

BEVERAGE OR FOODSTUFF PREPARATION SYSTEM

TECHNICAL FIELD

The present disclosure relates generally to electrically operated beverage or foodstuff preparation systems, with which a beverage or foodstuff is prepared from a pre-portioned capsule.

BACKGROUND

Systems for the preparation of a beverage comprise a beverage preparation machine and a capsule. The capsule comprises a single serving of a beverage forming precursor material, e.g. ground coffee or tea. The beverage preparation machine is arranged to execute a beverage preparation process on the capsule, typically by the exposure of pressurized, heated water to said precursor material. Processing of the capsule in this manner causes the at least partial extraction of the precursor material from the capsule as the beverage.

This configuration of beverage preparation machine has increased popularity due to 1) enhanced user convenience compared to a conventional beverage preparation machines (e.g. compared to a manually operated stove-top espresso maker) and 2) an enhanced beverage preparation process, wherein: preparation information encoded by a code on the capsule is read by the machine to define a recipe, and; the recipe is used by the machine to optimise the preparation process in a manner specific to the capsule. In particular, the encoded preparation information may comprise operating parameters selected in the beverage preparation process, including: fluid temperature; fluid pressure; preparation duration, and; fluid volume.

Codes for such capsules can encode a value of an operating parameter as a distance of a unit of the code from a reference point, where a magnitude of said distance is directly related to a magnitude of said value. A digital image of the code is then processed to extract the value.

A drawback is that errors may occur when extracting the value. Said errors may arise from one or more of: 1) printing errors when forming the units of the code may introduce a degree of variability in the value, for example there may be errors in a position of a centre point of the unit; 2) if the substrate carrying the code is deformed, e.g. due to handling, deformation or other non-uniformity of the substrate can also introduce errors in the value extracted from the digital image; 3) processing errors may also introduce a degree of error in the extracted value, for example if the code is misaligned when read such that a plane of the code is not normal to the direction the digital image is taken, and; 4) other like issues.

Therefore, in spite of the effort already invested in the development of said systems further improvements are desirable.

SUMMARY

The present disclosure provides a system comprising a container and a machine for preparing a
5 beverage and/or foodstuff or a precursor thereof.

In embodiments, container is for containing a precursor material for use with a machine for
preparing a beverage and/or foodstuff or a precursor thereof, the container including a machine-
readable code storing preparation information for use with a preparation process performed by
said machine. As used herein reference to a “code” may include one or more repetitions of the
10 code.

In embodiments, the container includes a body portion that has a storage portion for containing
the precursor material and a closing member to close the storage portion. In embodiments, the
code is arranged on the closing member. In embodiments, the storage portion includes a cavity
that extends in a depth direction from the closing member. The container may have a maximum
15 depth that is less than its diameter, which can be measured at the opening of the storage portion.
In embodiments, the body portion includes a flange portion that connects the storage portion to
the closing member. In embodiments, the cavity of the storage portion extends in a depth direction
from the flange portion. The flange portion may present a generally planar peripheral rim for
receiving the closing member. In embodiments, the flange portion is planar. As used herein the
20 term “planar” in respect of the flange portion may refer to the flange portion arranged to extend
entirely with the lateral and longitudinal directions, or substantially with said directions (e.g. with
major components in these directions as opposed to a depth direction). In embodiments, the
container is alternatively implements as a packet. In embodiments, the container is alternatively
implements as a packet. In embodiments, the body portion is formed of walls that are joined at
25 seams and/or folded (e.g. for a container arranged as a packet).

In embodiments, the machine for preparing a beverage and/or foodstuff or a precursor thereof,
includes: a code reading system to read the code of the container; a processing unit for processing
precursor material of the container, and; electrical circuitry to control the processing unit based
on preparation information read from the code (including the corrected preparation information or
30 uncorrected preparation information or stored corresponding preparation information as will be
discussed). The code reader may include an image capturing unit (e.g. a camera) a lens and an

outermost aperture (e.g. a reading window). An outermost portion of the code reader may be referred to as a reading head.

In embodiments, the machine includes electronic memory (which can be implemented by the electrical circuitry) to store corresponding preparation information, which is based on one or more
5 prior reads of a corresponding code of a container.

In embodiments, electrical circuitry (e.g., of the machine and/or system) is configured to: read the preparation information from the code; retrieve the corresponding preparation information from the electronic memory; correct the read preparation information based on the corresponding preparation information, and; control the processing unit based on the corrected preparation
10 information.

By implement processing circuitry of the system to correct the read preparation information using stored preparation information from comparable codes that have previously been read, arbitrary errors that may have occurred when obtaining parameter values if the parameters of the preparation information may be reduced, which may improve accuracy of control of the processing
15 unit for the particular container.

As used herein the term “based on one or more prior reads” may refer to the preparation information that is stored being obtained in at least one prior step for reading from an identical code of a different container. Hence the parameter values from the prior reads are intended to be the same but may vary due to read and processing errors.

20 As used herein the term “correct” in respect of the read preparation information may refer to numerically altering a parameter value that is read from the code using in some way a value of the corresponding stored preparation information of the to improve accuracy. The corrected preparation information therefore comprises a numerical combination of read preparation information and the stored corresponding preparation information rather than just one of these.

25 As used herein the term “based on” in respect of the preparation information (be it in corrected or read form etc) and control of the processing unit may refer to generally a value of parameter being used to control a setting on the processing unit, e.g. the value is a temperature, pressure or time that is set. The value can be directly encoded by the code, e.g. an encoding distance d directly encodes the value. The encoding distance d may be related to the value by a rule, e.g. an
30 equation, e.g. a linear or non-linear relationship. The rule may be stored on the electronic memory, e.g. as a lookup table relating d to the value of the parameter. In which case correction of the

preparation information as defined herein may refer to parameter value being the encoding distance d or the absolute value of the parameter determined from the encoding distance d being corrected.

As used herein the term “control the processing unit based on the corrected preparation information” may refer to the corrected preparation information being used to control the processing unit. It may include a combination of both the read preparation information and the stored preparation information being used in some combined manner to control the processing unit.

In embodiments, the electrical circuitry is configured to: identify the container, and; retrieve the corresponding preparation information from the electronic memory based on a stored relationship between the identity and the corresponding preparation information obtained from prior containers of the same identity. By implementing the electrical circuitry to identify the container, e.g. via shape, colour or other feature, the stored preparation information may be accurately looked-up using said identity.

In embodiments, the electrical circuitry is configured to identify the container based on an identifier encoded by the code. By implementing an identifier in the code, the identifier can be determined from the same digital image of the code as the preparation information and the stored preparation information may be accurately looked-up using said identifier. By implementing the identifier as a key, the specific stored preparation information can be looked up using a key value database paradigm.

In embodiments, the code comprises: a reference portion to locate the code, and; a data portion to store the preparation information. The identifier may be stored by the data portion.

In embodiments, the data portion is arranged at a predetermined position (e.g. which is stored on the electronic memory) with respect to the reference portion, wherein the data portion (including at least part) is arranged on an encoding line D , and a data unit is arranged a distance d from a starting position along the encoding line D as a variable to at least partially encode a parameter value of the preparation information.

In embodiments, the distance (d) may be any continuous distance from the start position or as a discrete predefined position. In embodiments, there are a plurality of encoding lines and the data portion is arranged as one or more individual data portions on each of the plurality of encoding lines.

In embodiments, the reference portion is arranged to define a linear reference line (L), and the encoding line is circular and is arranged to intersect the reference line (L). By implementing a circular encoding line, the data portions may be compactly arranged, including with varying priority depending on the radial location of the encoding line on which they are located, e.g. a greater radial position may have greater encoding accuracy due to the greater circumferential distance.

With a circular encoding line, the geometric distance that encodes the value of a parameter of the preparation information may be: the actual distance, e.g. the circumferential distance from the start portion to the data unit; the angular distance defined by the angle between the start position and data unit; another geometric quantity related to any of the aforementioned.

In embodiments, the identifier is arranged as one or more discrete positions, the discrete positions either comprising or are absent a unit to encode said identifier. The discrete positions may be arranged at a predefined location relative the reference portion. The predefined location may be with respect to a radial distance from the reference portion and an angle from the reference line. By implementing the identifier as discrete positions the accuracy of encoding may be increased as predefined values associated with said positions. In embodiments, the identifier is encoded as binary information, e.g., with the presence of a unit encoding one of a logical 1 or a 0 and the absence of a unit encoding the other of a logical 1 or a 0. As used herein the term "binary information" may refer to information encoded as 1s and 0s.

In embodiments, at least part of the identifier is arranged distal the or each encoding line, e.g. with said the or each encoding line arranged between the code identifying portion and the reference portion. By arranging the identifier separated from the encoding lines that the preparation information is arranged on, the identifier may be clearly distinguished from the preparation information.

In embodiments, at least part of the identifier is arranged on the or each encoding line. By implementing the identifier on an encoding line, an amount of information held by the identifier may be increased.

In embodiments, the electrical circuitry is configured to obtain a parameter value from at least two different codes and determined the parameter value as an average thereof. By determining the parameter value based on more than one code, arbitrary errors that may have occurred when obtaining either parameter values from each of the codes may be reduced. The electrical circuitry

may be configured to execute this step prior to correcting the parameter value with the stored preparation information.

In embodiments, the preparation information stored by the code comprises a parameter value encoded for a parameter; the corresponding preparation information stored by the electronic memory comprises a correction value for the parameter value, and; the electrical circuitry is
5 configured to correct the parameter value based on the correction value.

