200.

[0058] In some embodiments, hydraulic pressure may be used to push the plunger 212. Liquid may be pumped into a hydraulic chamber 226 between plunger head 214 and hydraulic wall 228. The liquid expands the size of the hydraulic chamber 226 by pushing the plunger 212 towards the beverage tablet 400. In some embodiments, as discussed further below, brew chamber fluid system 500 may be configured to supply liquid to the hydraulic chamber 226. However, it is contemplated that any suitable mechanism may be used to push the plunger, such as a motor.

[0059] In some embodiments, as the beverage tablet 400 deforms, the beverage tablet diameter/width increases for at least a portion of the tablet, reducing gap G between the outer perimeter of the beverage tablet and the inner perimeter of the sidewalls 210. In some embodiments, as the beverage tablet deforms, the first end 406 conforms to the shape of first crush plate 206 and/or the second end 408 conforms to the shape of the second crush plate 207, sealing the beverage tablet against the first crush plate 206 and/or the second crush plate 207.

[0060] The inlet piercing needles 232 are coupled to move with the plunger head 214, and are aligned with openings in the second crush plate 207. In some embodiments, initially, as seen in FIGS. 1-6, the inlet piercing needles 232 do not pass through the openings in the second crush plate 207, as the springs 230 bias the plunger head 214 away from the second crush plate 207. Thus, in some embodiments, prior to deformation of the beverage tablet, the inlet piercing needles 232 are not exposed in the brew chamber and do not make contact with the beverage tablet. Instead, the inlet piercing needles 232 are positioned behind the second crush plate 207. As the beverage tablet 400 deforms, the force exerted by the plunger 212 is sufficient to compress springs 230 between second crush plate 207 and the plunger head 214. This causes the plunger head 214 to move towards the second crush plate 207 as the beverage tablet 400 is deformed, exposing inlet piercing needles 232. In alternative embodiments, inlet piercing needles 232 may be always disposed above the surface of second crush plate 207. More details regarding the inlet piercing needles will be discussed further below.

[0061] Inlet piercing needles 232 then fully pierce the coating 404 at the second end 406 and enter body 402 of the beverage tablet 400. In some embodiments, inlet piercing needles 232 are hollow needles fluidly connected to the upstream fluid system 300. In some embodiments, outlet piercing needles 234 may partially pierce the beverage tablet 400 when the beverage tablet 400 is deformed.

[0062] In some embodiments, liquid is then introduced into the beverage tablet 400 through the inlet piercing needles 232. This allows the liquid to contact the beverage material of the beverage tablet and form a beverage. This also causes the beverage tablet 400 to expand as liquid is pushed into the beverage tablet, as seen in FIG. 8. The beverage tablet expands until the first end contacts the outlet piercing needles 234. The outlet piercing needles 234 then pierce the beverage tablet, allowing the beverage to exit the brew chamber 200 via brew chamber outlet 222, and flow along dispensing flow path 106 to exit the beverage machine. In some embodiments, as discussed further below, liquid is introduced into the beverage tablet 400 via the brew chamber fluid system 500.

[0063] In some embodiments, a seal (e.g. a gasket) may be positioned on either dispensing flow path 106 or the brew chamber outlet 222. During a brew operation, pressure buildup in brew chamber 200 may tend to exert a force on the first brew chamber section 202, which will push the seal on the brew chamber outlet 222 against flow path 106 allowing for a tighter seal between the brew chamber outlet 222 and the flow path 106. In embodiments where the seal is positioned on the flow path 106 instead of the brew chamber outlet 222, pressure buildup in the brew chamber 200 will push the brew chamber outlet 222 against the seal of the flow path 106, allowing for a tighter seal between brew chamber outlet 222 and flow path 106. In some embodiments, the seal is a pressure activated seal, such that a fluid pressure of the beverage flowing through the brew chamber causes the seal to press against the brew chamber outlet 222 or flow path 106, further tightening the seal between the brew chamber outlet 222 and the dispensing flow path 106.

