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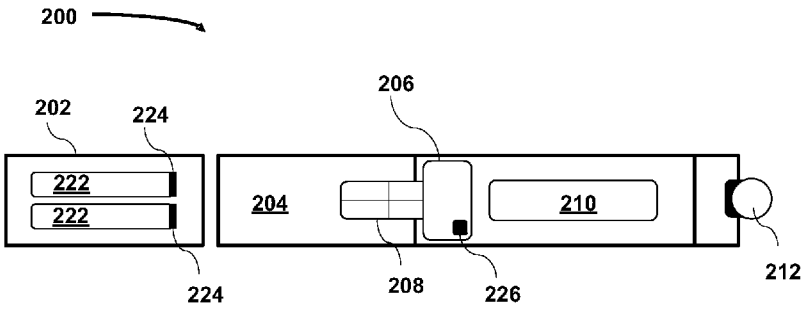

FIG. 2

(57) Abstract: There is provided vaporizer devices for dispensing chemical dosages, methods to generate formulas for the chemical dosages for a wellness objective, methods to classify cannabis, and a machine vision classifier. One vaporizer device comprises two or more cartridges connected to a heating chamber, each cartridge holding a different chemical powder, and a microprocessor for controlling valves associated with each cartridge such that amounts of each chemical powder are dispensed to the heating chamber based on a formula. Another vaporizer device comprises a removable cartridge connected to a heating chamber, and a microprocessor for controlling a valve associated with the cartridge such that the chemical powder is dispensed to the heating chamber. The removable cartridge holding a combination of chemical powders. A plurality of removable cartridges may each comprise different formulas of chemical powder.

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DEVICE AND METHOD FOR THE DYNAMIC PERSONALIZATION OF CHEMICAL CONSUMPTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims all benefit, including priority, to United States Provisional Patent Application 62/590,336, filed November 23, 2017, and entitled: "System for the Dynamic Personalization of Vitamin and Supplement Consumption," which is hereby incorporated by reference in its entirety.

FIELD

[0002] This invention relates to consumption of vitamins, supplements and cannabis, and to devices and methods for the dynamic personalization of medicinal and/or chemical consumption.

BACKGROUND

[0003] The global market for dietary supplements and vitamins is large and growing. Estimates place the size of the market at USD 132.8 billion in 2016, with a projected compounding annual growth rate of 8% year-over-year between 2017 to 2022, reaching USD 220.3 billion by 2022. Largely driving this growth is the consumer demand for personalization. Consumers, manufacturers, and distributors understand that optimal supplement intake is variable, and dependent on the intrinsic characteristics of an individual (age, gender, etc.), as well as the dynamic fluctuations in the environment and behaviors of said individual (diet, exercise, location, etc.).

[0004] The current state of the art has taken steps to personalize supplement intake for the former, but continues to lag with respect to the latter. Specialized supplements have been created for women, men, the young, and the old; however, these specialized supplements do not adequately consider the dietary, exercise, and geographical trends of the individuals that consume them.

[0005] Attempts have been made to solve this issue with the help of questionnaires and similar tools to personalize formulations for the lifestyles of consumers. Such questionnaires may inquire as to the geographic location of an individual, their dietary habits, and their frequency of exercise – using these inputs to determine the allocation of various formulations. This however, betrays the dynamic nature of diet, exercise, and location.

[0006] It is desirable to tailor the intake of medicine, vitamins or chemicals (including cannabis) to users.

SUMMARY

[0007] In accordance with an aspect, there is provided a vaporizer device for dispensing chemical dosages. The device comprises two or more cartridges connected to a heating chamber, each cartridge holding a different chemical powder, and a microprocessor for controlling valves associated with each cartridge such that amounts of each chemical powder are dispensed to the heating chamber based on a formula.

[0008] In accordance with another aspect, there is provided a method for dispensing chemical dosages. The method comprises holding a different chemical powder in two or more cartridges of a vaporizer device, and controlling, via a microprocessor of the vaporizer device, valves associated with each cartridge such that amounts of each chemical powder are dispensed to a heating chamber connected to the cartridges. The amount of each chemical powder dispensed based on a formula.

[0009] In accordance with another aspect, there is provided a vaporizer device for dispensing chemical dosages. The device comprises a removable cartridge connected to a heating chamber, and a microprocessor for controlling a valve associated with the cartridge such that the chemical powder is dispensed to the heating chamber. The removable cartridge holding a combination of chemical powders. A plurality of removable cartridges may each comprise different formulas of chemical powder.

[0010] In accordance with another aspect, there is provided a method for dispensing chemical dosages. The method comprises holding a combination of chemical powders in a removable cartridge of a vaporizer device, and controlling, via a microprocessor of the

vaporizer device, valves associated with the cartridge such that the chemical powder is dispensed to a heating chamber connected to the cartridge. A plurality of removable cartridges may each comprise different formulas of chemical powder.

[0011] In accordance with another aspect, there is provided a system for generating formulas for a wellness objective based on a classification system of cannabis strains. The classification system is based on Tetrahydrocannabinol (THC) and Cannabidiol (CBD) content of each strain. The system comprises a processor, and a memory comprising a sequence of instructions which, when executed by the processor, configure the processor to receive an input from a user for a wellness objective, determine a formula based on the wellness objective, and communicate the formula via a mobile user interface.