In embodiments, the correction value comprises an average derived from a plurality of associated parameter values of the parameter obtained from said prior reads of a corresponding code of a container (e.g. the average may be determined as the sum of the associated parameter values of
10 the parameter obtained from said prior reads and the read parameter value divided by the total number of values, or may be determined as the sum of the associated parameter values of the parameter obtained from said prior reads their number, which is combined with the read parameter value).

In embodiments, the electrical circuitry is configured with the plurality of parameter values of the parameter stored in a stack memory usage mechanism. By implementing a memory architecture
15 with a last-in-first-out manner, e.g. a most recent parameter value is stored as the oldest parameter stored is out, memory usage of by the electrical circuitry may be optimised in size, by avoiding storage of an unnecessary number of parameter values.

In embodiments, the correction value comprise a weighted sum of prior parameter values. By
20 implementing the correction value to comprise a weighted combination of the previous parameter values (e.g. as an exponential filter) efficient usage of the electronic memory may be achieved.

In embodiments, the electrical circuitry is configured to update the stored corresponding preparation information based on the read preparation information. By updating the stored
25 corresponding preparation information using the last read preparation information, the stored corresponding preparation information may be frequently updated to ensure it remains accurate. Moreover, for new codes which have not yet been read, the stored corresponding preparation information may be built up in the memory.

In embodiments, the electrical circuitry is configured to: determine if the electronic memory includes an entry for the corresponding preparation information which is related to the code of the
30 container, and; if not then to control the processing unit based on the read preparation information without correction with the corresponding preparation information. By implement the electrical

circuitry to determined if there is any stored corresponding preparation information that can be used to correct the read preparation information, and if there is not then using the read preparation information without a correction, the machine may operate for new codes which have not yet been read.

- 5 In embodiments, the electrical circuitry is configured to: determine if the read preparation information is within a threshold of the corresponding preparation information; and if within said threshold to execute said correction of the read preparation information based on the corresponding preparation information. In embodiments, if the read preparation information is outside of said threshold then the electrical circuitry does not to execute said correction and/or to
10 control the processing unit based on the corresponding preparation information from the electronic memory.

- By implementing the electrical circuitry only to correct the read preparation information only if it is within a threshold of the stored corresponding preparation information, it may be ensured that substantive read errors are avoided, e.g. a substantive read error may occur due to a wrong unit
15 being read or an item being identified as a unit that is not a unit (e.g. a piece of debris). Where outside of the threshold, updating of the stored corresponding preparation information with the read preparation information may be avoided to avoid a corruption of the stored corresponding preparation information. Where outside of the threshold, the stored corresponding preparation information (and not the read preparation information since this is not corrected and stored) may
20 be used to control the processing unit, which may avoid inaccurate control.

The present disclosure provides a machine for preparing a beverage and/or foodstuff or a precursor thereof from the container of any preceding embodiment or another embodiment disclosed herein.

- In embodiments, the machine comprises: a code reading system to read a code of a container; a
25 processing unit for processing precursor material of the container, and; electrical circuitry to control the processing unit based on preparation information read from the code.

In embodiments, the processing unit includes a container processing unit and a fluid processing system, and; the electrical circuitry is arranged to control the container processing unit and fluid processing system based on the preparation information read from the code.

- 30 In embodiments, the processing unit is arranged as a loose material processing unit, and; the electrical circuitry is arranged to control the loose material processing unit to process loose

precursor material dispensed from the container or arranged in the container based on the preparation information read from the code.

In embodiments, the electrical circuitry of the machine includes electronic memory to store corresponding preparation information, which is based on one or more prior reads of a corresponding code of a container. In embodiments, the electrical circuitry of the machine implements a method of reading preparation information from a code as disclosed herein.

The present disclosure provides use of the container of any preceding embodiment, or another embodiment disclosed herein for a machine for preparing a beverage and/or foodstuff or a precursor thereof according to any preceding embodiment or another embodiment disclosed herein.

The present disclosure provides a container for containing a precursor material for use with a machine for preparing a beverage and/or foodstuff or a precursor thereof, the container including one or a plurality of codes (which may be formed directly on the container or on an attachment/substrate for attachment to the container), each code storing preparation information for use with a preparation process performed by said machine.

The present disclosure provides a substrate for attachment to: a container for containing a precursor material for use with a machine for preparing a beverage and/or foodstuff or a precursor thereof, or; for attachment to a machine for preparing a beverage and/or foodstuff. The substrate comprising one or a plurality of codes comprising any feature of the codes of the preceding embodiments, or another embodiment disclosed herein.

The present disclosure provides a method of reading preparation information from a code for use in a preparation process, in which a machine is controlled based on the preparation information to prepare a beverage and/or foodstuff or precursor thereof. The method may implement the features of any preceding embodiment, or another embodiment disclosed herein.

In embodiments, the method comprises reading preparation information from a code of a container; retrieving the corresponding preparation information from the electronic memory; correcting the read preparation information based on the corresponding preparation information, and; controlling a processing unit to process the container based on the corrected preparation information.

The present disclosure provides electrical circuitry to implement the method of the preceding embodiments, or another embodiment disclosed herein.

The present disclosure provides a computer readable medium comprising program code, which may be executable on one or more processors (e.g. of the machine or system generally), to
5 implement the method of the preceding embodiments or another embodiment disclosed herein.

The preceding summary is provided for purposes of summarizing some embodiments to provide a basic understanding of aspects of the subject matter described herein. Accordingly, the above-described features are merely examples and should not be construed to narrow the scope or spirit of the subject matter described herein in any way. Moreover, the above and/or proceeding
10 embodiments may be combined in any suitable combination to provide further embodiments. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following Detailed Description of Embodiments, Brief Description of Figures, and Claims.

BRIEF DESCRIPTION OF FIGURES

15 Aspects, features and advantages of embodiments of the present disclosure will become apparent from the following detailed description of embodiments in reference to the appended drawings in which like numerals denote like elements.

Figure 1 is a block system diagram showing an embodiment system for preparation of a beverage or foodstuff.

20 Figure 2 is a block system diagram showing an embodiment machine of the system of figure 1.

Figure 3 is an illustrative diagram showing an embodiment fluid conditioning system of the machine of figure 2.

Figures 4 and 5 are illustrative diagrams showing an embodiment container processing system of the machine of figure 2 on open and closed positions.

25 Figure 6 is an illustrative diagram showing an embodiment machine of figure 2, which comprises a loose material processing unit.

Figure 7 is a block diagram showing embodiment control electrical circuitry of the machine of figure 2.

Figures 8 and 9 are illustrative diagrams showing embodiment containers of the system of figure 1.

Figure 10 is flow diagram showing an embodiment preparation process, which is performed by the system of figure 1.

- 5 Figure 11 is a plan view showing an embodiment code of the containers of the system of figure 1.

Figures 12 and 13 are flow diagrams showing embodiment processes for extracting preparation information from the code of figure 11.

- 10 Figure 14 is flow diagram showing an embodiment process for correcting preparation information read from the code of figure 11.

Figure 15 is a plan view showing an embodiment code of the containers of the system of figure 1.

Figures 16 and 17 are flow diagrams showing an embodiment process for correcting preparation information read from the code of figure 11.

15 DETAILED DESCRIPTION OF EMBODIMENTS

- Before describing several embodiments of the system, it is to be understood that the system is not limited to the details of construction or process steps set forth in the following description. It will be apparent to those skilled in the art having the benefit of the present disclosure that the system is capable of other embodiments and of being practiced or being carried out in various ways.
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The present disclosure may be better understood in view of the following explanations:

As used herein, the term “**machine**” may refer to an electrically operated device that: can prepare, from a precursor material, a beverage and/or foodstuff, or; can prepare, from a pre-precursor material, a precursor material that can be subsequently prepared into a beverage and/or foodstuff.

- 25 The machine may implement said preparation by one or more of the following processes: dilution; heating; cooling; mixing; whisking; dissolution; soaking; steeping; extraction; conditioning; infusion; grinding, and; other like process. The machine may be dimensioned for use on a work top, e.g. it may be less than 70 cm in length, width and height. As used herein, the term “**prepare**” in respect of a beverage and/or foodstuff may refer to the preparation of at least part of the

beverage and/or foodstuff (e.g. a beverage is prepared by said machine in its entirety or part prepared to which the end-user may manually add extra fluid prior to consumption, including milk and/or water).

As used herein, the term "**container**" may refer to any configuration to contain the precursor material, e.g. as a single-serving, pre-portioned amount. The container may have a maximum capacity such that it can only contain a single-serving of precursor material. The container may be single use, e.g. it is physically altered after a preparation process, which can include one or more of: perforation to supply fluid to the precursor material; perforation to supply the beverage/foodstuff from the container; opening by a user to extract the precursor material. The container may be configured for operation with a container processing unit of the machine, e.g. it may include a flange for alignment and directing the container through or arrangement on said unit. The container may include a rupturing portion, which is arranged to rupture when subject to a particular pressure to deliver the beverage/foodstuff. The container may have a membrane for closing the container. The container may have various forms, including one or more of: frustoconical; cylindrical; disk; hemispherical; packet; other like form. The container may be formed from various materials, such as metal or plastic or paper or a combination thereof. The material may be selected such that it is one or more of: food-safe; it can withstand the pressure and/or temperature of a preparation process, and; it is biodegradable. The container may be defined as a capsule, wherein a capsule may have an internal volume of 20 - 100 ml. The capsule includes a coffee capsule, e.g. a Nespresso® or Nescafé® capsule (including a Classic, Professional, Vertuo, Dolce Gusto or other capsule). The container may be defined as a receptacle, wherein a receptacle may have an internal volume of 150 - 350 ml. The receptacle is typically for end user consumption therefrom, and includes a pot, for consumption via an implement including a spoon, and a cup for drinking from. The container may be defined as a packet, wherein the packet is formed from a flexible material, including plastic or foil. A packet may have an internal volume of 150 - 350 ml or 200 - 300 ml or 50 - 150 ml.