[0064] In some embodiments, as seen in FIG. 8, as the beverage tablet 400 expands, a portion of first end 406 expands into a recess 252 of the first crush plate 206, conforming to the shape of the first crush plate 206. The portion of first end 406 may therefore have a smaller diameter than the portion of the beverage tablet 400 which does not expand into the recess 252. As seen in FIG. 9, which shows the ejected beverage tablet after brewing, the resulting beverage tablet may have a stepped down portion 405 having a smaller diameter than the rest of the body 407. In some embodiments, it may be desirable to include a blocker plate 236 configured to selectively cover the outlet piercing needles 234. Such a blocker plate may reduce the likelihood of a piercing injury to the user as they load the beverage tablet into the beverage machine (as seen in FIG. 2). Also, in some embodiments, such a blocker plate may increase backpressure in the beverage tablet 400 during a brew operation, as pressure in the beverage tablet 400 must reach a pressure sufficient to push the blocker plate 236 and expose the outlet piercing needles 234. The blocker plate may include springs 238 configured to bias the blocker plate in an expanded configuration, where the blocker plate 236 covers the outlet piercing needles 234. As the beverage tablet 400 expands, springs 238 are compressed and the blocker plate 236 is pushed towards a compressed configuration, exposing the outlet piercing needles 234.

[0065] As seen in FIG. 9, in some embodiments, it may be desirable to automatically eject the beverage tablet 400 from the brew chamber 200 once a brew operation is complete without any interaction from the user. For instance, in embodiments where lid 102 is linked to the brew chamber 200, as discussed above, it may be desirable to eject the beverage tablet 400 from the brew chamber 200 without requiring actuation of the lid back to the lid open

position. Therefore, hydraulic chamber 226 may be drained and/or the second brew chamber section 204 may be disengaged from a linkage connecting the second brew chamber section 204 with the rest of the brew chamber 200 and/or lid 102. In some embodiments, a solenoid is used to disconnect the second brew chamber section. Alternatively or in addition, as discussed further below, the second brew chamber section 204 is not connected to the lid 102 and/or first brew chamber section 202 via a linkage, and instead the second brew chamber section 204 may be moved between retracted and extended positions via some other means, such as a motor, a hydraulic actuator, or other suitable arrangement. The second brew chamber section 204 may then be moved towards the retracted position, e.g. via a biasing spring, a motor, a hydraulic actuator, and/or any other suitable component. As the second brew chamber section is retracted, the compressive force on the beverage tablet is removed, and an opening 240 is exposed below the brew chamber 200. As mentioned above, the grippers 220 may be locked in a gripper open position until the brew chamber 200 is moved back towards the initial open position in which the brew chamber is configured to receive a beverage tablet, so the grippers 220 may not re-grasp the beverage tablet 400. With the second brew chamber section retracted and the compressive force on the beverage tablet removed, the springs 238 may then decompress, pushing the blocker plate 236 towards the expanded configuration, thereby pushing the beverage tablet 400 off of the outlet piercing needles 234 and away from the first brew chamber section, causing the beverage tablet 400 to fall through the opening 240. Alternatively, or in addition, springs 230 may push the second crush plate 207 to an expanded configuration, pushing the beverage tablet off of the inlet piercing needles 232 and away from the second brew chamber section, causing the beverage tablet 400 to fall through the opening 240. Pushing the beverage tablet 400 off the outlet piercing needles 234 and/or inlet piercing needles 232, causes the beverage tablet 400 to fall through the opening 240 out of the brew chamber. In some embodiments, the beverage tablet may fall into a disposal unit.

[0066] In some embodiments, the disposal unit is the same unit where liquid drains from the brew chamber during the pre-wetting operation and/or from the hydraulic actuator(s) after the brew operation is completed.

[0067] Once the rest of brew chamber 200 is moved back to the open configuration, e.g. by moving the lid 102 from the lid closed position to the lid open position, the brew chamber may reset for another brew operation.

Grippers

[0068] As discussed above, a brew chamber may include grippers 220 of a gripping assembly configured to grip the beverage tablet 400 as the first brew chamber section rotates from an open position (e.g. a first, vertical-facing position) to a closed position (e.g. a second, horizontal-facing position).

[0069] One embodiment of grippers 220 is shown in FIGs. 10 and 11. Such grippers may be used in the brew chamber 200 or any other suitable brew chamber. FIG. 10 depicts a first brew chamber section 202 holding a beverage tablet 400, where the beverage tablet 400 is shown in phantom. In some embodiments, as seen in FIGs. 1-12, the first brew chamber section includes two grippers positioned on opposing ends of the first brew chamber section and configure to grip opposing sides of the beverage tablet. However, it is contemplated that any suitable number and/or combination of grippers may be used, as the disclosure is not so limited.