[0012] In accordance with another aspect, there is provided a system for the automated and individualized delivery of chemical dosages on the basis of biometric and/or demographic information collected through a mobile device.

[0013] In accordance with another aspect, there is provided a machine vision classifier comprising a processor and a memory storing instructions that when executed by the processor configure the processor to receive a name of a cannabis, determine a strain classification for the cannabis, and output the strain classification.

[0014] In various further aspects, the disclosure provides corresponding systems and devices, and logic structures such as machine-executable coded instruction sets for implementing such systems, devices, and methods.

[0015] In this respect, before explaining at least one embodiment in detail, it is to be understood that the embodiments are not limited in application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[0016] Many further features and combinations thereof concerning embodiments described herein will appear to those skilled in the art following a reading of the instant disclosure.

DESCRIPTION OF THE FIGURES

[0017] Embodiments will be described, by way of example only, with reference to the attached figures, wherein in the figures:

FIG. 1 illustrates, in a component diagram, an example of one type of a standard vaporizer;

FIG. 2 illustrates, in a schematic diagram, an example of a vaporizer device, in accordance with some embodiments;

FIG. 3A illustrates, in a schematic diagram, another example of a vaporizer device, in accordance with some embodiments;

FIG. 3B illustrates, in a schematic diagram, another example of a vaporizer device, in accordance with some embodiments;

FIG. 3C illustrates, in a schematic diagram, another example of a vaporizer device, in accordance with some embodiments;

FIG. 4 illustrates, in a flowchart, an example of a method of dispensing chemical dosages, in accordance with some embodiments;

FIG. 5 illustrates, in a flowchart, an example of a method of dispensing chemical dosages, in accordance with some embodiments;

FIG. 6 illustrates, in a schematic diagram, another example of a vaporizer device, in accordance with some embodiments;

FIG. 7 illustrates, in a schematic diagram, an example of a two-way communication between a mobile device and a Bluetooth linked vaporizer, in accordance with some embodiments;

FIG. 8A illustrates, in a flowchart, an example of a method of classifying strains with a standard nomenclature on the basis of the THC and CBD content of the strain, in accordance with some embodiments;

FIG. 8B illustrates, in a flowchart, another example of a method of classifying strains with a standard nomenclature on the basis of the THC and CBD content of the strain, in accordance with some embodiments;

FIGs. 9A and **9B** illustrate, in flowcharts, examples of a method of generating a strain formula, in accordance with some embodiments;

FIG. 10 illustrates, in a flowchart, another example of a method of generating a strain formula, in accordance with some embodiments;

FIG. 11 illustrates, in a screenshot, an example of the collection of user-inputted information through a mobile device, in accordance with some embodiments;

FIG. 12 illustrates, in a screenshot**,** an example of the collection of biometrics user information directly from the device, in accordance with some embodiments;

FIG. 13 illustrates, in a screenshot, the storing to a database of user-inputted information and device-collected information, in accordance with some embodiments;

FIG. 14 depicts the testing of a suggestion of a pain relief formula to a multitude of users, in accordance with some embodiments;

FIG. 15 illustrates a process of self-improvement in the classification system, in accordance with some embodiments;

FIG. 16 illustrates the suggestion of a pain relief formula incorporating the changes to the classification system and accounting for previously observed side effects, in accordance with some embodiments;

FIG. 17 illustrates an example of an interface for a machine vision mobile application that scans strain names and classifies them within a classification system;

FIG. 18 illustrates an example of a process of scanning a product for the purpose of classifying the product into a classification system, in accordance with some embodiments;

FIG. 19 illustrates an example of the presentation of strain information through a mobile interface, in accordance with some embodiments;

FIG. 20 illustrates an example of the segmentation of a multivitamin into constituent parts, in accordance with some embodiments;

FIG. 21 illustrates an example of the segmentation of Vitamin D into reduced portions to affect an individual's ability to consume variable volumes of Vitamin D, in accordance with some embodiments;

FIG. 22 illustrates an example of the segmentation of Magnesium into reduced portions to affect an individual's ability to consume variable volumes of Magnesium, in accordance with some embodiments;

FIG. 23 illustrates an example of the segmentation of Omega-3 into reduced portions to affect an individual's ability to consume variable volumes of Omega-3, in accordance with some embodiments;

FIG. 24 illustrates an example of the segmentation of a bottle of multivitamin into three separate bottles composed of the specifications and segmentations;

FIG. 25 illustrates an example of a box containing a multitude of bottles described in **FIG. 24**.

FIG. 26 illustrates an example of variable dosages of Vitamin D for otherwise identical individuals, in accordance with some embodiments;

FIG. 27 illustrates an example of a user interface, in accordance with some embodiments.

FIG. 28 illustrates an example of an input method for the determination of vitamin intake, in accordance with some embodiments;

FIG. 29 illustrates an example of how variations in input variables impacts suggested vitamin intake, in one embodiment;

FIG. 30 illustrates an example of how variations in input variables impacts suggested vitamin intake, in one embodiment.