As used herein, the term "**external device**" or "**external electronic device**" or "**peripheral device**" may include electronic components external to the machine, e.g. those arranged at a same location as the machine or those remote from the machine, which communicate with the machine over a computer network. The external device may comprise a communication interface for communication with the machine and/or a server system. The external device may comprise devices including: a smartphone; a PDA; a video game controller; a tablet; a laptop; or other like device.

As used herein, the term "**server system**" may refer to electronic components external to the machine, e.g. those arranged at a remote location from the machine, which communicate with the machine over a computer network. The server system may comprise a communication interface for communication with the machine and/or the external device. The server system can
5 include: a networked-based computer (e.g. a remote server); a cloud-based computer; any other server system.

As used herein, the term "**system**" or "**beverage or foodstuff preparation system**" may refer to the combination of any two of more of: the beverage or foodstuff preparation machine; the container; the server system, and; the peripheral device.

10 As used herein, the term "**beverage**" may refer to any substance capable of being processed to a potable substance, which may be chilled or hot. The beverage may be one or more of: a solid (e.g. a solid suspended in a liquid); a liquid; a gel; a paste. The beverage may include one or a combination of: tea; coffee; hot chocolate; milk; cordial; vitamin composition; herbal tea/infusion; infused/flavoured water, and; other substance. As used herein, the term "**foodstuff**" may refer to
15 any substance capable of being processed to a nutriment for eating, which may be chilled or hot. The foodstuff may be one or more of: a solid; a liquid; a gel; a paste. The foodstuff may include: yoghurt; mousse; parfait; soup; ice cream; sorbet; custard; smoothies; other substance. It will be appreciated that there is a degree of overlap between the definitions of a beverage and foodstuff, e.g. a beverage can also be a foodstuff and thus a machine that is said to prepare a beverage or
20 foodstuff does not preclude the preparation of both.

As used herein, the term "**precursor material**" may refer to any material capable of being processed to form part or all of the beverage or foodstuff. The precursor material can be one or more of a: powder; crystalline; liquid; gel; solid, and; other. Examples of a beverage forming precursor material include: ground coffee; milk powder; tea leaves; coco powder; vitamin
25 composition; herbs, e.g. for forming a herbal/infusion tea; a flavouring, and; other like material. Examples of a foodstuff forming precursor material include: dried vegetables or stock as anhydrous soup powder; powdered milk; flour based powders including custard; powdered yoghurt or ice-cream, and; other like material. A precursor material may also refer to any pre-precursor material capable of being processed to a precursor material as defined above, i.e. any
30 precursor material that can subsequently be processed to a beverage and/or foodstuff. In an example, the pre-precursor material includes coffee beans which can be ground and/or heated (e.g. roasted) to the precursor material.

A precursor material may also refer to any pre-precursor material capable of being processed to a precursor material as defined above, i.e. any precursor material that can subsequently be processed to a beverage and/or foodstuff. In an example, the pre-precursor material includes coffee beans which can be ground and/or heated (e.g. roasted) to the precursor material.

- 5 As used herein, the term "**fluid**" (in respect of fluid supplied by a fluid conditioning system) may include one or more of: water; milk; other. As used herein, the term "**conditioning**" in respect of a fluid may refer to to change a physical property thereof and can include one or more of the following: heating or cooling; agitation (including frothing via whipping to introduce bubbles and mixing to introduce turbulence); portioning to a single-serving amount suitable for use with a single
10 serving container; pressurisation e.g. to a brewing pressure; carbonating; fliting/purifying, and; other conditioning process.

As used herein, the term "**processing unit**" may refer to an arrangement that can process precursor material to a beverage or foodstuff. It may refer to an arrangement that can process a pre-precursor material to a precursor material.

- 15 As used herein, the term "**container processing unit**" may refer to an arrangement that can process a container to derive an associated beverage or foodstuff from a precursor material. The container processing unit may be arranged to process the precursor material by one of more of the following: dilution; heating; cooling; mixing; whisking; dissolution; soaking; steeping; extraction; conditioning; pressurisation; infusion, and: other processing step. The container
20 processing unit may therefore implement a range of units depending on the processing step, which can include: an extraction unit (which may implement a pressurised and/or a thermal, e.g. heating or cooling, brewing process); a mixing unit (which mixes a beverage or foodstuff in a receptacle for end user consumption therefore; a dispensing and dissolution unit (which extracts a portion of the precursor material from a repository, processes by dissolution and dispenses it
25 into a receptacle), and: other like unit.

- As used herein, the term "**loose material processing unit**" may refer to an arrangement that can process loose material of a pre-precursor material to a precursor material. The loose material processing unit may be arranged to process the pre-precursor material by one of more of the following: heating; cooling; grinding; mixing; soaking; conditioning; other processing step. The
30 loose material may be supplied to the loose material processing unit in a container, from which it is extracted and processed.

As used herein, the term "**preparation process**" may refer to a process to prepare a beverage or foodstuff from a precursor material or to prepare a pre-precursor material from precursor material. A preparation process may refer to the processes electrical circuitry executes to control the container processing unit to process said precursor or pre-precursor material.

- 5 As used herein, the term "**electrical circuitry**" or "**circuitry**" or "**control electrical circuitry**" may refer to one or more hardware and/or software components, examples of which may include: an Application Specific Integrated Circuit (ASIC); electronic/electrical componentry (which may include combinations of transistors, resistors, capacitors, inductors etc); one or more processors; a non-transitory memory (e.g. implemented by one or more memory devices), that may store one
10 or more software or firmware programs; a combinational logic circuit; interconnection of the aforesaid. The electrical circuitry may be located entirely at the machine, or distributed between one or more of: the machine; external devices; a server system.

- As used herein, the term "**processor**" or "**processing resource**" may refer to one or more units for processing, examples of which include an ASIC, microcontroller, FPGA, microprocessor,
15 digital signal processor (DSP), state machine or other suitable component. A processor may be configured to execute a computer program, e.g. which may take the form of machine readable instructions, which may be stored on a non-transitory memory and/or programmable logic. The processor may have various arrangements corresponding to those discussed for the circuitry, e.g. on-board machine or distributed as part of the system. As used herein, any machine executable
20 instructions, or computer readable media, may be configured to cause a disclosed method to be carried out, e.g. by the machine or system as disclosed herein, and may therefore be used synonymously with the term method, or each other.

- As used herein, the term "**computer readable medium/media**" or "**data storage**" may include any medium capable of storing a computer program, and may take the form of any conventional
25 non-transitory memory, for example one or more of: random access memory (RAM); a CD; a hard drive; a solid state drive; a memory card; a DVD. The memory may have various arrangements corresponding to those discussed for the circuitry.

- As used herein, the term "**communication resources**" or "**communication interface**" may refer to hardware and/or firmware for electronic information transfer. The communication
30 resources/interface may be configured for wired communication ("wired communication resources/interface") or wireless communication ("wireless communication resources/interface"). Wireless communication resources may include hardware to transmit and receive signals by radio

and may include various protocol implementations e.g. the 802.11 standard described in the Institute of Electronics Engineers (IEEE) and Bluetooth™ from the Bluetooth Special Interest Group of Kirkland Wash. Wired communication resources may include; Universal Serial Bus (USB); High-Definition Multimedia Interface (HDMI) or other protocol implementations. The machine may include communication resources for wired or wireless communication with an external device and/or server system.

As used herein, the term "**network**" or "**computer network**" may refer to a system for electronic information transfer between a plurality of apparatuses/devices. The network may, for example, include one or more networks of any type, which may include: a Public Land Mobile Network (PLMN); a telephone network (e.g. a Public Switched Telephone Network (PSTN) and/or a wireless network); a local area network (LAN); a metropolitan area network (MAN); a wide area network (WAN); an Internet Protocol Multimedia Subsystem (IMS) network; a private network; the Internet; an intranet.

As used herein, the term "**code**" may refer to a storage medium that encodes preparation information. The code may be an optically readable code, e.g. a bar code. The code may be arranged as a bit code (e.g. a binary sequence of 0s and 1s encoded by the absence or presence of an element). The code may be formed of a plurality of units, which can be referred to as elements or markers. The elements may implement a finder portion and a data portion, wherein the finder portion encodes a predefined reserved string of bits that is identifiable when processing the code from the data portion, to enable location of the data portion, which encodes the preparation information. The code may be arranged as a one dimensional code, which is read by relative movement between the code and a code reader. The code reader may provide a bit stream signal or a high and low signal for processing by preparation information extraction. The code may be arranged as a two dimensional code, which is processed via a digital image obtained from a camera of the code reader. It will be understood that a code may therefore exclude a mere surface finish or branding on a container, which is not configured in any way for information storage.

As used herein the term "**preparation information**" may refer to one of more of: parameters as defined herein; a recipe as defined herein; an identifier, and; other information related to the operation of the machine.

As used herein, the term "**parameter**" may refer to a variable that is used as an input for controlling (e.g. RPM) and/or or a property of the beverage/foodstuff or a precursor thereof that is controlled

by the processing unit (e.g. a fluid target temperature or volume) during the preparation process. Depending on the implementation of the processing unit said parameter may vary. Examples include: volume of a particular component of the beverage and/or foodstuff; fluid temperature; fluid flow rate; operational parameters of the processing unit, e.g. RPM of an extraction unit based
5 on centrifugation or closing force for a hydraulic brewing unit; an order of dispensing of components of the beverage and/or foodstuff; agitation (e.g. frothing degree); any of the aforesaid defined for one or more phases, wherein the preparation process is composed of a series of sequential, discrete phases. The parameters that may be associated container processing unit that comprises a loose material processing unit, can include one or more of: grinding parameters,
10 including intensity; heating temperature. The parameter may have a value, which may be numerical and can vary in predetermined increments between predetermined limits, e.g. a temperature of the water may vary between 60 – 90 degrees in 5 degree increments.