[0070] The inventors have recognized that in some embodiments, it may be desirable for the grippers to apply a frictional force to the beverage tablet to assist in holding of the beverage tablet as the first brew chamber section rotates. Such a configuration may decrease the likelihood of the beverage tablet 400 slipping out of the first brew chamber section 202 during rotation.

[0071] In some embodiments, each gripper 220 may include a flexible tip 274 configured to contact the beverage tablet 400 as the first brew chamber section 202 rotates to the closed position. In some embodiments, the material of the flexible tip may have a relatively high coefficient of friction. Grippers 220 with flexible tips 274 may hold the beverage tablet 400 more securely than comparable grippers without such flexible tips. Examples of materials of such flexible tips include, but are not limited to: rubber (including natural rubber and synthetic rubber), silicone, thermoplastic elastomer, or any other suitable material.

[0072] As best seen in in FIG. 11, the flexible tip 274 may include an undercut portion 276. Such a configuration may allow for deformation of a leading edge 278 of the flexible tip 274 as the leading edge 278 contacts a beverage tablet. In some cases, such deformation may increase the contact surface area between the leading edge 278 and the beverage tablet. This may, in some instances, help to distribute gripping force and/or increase frictional holding force. In some embodiments, the leading edge 278 and the undercut portion 276 may be shaped such that the leading edge 278 curls inwardly towards the first brew chamber section 202 when the flexible tip contacts a beverage tablet, which may cause the beverage tablet to be wedged more tightly into the first brew chamber section 202 as the

grippers grip the beverage tablet during a closing operation. In some embodiments, this undercut portion 276 may also allow for beverage tablets with different diameters to be retained in the first brew chamber section 202during closing, allowing the beverage machine to be compatible with a variety of beverage tablet sizes and shapes. As discussed above in relation to brew chamber 200, the grippers may be pushed away from the beverage tablet 400 by a portion of the second brew chamber section. In some embodiments, the flexible tips include non-flexible strips 280 configured to be contacted by a portion 282 (see e.g. FIG. 12, showing a bottom view of an alternative embodiment of a brew chamber 200) of the second brew chamber section 204 to push grippers 220 to a disengaged position after the first brew chamber section has moved to the closed position. Such a configuration may reduce an amount of force required to push the grippers to the disengaged position.

Upstream Fluid System

[0073] FIG. 13 is a schematic diagram of an upstream fluid system 300 of a beverage machine in an illustrative embodiment. As mentioned above, beverage machine 100 may include an upstream fluid system 300 located upstream of brew chamber 200. Upstream fluid system 300 may be configured to condition and deliver liquid from liquid supply 302 to the brew chamber fluid system 500, which may then deliver liquid to various components of the brew chamber 200. The upstream fluid system 300 may include, for example, a liquid supply, a liquid heater, pumps, and valves, to name a few components. The beverage machine 100 may include a controller 301 configured to receive a user's input from a user interface 110 and control the upstream fluid system 300 to deliver liquid to the brew chamber fluid system 500 with the desired brew parameters (e.g., temperature, volume, flow rate, etc.). Controller 301 may also be used to control various controllable valves (e.g. solenoid valves, electric ball valves, etc.) in the brew chamber fluid system 500 in order to direct fluid flow along various flow paths,.

[0074] The upstream fluid system 300 may include a liquid supply 302, such as a cold-water tank. In general, the liquid supply may include a reservoir configured to hold liquid. The water level of the cold-water tank may be monitored by a sensor 304. If the sensor 304 detects that there is insufficient water in the cold-water tank, the sensor may send a signal to a user interface 110 to alert a user. Water from the cold-water tank may pass through a filter 308 and a check valve 310 before being pumped by a pump 312 into a hot water tank 314. The water may be heated within the hot water tank 314 (e.g., via a heating element inside the hot water tank 314), and/or may be heated while traveling along the pathway to the

hot water tank 314 (e.g., via an in-line heater). An air pump 322 may be connected to the hot water tank 314 to introduce air into the hot water tank 314 for delivery of hot water to the brew chamber, and for purging the hot water tank and brew chamber fluid system of water and/or beverage. The beverage machine may include a pressure release valve 316 that may be connected to a pressure transducer 318 that monitors pressure levels. In the case that the pressure transducer determines that pressure levels are too high, the pressure release valve may reduce the pressure levels through a vent 320. In some embodiments, the vent 320 is passive, and not controllable. In embodiments in which the vent is controllable, the vent may be directly connected to the hot water tank.