FIG. 31 illustrates an example of the introduction of demographic input variables into the intake method, in accordance with some embodiments;

FIG. 32 illustrates examples of variations in the demographic input variables in one embodiment;

FIG. 33 illustrates an example of an intake method component for the purpose of determining Vitamin D intake on any given day, in accordance with some embodiments;

FIG. 34 illustrates an example of an intake method component for the purpose of determining Magnesium intake on any given day, in accordance with some embodiments;

FIG. 35 illustrates an example of a vitamin intake suggestion utilizing an example intake algorithm, in accordance with some embodiments;

FIG. 36 illustrates an example of a vitamin intake suggestion utilizing an example intake method, in accordance with some embodiments; and

FIG. 37 illustrates, in a block schematic diagram, an example of a computing device, according to some embodiments.

[0018] It is understood that throughout the description and figures, like features are identified by like reference numerals.

DETAILED DESCRIPTION

[0019] Embodiments of methods, systems, and apparatus are described through reference to the drawings.

[0020] Over the past several years, cannabis and cannabis-related products have become increasingly diffused across the United States and around the world – both medicinally and recreationally – and this trend is expected to continue. Currently, 33 states

have legalized marijuana for medicinal purposes, and 11 states have legalized marijuana recreationally. Nevertheless, the consumer market for cannabis remains staggered, unreliable, and fraught with misinformation. In states where cannabis is legal, consumers will typically have thousands – perhaps tens of thousands – of strains to choose from. These strains each contain varying levels of Tetrahydrocannabinol (THC) and Cannabidiol (CBD).

[0021] For any particular strain, the mix and relative preponderance of THC and CBD content constitutes the primary determinant of the pyscho-physiological impacts on the individual consuming the product. The chemical content therefore regulates (1) the health and wellness benefits derived as a consequence of consumption, (2) the undesirable side-effects as a consequence of consumption, and (3) any temporary alterations in state of mind and/or consciousness – colloquially referred to as a "high" – experienced as a consequence of consumption. As it pertains specifically to the wellness benefits arising from cannabis use, optimal chemical composition will be variable along different wellness segments and the individual's idiosyncratic needs and predispositions. For instance, cannabis consumption may play a role in reducing pain and inflammation, attenuating stress and anxiety, and functioning as a sleep aid. Optimal chemical compositions will vary accordingly.

[0022] An individual seeking to reduce ongoing pain or inflammation may be optimally situated for a strain with a 1:2 ratio of THC to CBD content – that is, a strain with twice the amount of CBD relative to THC. By contrast, an individual seeking to attenuate chronic anxiety may be best suited for a strain with a 1:10 ratio of THC to CBD – that is, a strain with 10 times the amount of CBD relative to THC. Moreover, as with any complex system, cannabis consumption in a vacuum does not constitute the optimal format for yielding its potential benefits. In the same manner that exercise alone – absent an accompanying healthy diet – will be found wholly insufficient as a vehicle for ameliorating health outcomes, cannabis consumption alone, in many instances, is insufficient to unlock its potential benefits. Rather, cannabis consumption should be paired with other actions or activities – such as exercise – in order to yield the best results for health-minded consumers.

[0023] From this perspective however, cannabis-use for health and wellness presents a substantially more complex challenge as compared to diet and exercise or the consumption of vitamins and supplements. From a physiological perspective, cardiovascular exercise, e.g., running and swimming, correlates to positive health outcomes across the population.

Similarly, the bioactivity of Vitamin D – and its general biological impacts – are consistent across populations, albeit with minor variations as a consequence of genetic variability. Cannabis, in contrast, will manifest itself differently in relation to the demographics and peculiarities of the consuming individual. This is compounded by a broad scope of chemical variability, creating an untenable consumer market; one where consumers may neither reliably estimate the health benefits of consumption, nor predictively and consistently attenuate for the negative impacts of consumption.

[0024] Where chemical composition is variable, and cannabis-response is distinctive of the individual or group of individuals, dosage becomes an equally pronounced challenge for the industry. Analogous to other consumables – particularly those with psychoactive compounds and delayed onset – the dosage of the intake will inevitably impact the experience of the individual. For cannabis, this presents a challenge. Even if a consumer identifies a strain with an optimal chemical composition to assist with their wellness goal, consuming too modest a dose may be insufficient for yielding the benefits. Similarly, consuming too great a dose may cause the onset of a plurality of negative side-effects, including dry mouth and poor sleep. Optimal dosage will be dependent on a multitude of factors, including but not limited to, the desired outcome of consumption, and the demographics of the individual in question, e.g., age, gender, weight, etc.

[0025] In its current state, the industry is characterized by a near ubiquitous asymmetry of information and a pronounced absence of personalization. First, with thousands of available strains, consumers are ill-equipped to reliably ascertain the content of an individual strain and its associated wellness value and potential risk. Second, the industry lacks the ability to cater to the particularities of individuals, thus creating a disjointed experience for consumers, while magnifying the risk-profile of partaking.