As used herein, the term "**recipe**" or "**control data set**" may refer to a combination of said parameters, e.g. as a full or partial set of inputs, that are used by the processing unit to prepare
15 a particular beverage and/or food stuff.

As used herein, the term "**preparation process**" may refer to a process to prepare a beverage or foodstuff from a precursor material or to prepare a pre-precursor material from precursor material. A preparation process may refer to the processes electrical circuitry executes to control the processing unit to process said precursor or pre-precursor material.

20 As used herein, the term "**code reading process**" may refer to the process of reading the code to extract the preparation information (which can include the identifier and/or parameters). The process may include one or more of the following steps: obtaining a digital image of the code or a code signal; extracting a sequence of bits from the code; identifying a finder portion of the code in the sequence; locating a data portion using the finder portion, and; extracting the preparation
25 information from the data portion.

[General system description]

Referring to figure 1, the system 2 comprises a machine 4, a container 6, server system 8 and a peripheral device 10. The server system 8 is in communication with the machine 4 via a computer network 12. The peripheral device 10 is in communication with the machine 4 via the computer
30 network 12.

In variant embodiments, which are not illustrated: the peripheral device and/or server system is omitted.

Although the computer network **12** is illustrated as the same between the machine **4**, server system **8** and peripheral device **10**, other configurations are possible, including: a different
5 computer network for intercommunication between each device: the server system communicates with the machine via the peripheral device rather than directly. In a particular example: the peripheral device communicates with the machine via a wireless interface, e.g. with a Bluetooth™ protocol, and; the server system communicates with the machine via a via a wireless interface, e.g. with a IEE 802.11 standard, and also via the internet.

10 [Machine]

Referring to figure 2, the machine **4** comprises: a processing unit **14** for processing the precursor material; electrical circuitry **16**, and; a code reading system **18**.

The electrical circuitry **16** controls the code reading system **18** to read a code (not illustrated in figure 2) from the container **6** and determine preparation information therefrom. The electrical
15 circuitry **16** uses the preparation information to control the processing unit **14** to execute a preparation process, in which the precursor material is process to a beverage or foodstuff or a precursor thereof.

[First example of Processing unit]

Referring to figures 3, 4 and 5, in a first example of the processing unit **14**, said unit comprises a
20 container processing unit **20** and a fluid conditioning system **22**.

The container processing unit **20** is arranged to process the container **6** to derive a beverage or foodstuff from precursor material (not illustrated) therein. The fluid conditioning system **22** conditions fluid supplied to the container processing unit **20**. The electrical circuitry **16** uses the preparation information read from the container **6** to control the container processing unit **20** and
25 the fluid conditioning system **22** to execute the preparation process.

[Fluid conditioning system]

Referring to figure 3, the fluid conditioning system **22** includes a reservoir **24**; pump **26**; heat exchanger **28**, and; an outlet **30** for the conditioned fluid. The reservoir **24** contains fluid, typically sufficient for multiple preparation processes. The pump **26** displaces fluid from the reservoir **24**,

through the heat exchanger **26** and to the outlet **30** (which is connected to the container processing unit **20**). The pump **26** can be implemented as any suitable device to drive fluid, including: a reciprocating; a rotary pump; other suitable arrangement. The heat exchanger **28** is implemented to heat the fluid, and can include: an in-line, thermo block type heater; a heating element to heat the fluid directly in the reservoir; other suitable arrangement.

In variant embodiments, which are not illustrated: the pump is omitted, e.g. the fluid is fed by gravity to the container processing unit or is pressurised by a mains water supply; the reservoir is omitted, e.g. water is supplied by a mains water supply; the heat exchanger is arranged to cool the fluid, e.g. it may include a refrigeration-type cycle heat pump; the heat exchanger is omitted, e.g. a mains water supply supplies the water at the desired temperature; the fluid conditioning system includes a filtering/purification system, e.g. a UV light system, a degree of which that is applied to the fluid is controllable; a carbonation system that controls a degree to which the fluid is carbonated.

[Container processing unit]

The container processing unit **20** can be implemented with a range of configurations, as illustrated in examples 1 – 6 below. Generally, in examples where the machine **2** comprises a guide portion, in to which a container is inserted and is guided by gravity (e.g. under its own weight) to the container processing unit **20**, the container processing unit **20** is arranged with a container holding portion and a closing portion, which are movable between a container receiving position and a container processing position in a depth direction, which is perpendicular (including substantially perpendicular) to a direction of transmission of the guide portion.

Referring to figures 4 and 5, a first example of the container processing unit **20** is for processing of a container arranged as a capsule **6** (a suitable example of a capsule is provided in figure 7, which will be discussed) to prepare a beverage. The container processing unit **20** is configured as an extraction unit **32** to extract the beverage from the capsule **6**. The extraction unit **32** includes a capsule holding portion **34** and a closing portion **36**. The extraction unit **32** is movable to a capsule receiving position (figure 4), in which capsule holding portion **34** and a closing portion **36** are arranged to receive a capsule **6** therebetween. The extraction unit **32** is movable to a capsule extraction position (figure 5), in which the capsule holding portion **34** and a closing portion **36** form a seal around a capsule **6**, and the beverage can be extracted from the capsule **6**. The extraction unit **32** can be actuator driven or manually movable between said positions.

The outlet **30** of the fluid conditioning system **22** is arranged as an injection head **38** on the capsule holding portion **34** to inject the conditioned fluid into the capsule **6** in the capsule extraction position, typically under high pressure. A beverage outlet **40** on the closing portion **36** is arranged to capture the extracted beverage and convey it from the extraction unit **32**.

- 5 The extraction unit **32** is arranged to prepare a beverage by the application of pressurised (e.g. at 10 – 20 Bar), heated (e.g. at 50 – 98 degrees C) fluid to the precursor material within the capsule **6**. The pressure is increased over a predetermined amount of time until a pressure of a rupturing portion (not illustrated in figures 4 and 5) of the capsule **6** is exceeded, which causes rupture of said portion and the beverage to be dispensed to the beverage outlet **40**.
- 10 In variant embodiments, which are not illustrated, although the injection head and beverage outlet are illustrated as arranged respectively on the capsule holding portion and closing portion, they may be alternatively arranged, including: the injection head and beverage outlet are arranged respectively on the closing portion capsule holding portion and; or both on the same portion. Moreover, the extraction unit may include both parts arranged as a capsule holding portion, e.g.
- 15 for capsules that are symmetrical about the flange, including a Nespresso® Professional capsule. Examples of suitable extraction units are provided in EP 1472156 A1 and in EP 1784344 A1 and provide a hydraulically sealed extraction unit.

- In a second example (which is not illustrated) of the container processing unit a similar extraction unit to the first example is provided, however the extraction unit operates at a lower pressure and
- 20 by centrifugation. An example of a suitable capsule is a Nespresso® Vertuo capsule. A suitable example is provided in EP 2594171 A1. With such an example (or indeed the other examples) a guide portion may be obviated and the container manually loaded into the extraction unit.

- In a third example, (which is not illustrated) the capsule processing unit operates by dissolution of a beverage precursor that is selected to dissolve under high pressure and temperature fluid.
- 25 The arrangement is similar to the extraction unit of the first and second example, however the pressure is lower and therefore a sealed extraction unit is not required. In particular, fluid can be injected into a lid of the capsule and a rupturing portion is located in a base of a storage portion of the capsule. An example of a suitable capsule is a Nescafé® Dolce Gusto capsule. Examples of suitable extraction units are disclosed in EP 1472156 A1 and in EP 1784344 A1.

- 30 In a fourth example, (which is not illustrated) wherein the container is arranged as a packet, the container processing unit implements an extraction unit operable to receive the packet and to

inject, at an inlet thereof, fluid from the fluid conditioning system. The injected fluid mixes with precursor material within the packet to at least partially prepare the beverage, which exits the packet via an outlet thereof. An example of such an arrangement is provided in WO2014125123 A1 or in WO2022023578A1.

- 5 In a fifth example, (which is not illustrated) the container processing unit is arranged as a mixing unit to prepare a beverage or foodstuff precursor that is stored in a container that is a receptacle, which is for end user consumption therefrom. The mixing unit comprises an agitator (e.g. planetary mixer; spiral mixer; vertical cut mixer) to mix and a heat exchanger to heat/cool the beverage or foodstuff precursor in the receptacle. A fluid supply system may also supply fluid to the receptacle. An example of such an arrangement is provided in WO 2014067987 A1.

- 15 In a sixth example, (which is not illustrated) the container processing unit is arranged as a dispensing and dissolution unit. The dispensing and dissolution unit is arranged to extract a single serving portion of beverage or foodstuff precursor from a storage portion of the machine (which can include any multi-portioned container including a packet or box). The dispensing and dissolution unit is arranged to mix the extracted single serving portion with the conditioned fluid from the fluid conditioning system, and to dispense the beverage or foodstuff into a receptacle. An example of such an arrangement is provided in EP14167344A.

[Second example of Processing unit]

- 20 Referring to figure 6, in a second example of the processing unit **14**, said unit comprises a loose material processing unit **42**.

- The loose material processing unit **42** is arranged to receive loose pre-precursor material from a container **6** (a suitable example is provided in figure 8 as will be discussed) and to process the pre-precursor material to derive the precursor material. The electrical circuitry **16** uses the preparation information read from the container **6** to control the loose material processing unit **42** to execute the preparation process.