[0075] While the above embodiments of upstream fluid system 300 disclose pump 312 as delivering water to hot water tank 314, and separate air pump 322 moving water from the hot water tank 314 and though brew chamber fluid system 500, it is contemplated that a single pump may move water through the entire upstream fluid system 300 and through the brew chamber fluid system 500. It should be understood that the upstream fluid system 300 disclosed in embodiments above is only exemplary, and that any upstream fluid system configured to condition and/or deliver liquid and/or air to a brew chamber may be used.

[0076] In some embodiments, it may be desirable to deliver unheated water to the brew chamber fluid system 500, e.g. to pre-wet the beverage tablet or to operate the hydraulic system. The upstream fluid system 300 may include a bypass valve 324 between pump 312 and hot water tank 314. In some embodiments, the bypass valve 324 may be controlled by the controller. In other embodiments, the bypass valve 324 may be passive. In some embodiments, the upstream fluid system 300 may not include bypass valve 324, and heated water is used to pre-wet the beverage tablet and/or operate the hydraulic system.

[0077] In some embodiments, the controller may be configured to detect the beverage tablet height H using sensor system 241. In some embodiments, the controller may control the upstream fluid system to deliver water to the brew chamber fluid system 500 with parameters (e.g. pressure, volume, etc.) and/or control the brew chamber fluid system to deliver water along different flow paths based on the detected height. In some embodiments, the controller may present various options to a user (e.g. beverage volume options) based on the detected height H.

[0078] The beverage machine 100 may include a user interface 110 to allow a user to control the beverage machine. A user interface may include one or more of the following: a display, one or more buttons, and one or more indicator lights. The user may provide commands to the beverage machine through the user interface 110 by, for example, pressing

a button or touching a touch screen. The beverage machine may activate a beverage forming cycle, or may perform various other functions in response to the commands from the user. For example, a beverage having a first set of brew parameters (e.g. temperature, volume, strength, etc.) may be formed by the beverage machine 100 in response to a user inputting a first set of commands via the user interface, while a beverage having a second set of brew parameters may be formed by the beverage machine 100 in response to a user inputting a second set of commands via the user interface. Information may be communicated to the user through a display or indicator lights of the user interface.

[0079] It should be understood that a user interface may include any number or combination of the above-mentioned components, or any other appropriate components. In some embodiments, a user interface may include only a single touch screen that both receives commands from a user and communicates information to the user. In other embodiments, a user interface may include multiple buttons and multiple indicator lights. A user interface may include knobs, scroll wheels, mechanical switches, microphones, touch sensors, light sensors, or any other suitable components configured to receive input from a user. Additionally, a user interface may include displays, lights, speakers, haptic devices, or any other suitable components configured to provide information to a user.

Lid Biasing Element

[0080] FIGs. 14A-14C show side views of a beverage machine 100 including a biasing element 2000 coupled to a lid 102 in various configurations according to some embodiments. In some cases, the lid 102 of the beverage machine 100 is movable between a lid closed position (e.g., as shown in the depicted embodiment of FIG. 14A) and a lid open position (e.g., as shown in the depicted embodiment of FIG. 14C) and may be biased to assist a user in moving the lid. For example, the lid 102 may be biased towards the lid open position to assist a user in opening the lid. In another example, the lid 102 may be biased towards the lid closed position to assist the user in closing the lid. The inventors have recognized that providing a lid which is biased appropriately to assist a user in both opening and closing the lid may provide advantages, such as improved ergonomics for an improved user experience. As such, the beverage machine 100 may include a biasing element 2000 configured to bias the lid 102 towards the lid open position and the lid closed position. The inventors have further recognized that configuring the beverage machine 100 such that the lid 102 is biased towards a direction which a user is moving the lid may provide further ergonomic benefits. For example, the beverage machine 100 may be configured to bias the lid 102 towards the lid

open position while the lid moves toward the lid open position. In another example, the beverage machine 100 may be configured to bias the lid 102 towards the lid closed position while moving the lid towards the lid closed position. In some preferred embodiments, the beverage machine 100 may be configured such that the lid 102 is biased towards the lid open position while the lid is moved towards the lid open position and biased towards the lid closed position while the lid is moved towards the lid closed position.