[0026] **FIG. 1** illustrates, in a schematic diagram, an example of one type of a standard design for a vaporizer **100**, including a removable cartridge **102** to hold a powder, such as cannabis powder. The cartridge **102** connects to a heating chamber **104**. The heat is controlled by a microprocessor **106**, which controls the temperature and vaporizes the powder through a connected heater or coil **108**. The device **100** is powered by a battery **110** – typically a lithium ion battery. At the tip of the device **100** is a light-emitting diode (LED) light **112** that is activated with every inhalation.

[0027] **FIG. 2** illustrates, in a schematic diagram, an example of a vaporizer device **200**, in accordance with some embodiments. The device **200** comprises a removable external cartridge **202** having two or more individual cartridges (or chambers) **222** to hold powder, and corresponding two or more release valves **224**. The cartridges **222** may each hold the same type of powder or different powders. The removable external cartridge **202** (and/or each individual cartridge **222**) connects to a heating chamber **204**. A wireless chip **226** (e.g., a Bluetooth chip) may be associated with a microprocessor **206** (e.g., incorporated as part of the microprocessor **206**, or communicably coupled with the microprocessor **206** for example on a circuit), which enables communication between the vaporizer device **200** and a mobile device. The heat is controlled by the microprocessor **206**, which regulates the temperature and vaporizes the powder through a connected heater or coil **208**. Other components may be added to the device **200**, such as a power source **210** (e.g., a lithium ion or other battery), and an LED light **212** that is activated with inhalation.

[0028] In some embodiments, different amounts of each powder may be dispensed into the chamber based on a formula. The microprocessor **206** may include a memory for storing formulas. The microprocessor **206** may also receive formals from an external device (such as a mobile device) via the wireless chip **226**. The microprocessor may activate the release valves **224** for each individual cartridge **222** to release an optimal amount of each powder based on the formula.

[0029] **FIG. 3A** illustrates, in a schematic diagram, another example of a vaporizer device **300**, in accordance with some embodiments. The device **300** comprises an external cartridge **302** having three individual cartridges **322**, a heating chamber **304**, the heating coil **208**, the microprocessor **206** and wireless chip **226**. The cartridges **302** or the platforms on which they may be placed in the vaporizer device **300** may be labelled to differentiate them from one another. For example, one cartridge may be labelled “A” and another may be labelled “B”, or one may be labelled “1” and another may be labelled “2”. In a commercialized product, the cartridge labels may match the formula nomenclature. In the example of **FIG. 3A**, the individual cartridges **322** are labelled “A”, “B” and “C” for ease-of-use and consistency between the vaporizer device **300** and a mobile application.

[0030] Control of the cartridge valves may be performed via pre-set inputs on the microprocessor **206**. In some embodiments, a formula for the powder combination may be set

directly on the vaporizer device **300**. This may be performed with pre-set formulas stored in a memory on the device **300**. The selection process of the formula may be performed onboard the device **300** or via wireless communication (e.g., Bluetooth). For example, adjustable setting prompts **330** or switches may be display or connected to the heating chamber **304**. In the example of **FIG. 3A**, settings between 0 to 5 are shown. It should be understood that other ranges may be used. The example shows a prompt corresponding to individual cartridge A is set to 3, a prompt corresponding to individual cartridge B is set to 1, and a prompt corresponding to individual cartridge C is set to 0. These settings correspond to a formula that requires 3 parts of the powder in cartridge A and 1 part of the powder in cartridge B.

[0031] In some embodiments, the formula for the powder combination may be provided by an external device to the vaporizer device **300** via wireless communication. For example, an application on a device may provide a user interface that mimics prompts **330** corresponding to amounts of powder to be dispensed form the individual cartridges.

[0032] In some embodiments, the formulas may be presented in a descriptive manner rather than a numerical or formulaic manner. For example, formulas may be set onboard or via an external device. **FIG. 3B** illustrates, in a schematic diagram, another example of a vaporizer device **350**, in accordance with some embodiments. In the example of **FIG. 3B**, the onboard prompt **340** shows settings of "Pain", "Energy", "Stress" and "Sleep" wellness outcomes. In some embodiments, a wellness outcome setting may be associated with a pre-set formula for the individual cartridges **322**. It should be understood that other descriptive names may be provided for the same or other wellness outcomes.

[0033] **FIG. 3C** illustrates, in a schematic diagram, another example of a vaporizer device **370**, in accordance with some embodiments. In the example of **FIG. 3C**, the prompt **340** is now coming from an external device **390** wirelessly communicating with the vaporizer **370**.

[0034] In some embodiments, a vaporizer device for dispensing chemical dosages may comprise a single removable cartridge pod connected to the heating chamber, the single removable cartridge pod holding a combination of chemical powders. A microprocessor for controlling a valve associated with the cartridge may control how much chemical powder is dispensed to the heating chamber. There may be a plurality of removable cartridge pods

available to users for different formula. Users may then change or replace the pods based on a formula recommendation for their wellness objective.

[0035] **FIG. 4** illustrates, in a flowchart, an example of a method **400** of dispensing chemical dosages, in accordance with some embodiments. The method **400** may be performed by a vaporizer device **200**, **300**, **350**, **370**. The method **400** comprises holding **402** a different chemical powder in two or more individual cartridges **322**, and controlling **404**, via a processor such as the microprocessor **206**, valves **324** associated with each individual cartridge **322** such that amounts of each chemical powder are dispensed to the heating chamber **304** connected to the individual cartridges **322**. The amount of each chemical powder dispensed is based on a formula combination of the chemical powders. Other steps may be added to the method **400**.