- 30 A user resents manually the container **6** to a code reading system **18**, of the machine **4**, to read the code (as will be discussed). The user then opens the container **6** and dispenses the pre-precursor material (not illustrated) arranged therein into the loose material processing unit **42**. The loose material processing unit **42** processes the loose pre-precursor material to the precursor material.

In a particular example, the pre-precursor material is coffee beans, and the loose material processing unit **42** is arranged to roast and/or grind the coffee beans to provide a precursor material.

5 In variant embodiments, which are not illustrated, the loose material processing unit is alternatively configured, including: with a dispensing system to open and dispense the pre-precursor from the capsule for subsequent processing (e.g. it may include a cutting tool to cut open the container and an extractor such as a scop to extract the pre-precursor material); the pre-precursor material may be processed in the container and either dispensed from the container by the aforescribed example or provided to a user in the container.

10 [Code reading system]

Referring to figures 4 and 5, the code reading system **18** is arranged to read a code **44** arranged on a lid of the container **6**. The code reading system **18** is integrated with the extraction unit **32** of first example of the container processing unit **20**. The code **44** is read with the extraction unit **32** in the capsule extraction position (as shown in figure 4).

15 The code reading system **18** includes a code reader **46** with an image capturing unit and a reading head housing the image capturing unit to capture a digital image of the code **44**. Examples of a suitable image capturing unit include a Sonix SN9S102; Snap Sensor S2 imager; an oversampled binary image sensor; other like system.

20 The electrical circuitry **16** includes image processing circuitry (not illustrated) to identify the code in the digital image and extract preparation information. An example of the image processing circuitry is a Texas Instruments TMS320C5517 processor running a code processing program.

In variant embodiments, which are not illustrated, the code reading system is separate from the container processing unit including: it is arranged in a channel that the user places the container in and that conveys the container to the container processing unit; it is arranged to read a code on a receptacle, which is positioned to receive a beverage from an beverage outlet of a dispensing and dissolution unit. In further variant embodiments, which are not illustrated, the code reading system is arranged to read a code at a different location of the container, e.g. on a flange or containment portion. In further variant embodiments, which are not illustrated, the code is a one dimensional code and is read by relative movement between the code reader and the code to produce a code signal.

25

30

[Control electrical circuitry]

Referring to figure 7, the electrical circuitry **16** is implemented as control electrical circuitry **48** to control the processing unit **14** to execute a preparation process. In the embodiment of figure 7, for illustrative purposes, the processing unit **14** is exemplified as the first example, which
5 comprises a container processing unit **20** and a fluid supply unit **22**.

The electrical circuitry **16, 48** at least partially implements (e.g. in combination with hardware) an: input unit **50** to receive an input from a user confirming that the machine **4** is to execute a preparation process; a processor **52** to receive the input from the input unit **50** and to provide a control output to the processing unit **14**, and; a feedback system **54** to provide feedback from the
10 processing unit **54** during the preparation process, which may be used to control the preparation process.

The input unit **50** is implemented as a user interface, which can include one or more of: buttons, e.g. a joystick button or press button; joystick; LEDs; graphic or character LDCs; graphical screen with touch sensing and/or screen edge buttons; other like device; a sensor to determine whether
15 a container has been supplied to the machine by a user.

The feedback system **54** can implement one or more of the following or other feedback control based operations:

a flow sensor to determine a flow rate/volume of the fluid to the outlet **30** (shown in figure 3) of the fluid supply system **22**, which may be used to meter the correct amount of fluid to the container
20 **6** and thus regulate the power to the pump **26**;

a temperature sensor to determine a temperature of the fluid to the outlet **30** of the fluid supply unit **22**, which may be used to ensure the temperature of fluid to the container **6** is correct and thus regulate the power to the heat exchanger **28**);

a level sensor to determine a level of fluid in the reservoir **24** as being sufficient for a preparation
25 process;

a position sensor to determine a position of the extraction unit **32** (e.g. a capsule extraction position or a capsule receiving position).

It will be understood that the electrical circuitry **16**, **44** is suitably adapted for the other examples of the processing unit **14**, e.g.: for the second example of the container processing system the feedback system may be used to control speed of rotation of the capsule.

[Container]

- 5 Referring to figure 8, a first example of a container **6**, that is for use with the first example of the processing unit **14** comprises the container **6** arranged as a capsule **6**. The capsule **6** includes a closing member **56** and a body portion **62**, which comprises a storage portion **58**, and a flange portion **60**.

- 10 The storage portion **58** includes a cavity for storage of the precursor material (not illustrated). The cavity of the storage portion extends in a depth direction **106** from the flange portion **60**. Referring to figures 4 and 5, the storage portion **56** is perforated by the injection head **38** to supply conditioned fluid into the capsule.

- The storage portion **58** is formed from a paper based material. The storage portion **58** has a thickness of 0.2 mm. The closing member **56** is formed from a paper based material. The closing member **58** has a thickness of 0.15 mm.
- 15

As used herein "paper based" may refer to as being formed at least partially from a thin sheet material produced by mechanically or chemically processing cellulose fibres derived from one or more of: wood; rags; grasses, or; other vegetable sources, in water, draining the water through fine mesh leaving the fibre evenly distributed on the surface, followed by pressing and drying.

- 20 The closing member **56** closes and may hermitically seal the storage portion **58** and comprises a flexible membrane. Referring to figures 4 and 5, the closing member **56** is perorated to eject the beverage/foodstuff.

- The flange portion **60** is formed integrally with the storage portion. The flange portion **60** is arranged at the junction of the storage portion **58** and closing member **56** and comprise a planar extension of the storage portion **58** that is overlapped by a portion of the closing member that is fixed thereto to hermetically seal the precursor material. The flange portion **60** extends in a plane defined by a lateral direction **102** and a longitudinal direction **100**. Hence the closing member is planar in said plane.
- 25

- The capsule **6** is circular cross sections such that it is rotationally symmetric about axis **108**. In this way a user can present the capsule to the machine **2** with any orientation about the axis **108**.
- 30

The capsule **6** has a diameter of 53 mm, which is measured across an outer or inner periphery of the flange portion **60** in said plane of the flange portion **60**. The capsule **6** can be configured with different sizes, which are characterised by different depths e.g.: 7 mm; 12 mm; 15 mm; 18 mm, and; 21mm. The capsule **6** in each size is compatible with the first and second examples of the code reading system **18** as will be discussed.

In variant embodiments, which are not illustrated, the closing member may be arranged as convex or concave with respect to the storage portion. For example, for a convex arrangement, a centre of the closing member may extend into the storage portion in the depth direction by up to 1 mm $\pm$ 10% or 20%. A minimum concavity may be 0.2 mm. For example, for a concave arrangement, a centre of the closing member may extend away from the storage portion in the counter depth direction by up to 4 mm $\pm$ 10% or 20%. A minimum concavity may be 0.5 mm.

In variant embodiments, which are not illustrated: the body portion comprises the flange portion formed non-integrally with the storage portion and connected thereto; the body portion comprises the flange portion omitted, e.g. the closing member is wrapped around the storage portion; the container may be a non-rotationally symmetric shape, e.g. square sectioned or other shape; the capsule is alternatively dimensioned, including across an outer or inner periphery of the flange portion is 40 – 70 mm or 53 mm $\pm$ 10% or 20% and the depth is any of the described depths $\pm$ 10% or 20%; the thickness of the storage portion may have a thickness of 0.1 to 0.4 mm or 0.2 $\pm$ 20% or 30%; the thickness of the closing member may have a thickness of 0.05 to 0.3mm or 0.15 $\pm$ 20% or 30%, and; the storage portion and/or closing member may be made out of or include a different material, e.g. including a plastics or aluminium based material.

Referring to figure 9, a second example of a container **6** that is for use with the second example of the processing unit **14** comprises the container **6** arranged as a packet and includes: an arrangement of sheet material **62** joined at peripheral seams **64** defining an internal volume for the storage of the precursor material (not illustrated), and; an opening **66**, that a user opens to dispense the precursor material into the loose material processing unit **42**.

[Arrangement of Code]

Referring to figure 8, the code **44** code may be arranged on an exterior surface of the container **6** in any suitable position such that it can be read by the code reading system **18**.

In a first example, the code **44** is arranged at a central region of the closing member **56**. The code can therefore be read by any code reader that is aligned to the centre of the container. In a second

example, the code is reproduced over the entire closing member so that it can be read from any exterior position on the closing member **56**. With such an arrangement the closing member does not require any specific alignment with the storage portion, which simplifies cutting and assembly processes for the container **6**.

- 5 In variant embodiments, which are not illustrated, the code can be arranged on the flange portion **60** (including on either side) and on the storage portion **58**. The code may also be arranged on the closing member but not on the central region.

In the second example shown in figure 9, the code **44** is arranged at various positions on the sheet material **62**, including distal the seams **64**.

10 [Preparation Process]

Referring to figure 10, a process for preparing a beverage/foodstuff from precursor material is illustrated:

Block 70: a user supplies a container **6** to the machine **4**.

- 15 **Block 72:** the electrical circuitry **16** (e.g. the input unit **50** thereof) receives a user instruction to prepare a beverage/foodstuff from precursor, and the electrical circuitry **16** (e.g. the processor **52**) initiates the process.

Block 74: the electrical circuitry **16** controls the processing unit **14** to process the container (e.g. in the first example of the container processing unit **20**, the extraction unit **32** is moved from the capsule receiving position (figure 4) to the capsule extraction position (figure 5)).

- 20 **Block 76:** the electrical circuitry **16** controls the code reading system **18** to provide a digital image of the code **6** of the container.