[0081] The biasing element 2000 may be coupled to the lid 102 and configured to provide a biasing force B to the lid which biases the lid in a direction. In some embodiments, the direction in which the biasing element 2000 biases the lid 102 changes in response to the position of the lid 102. For example, as the lid 102 is initially moved from the lid closed position to the lid open position, the biasing element 2000 may be configured to bias the lid 102 towards the lid closed position, and as the lid 102 is moved further from the lid closed position to the lid open position, e.g., beyond a threshold biasing position, the biasing element 2000 may be configured to bias the lid 102 towards the lid open position. The depicted embodiment of FIG. 14B shows the side view of the portion of the beverage machine of FIG. 14A including the biasing element 2000 coupled to the lid 102 in the threshold biasing position according to an embodiment. In the threshold biasing position, the lid 102 and the biasing element 2000 may be configured such that the biasing force B is directed at a lid rotation axis 2004, thereby not producing a moment about the lid rotation axis 2004 and on lid 102. In some embodiments, the lid rotation axis 2004 may be aligned central to a lid rotary joint 2002. In some embodiments, the lid 102 may be configured to rotate between the lid closed position and the lid open position about the lid rotation axis 2004. In such embodiments, the biasing element 2000 may be configured to bias the lid 102 towards the lid closed position while the lid is positioned and rotated between the lid closed position and the threshold biasing position and may be configured to bias the lid 102 towards the lid open position while the lid 102 is positioned and rotated between the threshold biasing position and the lid open position.

[0082] In some embodiments, the biasing element 2000 may be coupled to the lid 102 via a coupling 2006. The coupling 2006 may be formed with any appropriate linkage or combination of linkages configured to couple the biasing element 2000 with the lid 102 as the disclosure is not limited in this sense. The coupling 2006 may be configured to orient the biasing element 2000 such that the direction of the biasing force B from the biasing element 2000 may be appropriately oriented to enable the transition of biasing force from biasing the lid 102 towards the lid closed position to biasing the lid 102 towards the lid open position and

vice versa while the lid 102 is moved between the lid open position and lid closed position. In some embodiments, the biasing element 2000 may be configured to exert a linear biasing force (e.g., in the depicted embodiment of FIGs. 14A-14C showing linear biasing force B) which biases the lid 102 towards the open or lid closed positions depending on the orientation of the biasing element 2000 and corresponding biasing force. For example, the biasing element 2000 may be configured to enact a first moment on the lid 102 via the coupling 2006 which urges the lid 102 towards the lid closed position while the lid is positioned between the lid closed position and the threshold biasing position and may be configured to enact a second moment on the lid 102 via the coupling 2006 which urges the lid towards the lid open position while the lid is positioned between the threshold biasing position and the lid open position. In some embodiments, the biasing element 2000 may be movably coupled to the coupling 2006, e.g., rotatably coupled such that the biasing element 2000 is configured to rotate about a biasing element rotary joint 2008 as the lid 102 is moved between the open and lid closed positions. For example, the biasing element 2000 may be configured to move between a closing bias position and an opening bias position. In the closing bias position, the biasing element 2000 may be configured to bias the lid 102 towards the lid closed position, e.g., by directly exerting a rotational force or by exerting linear force B which forms a moment on the lid rotation axis 2004 via the coupling 2006 which may urge the lid to the lid closed position (e.g., urge the lid to rotate counterclockwise towards the lid closed position with respect to the view shown in FIG. 14A). In the opening bias position, the biasing element 2000 may be configured to bias the lid 102 towards the lid open position, e.g., by directly exerting a rotational force or by exerting linear force B which forms a moment about the lid rotation axis 2004 via the coupling 2006 which may urge the lid to the lid open position (e.g., urge the lid to rotate clockwise towards the lid open position with respect to the view shown in FIG. 14C). In some cases, the movement of the biasing element 2000 between the closing bias position and the opening bias position may transition the biasing element 2000 from biasing the lid 102 towards the lid closed position to biasing the lid 102 towards the lid open position and vice versa.

[0083] In some embodiments, such as the depicted embodiments of FIGs. 14A-14C, the biasing element 2000 may be configured to contact a surface 2010 of the beverage machine 100. The surface 2010 may be angled to enable movement of the biasing element 2000 between the closing bias position and the opening bias position. In some cases, the surface 2010 may be formed on the housing 108 of the beverage machine 100. In some embodiments, the surface 2010 may be angled with respect to a local direction of gravity

while the beverage machine 100 is positioned upright. In some embodiments, the lid 102 may include a first end with a handle and a second end which is disposed proximate to rotation axis 2004. In some cases, the rotation axis 2004 may be positioned within the second end of the lid 102. In some embodiments, the coupling 2006 and/or the biasing element 2000 may be coupled to the second end.