[0036] **FIG. 5** illustrates, in a flowchart, an example of a method **500** of dispensing chemical dosages, in accordance with some embodiments. The method **500** may be performed by a processor such as the microprocessor **206**. The method **500** comprises obtaining **502** a formula, and activating **504** the valves **324** of each individual cartridge **322** to dispense an amount of powder held in the individual cartridge **322** into a heating chamber **304**. The formula may be obtained from an external device **390** via a wireless communication with the microprocessor **206**. The formula may also be pre-set in a memory associated with the microprocessor **206**. Other steps may be added to the method **500**.

[0037] **FIG. 6** illustrates, in a schematic diagram, another example of a vaporizer device **600**, in accordance with some embodiments. The device **600** comprises the removable cartridge **302**, individual cartridges **322** with valves **324**, the heating chamber **304**, heating coil **208**, microprocessor **206** with wireless connectivity **226**, and a fingertip pulse oximeter **620**. The fingertip pulse oximeter **620** may measure a health metric of a user during a session with the vaporizer device **600**. The health metric may be communicated to an external device via the wireless communication component **226**. For example, elevated heart rate, diminished heart rate variability and/or altered respiration rate variability may each be derived from pulse oximetry. Such items may be proxy indicators of negative side-effects of cannabis usage. Said information may be employed to optimize both dosage and formula on a personal (for the user) and population (for all users) level scale.

[0038] **FIG. 7** illustrates, in a schematic diagram, an example of a two-way communication **710** between a mobile device **390** and a Bluetooth linked vaporizer **700**, in accordance with some embodiments. The mobile device **720** may communicate an optimal formula to the vaporizer **700**, which activates the release valves **324**, thus depositing the formula into the heating chamber **704**. The user's response to the session, including heart rate collected from the fingertip pulse oximeter **620**, may be communicated back to the mobile device **390**. The information may then be stored to a database **730** and used to generate future formulas for optimal response and minimal side-effects.

[0039] In some embodiments, the individual cartridges **322** may hold different strains of cannabis. Different strains of cannabis may comprise different chemicals that may cause different side-effects on different users. **Table 1** shows a sample of strains with varying levels of THC and CBD concentration:

Big Bud		Lavender		Haze	
11.43%	THC	12.24%	THC	4.26%	THC
0.23%	CBD	0.24%	CBD	0.01%	CBD
Orange Haze		Tora Bora		Elephant	
9.06%	THC	5.26%	THC	17.22%	THC
6.41%	CBD	9.72%	CBD	0.06%	CBD
Strawberry Ice		Cannatonic		B4	
26.95%	THC	0.60%	THC	12.08%	THC

0.06%	CBD	18.00%	CBD	0.10%	CBD

Table 1: Sample strains with varying levels of THC and CBD concentration

[0040] **FIG. 8A** illustrates, in a flowchart, an example of a method **800** of classifying strains with a standard nomenclature on the basis of the THC and CBD content of the strain, in accordance with some embodiments. The method **800** comprises determining **802** the ratio of THC and CBC concentration. If **804** the ratio is greater than 10, then the strain is classified **806** as "Group A". If **808** the ratio is greater than 0.3 and less than 10, then the strain is classified **810** as "Group B". If **812** the ratio is less than 0.3, then the strain is classified **814** as "Group C". It should be understood that other or further ratios may be employed in a classification. Other steps may be added to the method **800**.

[0041] In some embodiments, ratios may be automatically determined from a comprehensive internal strain database. The database may be generated by surveying publicly available strains and determining the THC and CBD levels of each strain. An arithmetic calculation may then automatically classify them. A method may be performed every time a new strain is added to the database on the basis of the algorithm. For example, in the example of **FIG. 8A**:

If %THC/%CBD > 10, Strain = "Group A"
If %THC/%CBD > 0.3, < 10, Strain = "Group B"
If %THC/%CBD < 0.3, Strain = "Group C"

[0042] **Table 2** illustrates the resulting classification of the strains into Groups A, B, and C using the method of **FIG. 8A**:

Group A Big Bud		Group A Lavender		Group A Haze	
11.43%	THC	12.24%	THC	4.26%	THC

0.23%	CBD	0.24%	CBD	0.01%	CBD
Group B Orange Haze		Group B Tora Bora		Group A Elephant	
9.06%	THC	5.26%	THC	17.22%	THC
6.41%	CBD	9.72%	CBD	0.06%	CBD
Group A Strawberry Ice		Group C Cannatonic		Group A B4	
26.95%	THC	0.60%	THC	12.08%	THC
0.06%	CBD	18.00%	CBD	0.10%	CBD

Table 2: Resulting classification of the strains

[0043] **FIG. 8B** illustrates, in a flowchart, another example of a method **850** of classifying strains with a standard nomenclature on the basis of the THC and CBD content of the strain, in accordance with some embodiments. The method **850** comprises determining **852** the percentage of THC concentration and determining **802** the ratio of THC and CBC concentration. If **854** the THC concentration is greater than 5% and the ratio is greater than 10, then the strain is classified **856** as "Group AA". If **858** the THC concentration is less than 5 and the ratio is greater than 10, then the strain is classified **860** as "Group AB". If **808** the ratio is less greater than 0.3 and less than 10, then the strain is classified **810** as "Group B". If **812** the ratio is less than 0.3, then the strain is classified **814** as "Group C". Other steps may be added to the method **850**.