Block 78: the code processing circuitry of the electrical circuitry **16** processes the digital image to extract the preparation information.

- 25 **Block 80:** the electrical circuitry **16**, based on the preparation information, executes the preparation process by controlling the processing unit **14**. In the first example of the processing unit this comprises: controlling the fluid conditioning system **22** to supply fluid at a temperature, pressure, and time duration specified in the preparation information to the container processing unit **20**.

The electrical circuitry **16** subsequently controls the container processing unit **20** to move from the capsule extraction portion through the capsule ejection position to eject the container **6** and back to the capsule receiving position.

In variant embodiments, which are not illustrated: the above blocks can be executed in a different order, e.g. **block 72** before **block 70** or **block 76** before **block 74**; some block can be omitted, e.g. where a machine stores a magazine of capsules **block 70** can be omitted.

Blocks **76** and **78** may be referred to a code reading and processing process. Block **80** may be referred to as the preparation process. The electrical circuitry **16**, includes instructions, e.g. as program code, for the preparation process (or a plurality thereof). In an embodiment the processor **52** implements the instructions stored on a memory (not illustrated).

As part of the preparation process, the electrical circuitry **16** can obtain additional preparation information via the computer network **12** from the server system **8** and/or peripheral device **10** using a communication interface (not illustrated) of the machine.

[Code general description]

Referring to figure 11, the code **44** is formed of a plurality of circular units **80** arranged on a surround **82**. The units **80** are a dark colour (e.g. including one of the following: black, dark blue, purple, dark green) and the surround **82** is a comparatively light colour (e.g. including one of the following: white, light blue, yellow, light green) such that there is sufficient contrast for the image capturing unit **46** to distinguish therebetween. The units **80** of the code may be configured to be read in the infra red and/or visible wavebands.

The units **80** are circular in shape. As used herein the term "shape" in respect of the units may refer to an exact shape or an approximation of the actual shape, which can occur to a printing or other manufacturing variations in precision.

In variant embodiments, which are not illustrated: the units are a light colour and the surround is a dark colour; the units have a different shape including one or a combination of the following shapes, triangular, polygon, in particular a quadrilateral such as square or parallelogram; other suitable shape.

The units **80** typically have a unit length of 50 - 200 μm . As used herein the term "unit length" in respect of a unit **80** may refer to a suitably defined distance of the unit **80**, e.g.: for a circular shape

the diameter; for a square a side length; for a polygon a distance between opposing or adjacent vertices; for a triangle a hypotenuse. The units **80** are arranged with a precision of about 1 μm .

The units **80** are formed by printing e.g. by means of an ink printer. As an example of printing the ink may be conventional printer ink and the substrate may be: polyethylene terephthalate (PET);
5 aluminium coated with a lacquer (as found on Nespresso Classic capsules) or other suitable substrate.

In variant embodiments, which are not illustrated: the units are alternatively formed, including by embossing, engraving or other suitable means, and; the units are alternatively dimensioned, e.g. a unit length of 80 - 120 μm .

- 10 Referring further to figure 11, the units **80** are organised into: a reference portion **R** to locate and determine an orientation of the code **44**, and; a data portion **D** to store the preparation information.

The units **80** of the code **44**, which are arranged as the reference portion **R**, comprise three reference units **84**. The reference units **84** have a unique spatial arrangement in the code **44** to allow the reference portion **R** to be identified by the electrical circuitry **16** (e.g. with a stored
15 relationship on a memory thereof) in the digital image. The unique spatial arrangement comprises the reference units **84** arranged at three of the vertices of a virtual rectangle (not illustrated), about an origin **O** at the centre of the rectangle, with specific distances between the reference units **84**.

In variant embodiments, which are not illustrated, the reference portion is alternatively implemented, including: as a different arrangement of reference units, e.g. including as a circle or
20 other shape of rectangle; with a different number of reference units, e.g. including as 4 or 5, and; the reference units may have a unique shape that is identifiable from the shape of the other units forming the code.

The arrangement of the reference units **84** enables the definition of a single reference line **r** at a specific vector relative to said units **84**. The reference line **r** is virtual, and is determined by the
25 electrical circuitry **16** (e.g. with a stored relationship on a memory thereof).

In the particular example, the reference units **84** define, using the right hand rule, a first virtual line (not illustrated) and a second virtual line (not illustrated), wherein: the thumb represents the first virtual line which intersects the centres of two of the reference units **84**; the index finger represents the second virtual line which intersects the centres of two of the reference units, one of
30 which being the common to the first virtual line; the second finger is into the plane of the page of

the code **44**. The reference line **r** extends from the origin **O** and is parallel to the first virtual line and is orthogonal to the second virtual line.

In variant embodiments, which are not illustrated, the reference line may be alternatively defined: the may comprise an actual line drawn on the code; it may have an alternative geometric arrangement with respect to the reference units.

Units **80** of the code **44**, which are arranged as the data portion **D**, comprise data units **86**. The data units **86** are arranged on an encoding line **E** that intersects the reference line **r**. The encoding line **E** is virtual and is determined by electrical circuitry **16**, (e.g. the encoding lines have predefined radii, which are stored on a memory thereof). The centre of the circle of the encoding line **E** is arranged at the origin **O** of the reference portion **R**. The reference line **r** therefore intersects the encoding line **E** with a tangent thereto orthogonal to the reference line **r**. There are two encoding lines **E1**, **E2**, each with data units **86**.

In variant embodiments, which are not illustrated: other numbers of encoding lines are implemented including 3, 4, or 5; the encoding lines may have non-circular shapes, including rectangular or triangular; the encoding line comprises an actual line drawn on the code.

The encoding line **E** includes one or more individual data portions, each of which includes a start position **88** and a data unit **86**, which is arranged at a distance **d** along the encoding line **E** from the start position **88** as a variable to encode a parameter of the preparation information. The start positions **88** are defined virtually and may be determined by electrical circuitry **16** (e.g. the start positions may be stored on a memory thereof). The individual data portions may also include an end position (not illustrated), which defines a maximum allowable distance **d** of the data unit **80** along the encoding line **E** from the start position **88**. Both the start and end positions are formed virtually.

For the first encoding line **E1**, the data portion includes two individual data portions: for the first individual data portion the distance **d** can be any continuous distance from the start position **88** at the reference line **r** to the first data unit **86** clockwise from the reference line **r**; for the second individual data portion the distance **d** can be any continuous distance from the start position **88** at the data unit **86** of the first individual data portion (hence the start position is variable) to the mid-point **m** between the subsequent two data units **86** in the clockwise direction.

For the second encoding line **E2**, the data portion includes one individual data portion, for which the distance **d** can be any one of a plurality of discrete distances, which are illustrated as discrete

positions **90** from the start position **88** at the reference line **r**, with each position associated with a value of the parameter. In the example there are 10 discrete positions **90**.

A incremented distance can be defined as the distance between the start position **88** and an end position divided by the total number of positions (which is 10 for **E2**) in the data portion **D** that the data unit **86** may occupy.

In variant embodiments, which are not illustrated: a start position can be arranged at any position on the encoding line, including spaced away from the reference line; there may be multiple start positions on an encoding line, each with an associated data unit; the start position may be formed as part of the code as a unit rather than defined virtually; an encoding line may comprise combinations of parameters encoded by the continuous distance and the discrete positions; more than one or two data units on the encoding line may define the parameter, which can be determined as an average of the positions, and; the data portion can include any suitable number of individual data portions.

The code **44** includes an outer periphery **92** that the units **80** are arranged within. The outer periphery **92** is rectangular in shape and has a dimension of 600 - 1600 μm , or about 1100 μm . The code **44** may be repeated such that multiple repetitions of the code **44** are arranged within a single digital image, such that one or several best captured repetitions of the code can be selected for processing.

In variant embodiments, which are not illustrated: the outer periphery may be alternatively shaped, including circular; the outer periphery may have alternative sizes, including greater or smaller than the example range. In variant embodiments, which are not illustrated, the data portion alternatively encodes the value of said parameter, including as alphanumeric symbols or other arrangement.

Referring to figure 12, with reference to the code of figure 11, a code processing process, which is executed by the electrical circuitry **16** (or the code processing circuitry thereof) for extraction of the preparation information includes:

Step 1 – Identify locations of units of code

Block 100: obtain digital image of code **44** via the code reading system **118**.

Block 102: assign pixels to dark areas in digital image that could represent units **80**.

Block 104: if several pixels grouped in proximity of each other then determine a unit **80** as present.

Block 106: for each determined unit determine a centre of pixel grouping by a rule, e.g. feature extraction, to determine a coordinate of a centre of the unit.

- 5 Invariant embodiments, which are not illustrated, alternative processing techniques for determining units and their coordinates may be implemented, including other techniques for locating a centre of a unit or identifying a unit as present, e.g. a level of magnification may be implemented so that a single pixel is determined as a unit, and a centre of a unit may be determined as the centre of a pixel.

10 **Step 2 – Locate Reference portion and read angles of code**

Referring to figure 13, with reference to the code of figure 11, processing of the code **44** includes:

Block 108: locate reference portion **R** by searching coordinates of units **80** of code **44** to identify the unique separation and geometric arrangement of reference units **84**. This may be implemented by geometric rules including Pythagoras and trigonometry or other suitable rule.

- 15 Said separation and geometric arrangement can be stored on the electrical circuitry **16** and accessed during searching.

Block 110: for the located reference portion **R**, define the origin **O** and the position of reference line **r** using a stored relationship. The arrangement of the origin and reference line can be stored on the electrical circuitry **16** and mapped onto the coordinates of the located reference portion.