[0084] The biasing element 2000 as discussed above may be formed as any appropriate biasing element which is configured to provide a biasing force as the disclosure is not limited in this sense. In a preferred embodiment, the biasing element 2000 is formed as a compression spring. In some embodiments, the biasing element 2000 may be formed a torsion spring, resilient body, or any other appropriate biasing element or combination of biasing elements adapted to provide a biasing force as the disclosure is not limited to any specific biasing element or combination or biasing elements.

[0085] While the present teachings have been described in conjunction with various embodiments and examples, it is not intended that the present teachings be limited to such embodiments or examples. On the contrary, the present teachings encompass various alternatives, modifications, and equivalents, as will be appreciated by those of skill in the art. Accordingly, the foregoing description and drawings are by way of example only.

CLAIMS

What is claimed is:

1. A beverage machine comprising:

a liquid supply configured to provide a liquid for forming a beverage; and

a brew chamber configured to hold, compress, and deform a beverage tablet having a beverage material for combining with liquid from the liquid supply to form the beverage, the beverage tablet comprising a body of compressed beverage material, the brew chamber comprising:

a brew chamber section configured to move between a first position and a second position, the brew chamber section configured to receive the beverage tablet when the brew chamber section is in the first position; and

at least one gripper configured to grip the beverage tablet as the brew chamber section moves from the first position to the second position, and configured to release the beverage tablet after the brew chamber section is moved to the second position.

2. The beverage machine of claim 1, wherein each gripper of the at least one gripper comprises a tip with a leading edge configured to contact the beverage tablet when gripping the beverage tablet, wherein the tip is formed of a flexible material.

3. The beverage machine of claim 2, wherein the tip comprises an undercut portion configured to allow deformation of the leading edge of the tip when the leading edge contacts the beverage tablet.

4. The beverage machine of claim 3, wherein the leading edge is configured to curl towards the brew chamber section when deformed.

5. The beverage machine of claim 3, wherein the at least one gripper is configured to grip beverage tablets having different diameters, wherein the flexible tip is configured to deform a larger amount when gripping a larger diameter beverage tablet and to deform a smaller amount when gripping a smaller diameter beverage tablet.

6. The beverage machine of claim 2, wherein the tip comprises a contact surface configured to be contacted by a portion of the beverage machine after the brew chamber section is moved to the second position to move the at least one gripper to a released position.

7. The beverage machine of claim 6, wherein the brew chamber section is a first brew chamber section, and wherein the portion of the beverage machine configured to contact the contact surface is part of a second brew chamber section.

8. The beverage machine of claim 2, wherein the flexible material is a rubber material.

9. The beverage machine of claim 1, wherein the at least one gripper comprises a first gripper and a second gripper positioned on opposing ends of the brew chamber section.

10. The beverage machine of claim 1, wherein the first position of the brew chamber section is an open position in which the brew chamber section is configured to receive a beverage tablet, and wherein the second position of the brew chamber section is a closed position in which the brew chamber section is configured to form a beverage.

11. The beverage machine of claim 1, wherein the brew chamber section is configured to rotate between the first position and the second position.

12. A method of inserting a beverage tablet into a brew chamber of a beverage machine, the method comprising:

placing a beverage tablet into a brew chamber section;

moving the brew chamber section from a first position to a second position;

engaging at least one gripper with a side of the beverage tablet to hold the beverage tablet in the brew chamber section as the brew chamber section moves from the first position to the second position; and

releasing the at least one gripper from the side of the beverage tablet after the brew chamber section is moved to the second position.

13. The method of claim 12, wherein engaging the at least one gripper with the side of the beverage tablet comprises deforming a leading edge of a tip of at least one gripper arm, at least a portion of the tip formed of a flexible material.

14. The method of claim 13, wherein deforming the leading edge of the tip comprises curling the leading edge of the tip towards the brew chamber section to wedge the beverage tablet against the brew chamber section.

15. The method of claim 13, further comprising engaging a portion of the beverage machine with a contact surface of the tip to release the at least one gripper from the beverage tablet, the contact surface formed of a material other than the flexible material.

16. The method of claim 15, wherein the brew chamber section is a first brew chamber section, and wherein the portion of the beverage machine which engages the contact surface is part of a second brew chamber section.

17. The method of claim 12, wherein engaging the at least one gripper with the side of the beverage tablet only occurs after the brew chamber section has begun moving to the second position.