[0044] **Table 3** illustrates the resulting classification of the strains into Groups AA, AB, B, and C using the method of **FIG. 8B**:

Group AA Big Bud		Group AA Lavender		Group AB Haze	
11.43%	THC	12.24%	THC	4.26%	THC
0.23%	CBD	0.24%	CBD	0.01%	CBD
Group B Orange Haze		Group B Tora Bora		Group AA Elephant	
9.06%	THC	5.26%	THC	17.22%	THC
6.41%	CBD	9.72%	CBD	0.06%	CBD
Group AA Strawberry Ice		Group C Cannatonic		Group AA B4	
26.95%	THC	0.60%	THC	12.08%	THC
0.06%	CBD	18.00%	CBD	0.10%	CBD

Table 3: Resulting classification of the strains

[0045] **FIGs. 9A** and **9B** illustrate, in flowcharts, examples of a method **900**, **950** of generating a strain formula, in accordance with some embodiments. The strain formula may incorporate a standard classification nomenclature. In this example, the suggested formula **908** is generated on the basis of a user's inputted wellness objective **902**, and on the basis of historical data **904** pertaining to the same. The wellness objective **902** may comprise a desire to alleviate pain, improve sleep, manage fatigue, reduce stress, etc. Other desired wellness objectives may be employed. In the example of **FIG. 9B**, the historical data **904** may comprise literature **914** (e.g., accepted science and new research), user demographics **924** (e.g., age, weight, gender, etc.) and adjoining actions **934** (e.g., mediations, exercise, sound therapy, etc.). The suggested formula **908** is generated from a formula generator **906** that matches the historical data **904** and wellness objective **902** with a suggested formula **908**. For example, in some embodiments, available research for alleviating pain may suggest that the formula include a ratio of 1:2 Group A to Group B, or a ratio of 1:3 Group A to Group C. In another embodiment, available research for improving sleep may suggest that the formula include a ratio of 5:3 Group A to Group B, or a ratio of 1:2 Group A to Group C. In some embodiments, available research for alleviating pain may suggest that the formula be coupled with another action such as stretching for short-acting pain relief, and/or continuous meditations for long-term pain management. In some embodiments, available research for managing fatigue may suggest that the formula be 1:6 Group A to Group B or 5:1 Group B to Group C, coupled with yoga for acute and long-term management.

[0046] Beginning with the literature review, the process **900** begins by examining a plurality of published papers and research studies with a view to determining therapeutic principles associated with chemical compounds – both as independent compounds and as combined compounds. For example, in one published study it may be found that the administration of products with THC concentrations of between 11% and 14% may alleviate pain. In another study, it may be found that administering products with THC concentrations of between 11% and 14%, when combined with CBD concentrations of 3% to 5% alleviate pain to a greater degree than THC alone. Similarly, potential side effects are extracted from the literature. For example, compounds comprising THC concentration of 11% - 14% and CBD concentration of 3% - 5% may alleviate pain, but they also result in dry mouth and difficulty sleeping. However, when the THC concentration is reduced to 8% - 9%, the benefits for pain alleviation remain, but the side effects are reduced. A broad-based literature review is therefore conducted, and the findings are tagged and stored into a database.

[0047] In some embodiments, said matching may comprise the use of a look-up table in a repository. In some embodiments, said matching may comprise the use of a machine learning clustering algorithm. For example, if historical data shows that women of certain ages respond a certain way, then a predictive algorithm may be employed to optimize the formulas on the basis of the totality of the historical data (i.e., tagged data) in the database. In this way, different cannabis combination formulas may be suggested for different data points.

[0048] **FIG. 10** illustrates, in a flowchart, another example of a method **1000** of generating a strain formula, in accordance with some embodiments. In this example, a user's response to different formulas are stored, and reinforce the data model for the generation of future formulas. User response includes user-inputted information as well as device-derived biometrics **1034**. The method **1000** includes a feedback loop to provide user-inputted feedback **1032** (e.g., the success of the treatment) and/or mobile device-derived feedback **1034** (e.g., variability in sleep patterns, heart rate, etc.) into an individual user history **1002** (e.g., past use patterns, trailing resting heart rate, sleep patterns, cannabis response, etc.).

[0049] **FIG. 11** illustrates, in a screenshot **1100**, an example of the collection of user-inputted information through a mobile device, in accordance with some embodiments.

[0050] **FIG. 12** illustrates, in a screenshot **1200,** an example of the collection of biometrics user information directly from the device, in accordance with some embodiments.

[0051] **FIG. 13** illustrates, in a screenshot **1300**, the storing to a database **1302** of user-inputted information and device-collected information, in accordance with some embodiments.