- 20 **Block 112:** for each unit (other than the units of the reference portion) determine based on distance from the origin **O** which encoding line **E** the units belong to. The electrical circuitry **16** can store a radii range for each encoding line **E** and using geometric rules determine the distance of each unit from the origin **O** and which radii range it falls in.

- 25 **Block 114:** for each unit (other than the units of the reference portion) determine the angle α_1 , α_2 with respect to the reference line **r**. It is to be noted that the angle is representative of the circumferential distance, and either could be used interchangeably. The angle can be calculated via known geometric relations between the coordinates of the reference line **r** and a virtual line extending from the origin **O** and through the associated unit.

Step 3 – Determine values of parameters of preparation information.

Referring to figure 13, with reference to the code of figure 11 processing of the code **44** includes:

Block 116: the encoding distance **d** is determined for each individual data portion. This is achieved by implementing a set of rules for determining the encoding distance **d** which are stored by the electrical circuitry **16**. This can include the one or more of: the number of individual data portions on each encoding line; the start positions **88** of the individual data portions; if a single unit or multiple units represent a data unit **86**, and; other suitable relationships.

For example referring to figure 9, the rules for determining the encoding distances **d** of encoding line **E1** include that there are: two individual data portions; the start position **88** of the first individual data portion is at the intersection between the reference line **r** and the encoding line **E1**; the start position **88** of the second individual data portion is at the data unit **86** of the first individual data portion; the data unit **86** of the first individual data portion is represented as a single unit of the code **44**; the data unit **86** of the second individual data portion is represented as a two units of the code **44**.

For example, referring to figure 11, the rules for determining the encoding distance **d** of encoding line **E2** include that there is: a single individual data portion; the start position **88** is at the intersection between the reference line **r** and the encoding line **E2**; the data unit **86** of the first individual data portion is represented as a single unit of the code **44**.

Block 118: the encoding distances **d** for each data portion are converted into a value of a parameter. This is achieved by implementing a set of rules for converting the distance of a value which are stored by the electrical circuitry **16**.

For example, for encoding line **E1**: the first individual data portion may encode a water volume of a brewing process wherein the distance **d** is any continuous value which is linearly related to the water volume, and; the second individual data portion may encode a time of a brewing process wherein the encoding distance **d** is any continuous value which is exponentially related to the time.

For example, for encoding line **E2**: the single individual data portion may encode a water temperature of a brewing process wherein the encoding distance **d** is a discrete value which incrementally changes by 5 degrees C for each discrete position **90**, and the rule specifies which 5 degree increment is closest to the determined encoding distance **d**.

In variant embodiments, which are not illustrated, other rules can be implemented, including: other mathematical functions relating the encoding distance to the value of the parameter; if an encoding distance is the average of the distance several individual data portions, and other suitable relationships, and; the distance d may directly encode the value such that no conversion is required.

[Parameter value correction]

Referring to figure 14 electrical circuitry **16** implements electronic memory (not illustrated) to store corresponding preparation information, which is based on one or more prior reads of a corresponding code of a container. The prior reads are obtained by prior executions of the process associated figure 14, as will be discussed following.

The electrical circuitry **16** implements the following steps:

Block 120: the preparation information from the code **44** is read. This block implements processes previously discussed at blocks **100 – 106** as illustrated in figure 12 and blocks **108 – 118** as illustrated in figure 13, in which the value at least one parameters of the preparation information are obtained from a digital image of the code.

Block 122: retrieve the corresponding preparation information from the electronic memory. This block includes retrieving values of parameters (or an aggregated value derived therefrom) that correspond to those obtained from **block 120**. The values correspond in that they are previously obtained and stored on the electronic memory from reads of one or more identical codes, e.g. from a container that was previously process by the machine **2**.

Block 124: correct the read preparation information based on the corresponding preparation information. This block includes that the retrieve the corresponding preparation information from **block 122** is used to increase accuracy of the value of the one or more parameters obtained from **block 120**, examples of which will be provided.

Block 126: the processing unit **20** is controlled based on the corrected preparation information, and example of which was previously discussed for **block 80** as illustrated in figure 10.

[Block 120 – reading preparation information]

Considering the above blocks in more detail, **block 120** is implemented for a parameter that has a value that is encoded as any continuous distance d from the start position. In this manner

reading precision is important, and is particularly addressed by the correction step of **block 124** as will be discussed.

Whilst for convenience the subsequent detailed examples generally refer to a single value of a parameter encoded by the code **44** being corrected, it will be understood that all or some values
5 of the parameters encoded by the code **44** may be correct by the same process.

In variant embodiments: the parameter has a value that is alternatively encoded as a discrete predefined positions from the start position, such alternative encoding may also be corrected according to the steps disclosed herein; and; in a particular variant, the electrical circuitry is configured to obtain at least two equivalent parameter values from at least two different repetitions
10 of the same code and determined the parameter value as an average thereof, which is subsequently corrected by the discussed process.

In variant embodiments, the process may be implemented for alternative codes, including a QR or barcode. Preparation information more generally may also be corrected according to the discussed process, including rather than a value of a parameter an identifier may be corrected.

15 [Block 122 – Retrieving preparation information from memory]

At **block 122** the code **44** encodes an identifier, which is read as the code **44** is processed. The electronic memory includes a stored relationship (e.g. as a key-value database paradigm) between the identifier and the values of the parameters (or an aggregated value derived therefrom, including a previously corrected value) of the corresponding preparation information
20 obtained from prior reads of codes of containers of the same identity.

The identifier is located at a predefined position with respect to the reference portion **R**. The predefined position is stored on the electronic memory so that once the reference portion **R** has been located and its orientation identified (as discussed for **block 108** and **block 110** of figure 13) the identifier can be read. Hence full reading of the data portion **D** may not be required to
25 determine identifier.

In a first example, the identifier is encoded by the previously discussed discrete positions **90** of encoding line **E2** of the data portion **D** in association with figure 11. The discrete positions **90** are present or absent a unit to encode said identifier. Whilst the discrete positions **90** are shown on encoding line **E2**, in variant embodiments, which are not illustrated, they may be arranged on any
30 one or more of the encoding lines.

In a second example, referring to figure 15, the identifier is encoded as the discrete positions **94**, which are distal the or each encoding lines **E1**, **E2**.

In a third example, the first and second examples are combined such that the identifier is split over the discrete positions **90**, **94**.

- 5 In a variant embodiment of the first or third example, the discrete positions **90** may follow a data unit **86** (e.g. at a predefined position thereto on encoding line **E2**) such that the identifier is encoded on the same line as the parameters of the data portion **D**.

10 In variant embodiments, which are not illustrated, the code or container is alternatively identified for retrieval of the corresponding preparation information (rather than by using an encoded identifier) including by one or more of: shape; colour; material, and; other feature (each of which may be determined by a suitable sensor e.g. a camera or inductive sensor etc).

Referring to figure 16, the electrical circuitry **16** subsequent to **block 122** at **block 130** is configured to determine if the electronic memory includes an entry for the corresponding preparation information to the identifier. If not, then the previously discussed **block 124** is omitted and **block 126** is executed. However, at **block 126** the processing unit **20** is alternatively controlled based on the read preparation information from the code without correction with the corresponding preparation information. Such an instance may occur is a new type of container **6** is used for the first time.

15

Moreover **block 132** is executed, in which the read preparation information is stored as the corresponding preparation information. In this manner, if the same capsule type is used again, then there exists an entry for the corresponding preparation information and **block 124** is alternatively executed.

20

[Block 124 - Correcting preparation information]

At **block 124** the value of the parameter of the read preparation information is corrected to improve accuracy. Said correction uses the values (or a quantity derived therefrom) of the retrieved corresponding preparation information as a correction value.

25

In a first example, values for the parameter for each prior read of the code **44** are stored as the corresponding preparation information. The value in the currently read preparation information is then summed with said values and an average taken. The average (e.g. a mean) is then used as the value in the corrected preparation information to control the processing unit **20**. Hence in the

30

first example, the values for the parameter for each prior read of the code **44** comprise the correction value.

To control memory usage a stack memory usage mechanism is implemented, which replaces the oldest of the stored values with the newest values once the stack is filled in a last-in-first-out manner. Hence a predetermined amount of values may be stored, e.g. 5 or 10. A stack memory usage mechanism may be useful if the manufacturer chooses to make small changes to the values with time since the older values will be removed from and have less effect on the calculation.

In variant embodiments, other correction is applied, e.g. a median rather than an average is taken; other memory usage mechanisms are implemented.

In a second example, a weighted sum of prior parameter values is stored on the electronic memory as the corresponding preparation information. In an example an exponential filter is implemented. Such an example may be less intensive in terms of memory storage than the first example.

With an exponential filter, a weighted combination of the previous values can be stored, which is combined with the newly read value, with a sum of the weights α equal to 1, for example:

Corrected Value = α . newly read value + $(1-\alpha)$. previously corrected value from corresponding preparation information. Hence in the second example, the sum and weight of the values for the parameter for each prior read of the code **44** comprise the correction value.

As part of **block 124**, the electrical circuitry **16** updates the stored corresponding preparation information.

For the first example, this includes saving the read value of the parameter to the memory, e.g. utilising the stack memory mechanism this new value replaces the oldest value for a full stack.

For the second example, this comprises setting the previously corrected value from corresponding preparation information to equal the corrected value.

In the above examples, a value being corrected has been referred to. However, this step is intended to refer to any step of the value determination process as previously described. For example, correction of a value includes correcting the encoding distance d prior to its conversion to an absolute value for the parameter. In such an example d is to be considered the read value

of the parameter and the stored corresponding values are the stored values of d from prior reads. That is, the process is not to be understood as being limited to operating on the absolute final value for the parameter.

[Handling exceptions]

5 Referring to figure 17, as part of **block 124**, at **block 134** for the read value, the electrical circuitry **16** determines if a threshold has been crossed. This comprises comparing the read value to the values of the corresponding preparation information (including: for the first example, the average of the values is compared; for the second example, the previously corrected value is compared or other suitable comparison is made based on said values). As an example, a threshold may be
10 set to ± 10 or ± 20 of the previously corrected value or average value from the corresponding preparation information.

If said threshold is crossed, and it may be assumed that a read error in the distance d has occurred (e.g. due to the wrong unit being identified or debris being identified as the unit or other like instance). In which case **block 136** is executed, which comprises the read value is discarded
15 (without the previously described update of the stored corresponding preparation information). The processing unit **20** is then controlled using the corresponding stored preparation information, which is retrieved by the identifier (or other identification means).

If the threshold is not crossed then **block 124** is executed as previously described, including correction at **block 138** and update at **block 140** of the stored corresponding preparation
20 information.

In variant embodiments, **block 134** is omitted and there is no comparison made to a threshold.

Whilst the or each code is illustrated herein as being arranged on the container, it will be appreciated that the code(s) can be formed integrally on the container or formed on a separate substrate (not illustrated) which can be attached to: the container, or; to the machine, e.g., as a
25 tab for arrangement between the container and the code reader so that the existing code reading arrangement may be used, or; other component, e.g. including a hand held component that is arranged for a user to present to a code reader of the machine, which may be suitably arranged for manual code reading.

It will be appreciated that any of the disclosed methods (or corresponding apparatuses, programs,
30 data carriers, etc.) may be carried out by either a host or client, depending on the specific

implementation (i.e. the disclosed methods/apparatuses are a form of communication(s), and as such, may be carried out from either 'point of view', i.e. in corresponding to each other fashion). Furthermore, it will be understood that the terms "receiving" and "transmitting" encompass "inputting" and "outputting" and are not limited to an RF context of transmitting and receiving radio waves. Therefore, for example, a chip or other device or component for realizing embodiments could generate data for output to another chip, device or component, or have as an input data from another chip, device or component, and such an output or input could be referred to as "transmit" and "receive" including gerund forms, that is, "transmitting" and "receiving", as well as such "transmitting" and "receiving" within an RF context.

As used in this specification, any formulation used of the style "at least one of A, B or C", and the formulation "at least one of A, B and C" use a disjunctive "or" and a disjunctive "and" such that those formulations comprise any and all joint and several permutations of A, B, C, that is, A alone, B alone, C alone, A and B in any order, A and C in any order, B and C in any order and A, B, C in any order. There may be more or less than three features used in such formulations.

In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word 'comprising' does not exclude the presence of other elements or steps than those listed in a claim. Furthermore, the terms "a" or "an," as used herein, are defined as one or more than one. Also, the use of introductory phrases such as "at least one" and "one or more" in the claims should not be construed to imply that the introduction of another claim element by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim element to inventions containing only one such element, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an." The same holds true for the use of definite articles. Unless stated otherwise, terms such as "first" and "second" are used to arbitrarily distinguish between the elements such terms describe. Thus, these terms are not necessarily intended to indicate temporal or other prioritization of such elements. The mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot be used to advantage.

Unless otherwise explicitly stated as incompatible, or the physics or otherwise of the embodiments, example or claims prevent such a combination, the features of the foregoing embodiments and examples, and of the following claims may be integrated together in any suitable arrangement, especially ones where there is a beneficial effect in doing so. This is not limited to only any specified benefit, and instead may arise from an "ex post facto" benefit. This is

to say that the combination of features is not limited by the described forms, particularly the form (e.g. numbering) of the example(s), embodiment(s), or dependency of the claim(s). Moreover, this also applies to the phrase “in one embodiment”, “according to an embodiment” and the like, which are merely a stylistic form of wording and are not to be construed as limiting the following features

5 to a separate embodiment to all other instances of the same or similar wording. This is to say, a reference to ‘an’, ‘one’ or ‘some’ embodiment(s) may be a reference to any one or more, and/or all embodiments, or combination(s) thereof, disclosed. Also, similarly, the reference to “the” embodiment may not be limited to the immediately preceding embodiment.

As used herein, any machine executable instructions, or compute readable media, may carry out

10 a disclosed method, and may therefore be used synonymously with the term method, or each other.

The foregoing description of one or more implementations provides illustration and description, but is not intended to be exhaustive or to limit the scope of the invention to the precise form disclosed. Modifications and variations are possible in light of the above teachings or may be

15 acquired from practice of various implementations of the present disclosure.

LIST OF REFERENCES

2 System

4 Machine

14 Processing unit

20 Container processing unit (first example)

32 Extraction unit

34 Capsule holding portion

36 Closing portion

38 Injection head

40 Beverage outlet

22 Fluid conditioning system

24 Reservoir

26 Pump

28 Heat exchanger

30 Outlet

42 Loose material processing unit (second example)

16 Electrical circuitry

	48 Control electrical circuitry
	50 Input unit
	52 Processor
	54 Feedback system
5	18 Code reading system
	46 Image capturing unit
	6 Container
	Capsule - Example 1
	56 Lid portion
10	44 Code
	80 Units
	R Reference portion
	84 Reference units
	r Reference line
15	O Origin
	D Data portion
	86 Data units
	E Encoding line
	d Distance
20	88 Start position
	90 Discrete positions
	I Code Identifying portion
	94 Discrete position
	96 Discrete position
25	82 Surround
	92 Outer periphery
	58 Containment portion
	60 Flange portion
	Packet – Example 2
30	62 Sheet material
	64 Seams
	68 Opening
	8 Server system
	10 Peripheral device

12 Computer network

CLAIMS

1. A system comprising:
- 5 a container for containing a precursor material for use with a machine for preparing a beverage and/or foodstuff or a precursor thereof, the container including a machine-readable code storing preparation information for use with a preparation process performed by said machine;
- a machine for preparing a beverage and/or foodstuff or a precursor thereof, the machine including: a code reading system to read the code of the container; a processing unit for processing precursor material of the container, and;
- 10 electrical circuitry to control the processing unit based on preparation information read from the code, and comprising electronic memory to store corresponding preparation information, which is based on one or more prior reads of a corresponding code of a container;
- wherein the electrical circuitry is configured to:
- 15 read the preparation information from the code;
- retrieve the corresponding preparation information from the electronic memory;
- correct the read preparation information based on the corresponding preparation information, and;
- control the processing unit based on the corrected preparation information.
- 20 2. The system of claim 1, wherein the electrical circuitry is configured to:
- identify the container, and;
- retrieve the corresponding preparation information from the electronic memory based on a stored relationship between the identity and the corresponding preparation information obtained from prior containers of the same identity.
- 25 3. The system of claim 2, wherein the electrical circuitry is configured to identify the container based on an identifier encoded by the code.

4. The system of claim 3, wherein the identifier is encoded as one or more discrete positions, the discrete positions either comprising or being absent a data unit.
5. The system of any preceding claim, wherein:
the preparation information stored by the code comprises a parameter value encoded for a
5 parameter;
the corresponding preparation information stored by the electronic memory comprises a
correction value for the parameter value, and;
the electrical circuitry is configured to correct the parameter value based on the correction
value.
- 10 6. The system of claim 5, wherein the correction value comprises an average derived from a
plurality of associated parameter values of the parameter obtained from said prior reads of a
corresponding code of a container.
7. The system of claim 6, wherein the electrical circuitry is configured with the plurality of
parameter values of the parameter stored in a stack memory usage mechanism.
- 15 8. The system of claim 5, wherein the correction value comprise a weighted sum of prior
parameter values.
9. The system of any preceding claim, wherein the electrical circuitry is configured to update the
stored corresponding preparation information based on the read preparation information.
10. The system any preceding claim, wherein the electrical circuitry is configured to:
20 determine if the electronic memory includes an entry for the corresponding preparation
information which is related to the code of the container, and;
if not then to control the processing unit based on the read preparation information without
correction with the corresponding preparation information.
11. The system of any preceding claim, wherein the electrical circuitry is configured to:
25 determine if the read preparation information is within a threshold of the corresponding
preparation information;

and if within said threshold to execute said correction of the read preparation information based on the corresponding preparation information;

if outside of said threshold not to execute said correction and/or to control the processing unit based on the corresponding preparation information from the electronic memory.

- 5 12. The system of any preceding claim, wherein: the code comprises a data portion arranged at a predetermined position with respect to a reference portion, wherein the data portion is arranged on an encoding line D, and a data unit is arranged a distance d from a starting position along the encoding line D as a variable to at least partially encode a parameter value of the preparation information.

- 10 13. A machine for preparing a beverage and/or foodstuff or a precursor thereof, the machine including: a code reading system to read a code of a container; a processing unit for processing precursor material of the container, and;

electrical circuitry to control the processing unit based on preparation information read from the code, and comprising electronic memory to store corresponding preparation information,
15 which is based on one or more prior reads of a corresponding code of a container;

wherein the electrical circuitry is configured to:

read the preparation information from a code of a container;

retrieve the corresponding preparation information from the electronic memory;

correct the read preparation information based on the corresponding preparation information,
20 and;

control the processing unit based on the corrected preparation information.

14. Use of a container comprising a code for the machine of claim 13.

15. A method of determining preparation information for a beverage or foodstuff preparation process, the method comprising:

25 reading preparation information from a code of a container;

retrieving the corresponding preparation information from electronic memory;

correcting the read preparation information based on the corresponding preparation information, and;

controlling a processing unit to process the container based on the corrected preparation information.

- 5 16. Electrical circuitry to implement the method of claim 15.
17. A computer readable medium comprising program code executable on one or more processors to implement the method of claim 15.