[0052] **FIG. 14** depicts the testing **1400** of a suggestion of a pain relief formula to a multitude of users, in accordance with some embodiments. Users select various qualifying strains – in this example three users have selected a "Lavender" strain and three users have selected an "Elephant" strain. The results and any side effects are recorded and stored to a database.

[0053] **FIG. 15** illustrates a process **1500** of self-improvement in the classification system, in accordance with some embodiments. In this example, the system recognizes a

variability in THC concentration between the "Lavender" and "Elephant" strains as potentially accounting for the variability in side effects. The system breaks down Group A strains into a more granular Group A+ and Group A-, accounting for variability in THC concentration.

[0054] **FIG. 16** illustrates the suggestion **1600** of a pain relief formula incorporating the changes to the classification system and accounting for previously observed side effects, in accordance with some embodiments.

[0055] In some jurisdiction, cannabis may not be allowed to be advertised. **FIG. 17** illustrates an example of a user interface **1700** for a mobile application of a machine vision classifier system that scans strain names and classifies them within a classification system, in accordance with some embodiments. This allows for users to be able to know the class of cannabis that may be available at a dispensary, and why that class could be relevant to the user's personal objectives and/or use history. For example, the machine vision classifier may note that the strain of cannabis that is available was or was not used by the user in the past, what affects the strain had on the user if used on the past, and what affects are expected by this strain on the user (side-effects or benefits to the user) based on the user's history.

[0056] The machine vision classifier system (e.g., mobile application) may comprise a processor and a memory storing instructions which when executed by the processor configure the processor to perform a method of classifying chemicals. For example, the method may comprise scanning a product (e.g., a cannabis product), determining a name of the product based on the scan (i.e., name of the cannabis), classifying the strain for the product based on the name (determine strain of the cannabis), and presenting the strain classification to a user.

[0057] In some embodiments, a process allows consumers to classify any single one of the thousands of strains they encounter into said standard classification system or into any other classification system through a Machine Vision application deployed through a mobile device and displayed through a mobile interface. Said Machine Vision application may be similarly leveraged to elucidate additional relevant information pertaining to the strain in question – including both objective information, and personalized information. Objective information may include, inter alia, the chemical composition of the strain, its breeding

history, and product reviews. Personalized information may include, inter alia, whether the individual has used this strain in the past and whether this strain is a recommended strain given the consumer's trailing health information and forward-looking health and wellness objectives.

[0058] **FIG. 18** illustrates an example of a process **1800** of scanning a product for the purpose of classifying the product into a classification system, in accordance with some embodiments. **FIG. 19** illustrates an example of the presentation **1900** of strain information through a mobile interface, in accordance with some embodiments. The information is stored to a database **1302**. Said database **1302** may further store a user's account information (e.g., age, weight, gender, use-history, ailments, etc.), a large strain database with associated classification, and may fetch related information, such as third-party reviews of the strain, to display a totality of relevant information.

[0059] In some embodiments, a process may standardize the many thousands of cannabis strains into a single classification system. It encompasses a standard classification system and nomenclature for the thousands of strains currently available on the market and the thousands of additional strains that will be made available in the coming years. Strains are classified primarily along their THC and CBD content, in a manner designed to seamlessly enhance consumer education and information, while allowing for the modularization of cannabis intake with a view towards catering towards health and wellness outcomes. Built upon this system of standardization is a system of diverse formulae. Formulas are derived from said standardized classification to create classes of cannabis products that cater to discreet health and wellness needs, e.g. pain management, stress reduction, improving sleep, etc. Formulas may reference said standard classification system and nomenclature, and are generated on the basis of, *inter alia*, the chemical content of strain classes, the demographics and characteristics of the individual consuming the formula, the state of the art with respect to published research, and any adjoining actions to consumption.

[0060] In some embodiments, said standard classification system and formula generation may be automated and/or continuously modified on the basis of associated collected data. Whereas said classification system does not reference the individual underlying strains, said underlying strains are nonetheless tracked by way of user-inputs. Statistical and computational models therefore include underlying strains, enabling the

identification of more granular associations on an individual strain level. These associations may be positive – e.g. associated with better health outcomes, or negative, e.g. associated with undesirable side-effects. These associations form the basis of a more granular interrogation of the chemical composition of individual strains, e.g. investigating exact levels of THC concentration, other minor cannabinoids, and other minor terpenoids. Applying extant statistical and computational methods to this dataset allows for the elucidation of novel understandings of how varying levels of THC or CBD concentration, or how terpene profiles, interact with individual consumers or classes of consumers. The classification system therefore continually builds itself and continuously refines itself on the basis of its collected cannabis data.

[0061] In some embodiments, a process may pair cannabis consumption with actions and activities with a view to optimizing the positive impacts of cannabis while minimizing its negative impacts. Said actions and activities are undertaken through a mobile interface, which suggests actions and activities and provides guidance on the same. This includes, inter alia, guided meditations, guided workouts, and guided breathing exercises.

[0062] In some embodiments, a process may collect and store information related to cannabis consumption through a mobile device. This includes both user inputted data and device-collected data. User inputted data includes but is not limited to, age, gender, weight, mood, nutrition, and particulars pertaining to cannabis consumption. Device-collected data includes but is not limited to, heart rate, heart rate variability, sleep, activity, GPS location, and associated time stamps for the aforementioned.

[0063] In some embodiments, an analysis of the collected data may comprise a plurality of statistical and computational methods for, among other things, (1) the elucidation of relationships between individual strain or strain formulae consumption, consumer demographics, accompanying actions and activities, and observed outcomes – both positive and negative, and (2) the prediction outcomes arising from individual strain or strain formulae consumption, controlled for consumer demographics and accompanying actions and activities.

[0064] In some embodiments, an automated and dynamic personalization of cannabis formulas and recommended accompanying actions and activities may be provided, with a

view towards achieving individual health and wellness goals, controlled for the demographics and circumstances of the individual.

[0065] In some embodiments, a Bluetooth connected smart vaporizer, linked to a mobile application, and equipped to deliver personalized, optimal dosages, on the instructions of the mobile application. Said vaporizer may comprise two or more cartridges, each loaded with an individual strain. On the basis of instructions received from said mobile application, each cartridge releases an amount of each strain, creating an optimal formula. Thereafter, the mobile application may further dictate to the vaporizer, via Bluetooth, the optimal temperature, and amount to be consumed. In some embodiments, said vaporizer may be equipped with an ECG monitor, capturing heart rate throughout consumption, and relaying the information back to the mobile backend, and storing the same to a database. By this process, the individual's formulas, and associated inputs, may be continuously improved and optimized.

[0066] The process of dynamic, ongoing personalization of general chemical intake on the basis of demographics and biometric data is similarly well suited in a vitamin and supplement context. The device and methods disclosed herein may also relate to the dynamic personalization of vitamin and supplement consumption, utilizing longitudinal user information including but not limited to, biometric information, location information, and dietary information.

[0067] An individual may spend the summer months in a northern climate and the winter months in a southern one, while simultaneously and cyclically altering his or her diet and exercise patterns on a weekly and often daily basis. In these instances, inaugural questionnaires to determine formulation are wholly inadequate, as the first-order formulation may soon become non-optimal and even damaging to the overall health of an individual. Outside of the summer months, human skin makes little if any vitamin D in regions contained in latitudes above 37 degrees north and below 37 degrees south [of the equator]. Therefore, on average, individuals residing north of the 37th parallel in states such as Washington, Illinois, and Massachusetts are at relatively greater risk for vitamin D deficiency than individuals residing south of the 37th parallel, in states such as Florida, Arizona, and Texas. On a global scale, residents of the United Kingdom will be at greater risk of deficiency than those of Greece, and residents of Beijing will be at greater risk than residents of Hong Kong.

[0068] While vitamin D deficiency presents risks, over-supplementation may present its own set of risks. Vitamin D toxicity is a buildup of calcium in the blood – hypercalcemia. This may cause poor appetite, nausea and vomiting. Other risk factors of over-supplementation include weakness, frequent urination, and kidney problems. Approximating appropriate levels of Vitamin D supplementation – as with other vitamins and minerals – is important to the overall wellbeing of an individual. When dynamic temporal variations, human mobility, and weather patterns are considered, assessing vitamin D deficiency and/or risk of toxicity becomes significantly more complex, and static regional generalizations are largely ineffectual in determining the vitamin D deficiency and supplementation requirements of an individual.

[0069] An individual residing above the 37th parallel may require vitamin D supplementation in the winter months, but not require supplementation in the summer months as compared to an individual residing below the 37th parallel. An individual who resides north of the 37th parallel, but spends sporadic days or weeks travelling in regions south of the 37th parallel, may require supplementation at time-specific intervals during the winter months, and/or may require more supplementation than a permanent resident south of the 37th parallel, but less supplementation than a permanent resident north of the 37th parallel who does not frequent regions south of the 37th parallel at regular intervals. An individual residing north of the 37th parallel may in some instances require less vitamin D supplementation than an individual residing south of the 37th parallel. Such a scenario may occur if weather patterns over a period of days, weeks, or months are such that the individual north of the 37th is receiving abnormally large amounts of sunshine whereas the individual south of the 37th is receiving abnormally low amounts of sunshine.

[0070] Further compounding these phenomena is the non-binary nature of deficiency risk. I.e., while individuals residing on the 40th parallel will be at greater risk than individuals residing on the 35th, individuals in-turn residing on the 50th parallel will be at greater risk than those residing on the 40th. This illustrates instances where the dynamic location of an individual will directly impact the optimal supplementation of vitamins and nutrients. In other instances, the variable actions of individuals will yield similarly complex considerations.

[0071] The variable exercise and activity levels of an individual will have a direct impact on their optimal level of magnesium intake. Muscles' ability to contract and relax is dependent on magnesium volume in the body. Additionally, magnesium may impact cardiac activity, nerve function, and blood pressure regulation. Thus, magnesium deficiencies may result in low energy levels and problems with muscle function. An individual partaking in high-intensity exercise one day, may require 100 mg in magnesium supplementation. If this same individual is largely sedentary the following day, required magnesium supplementation may be as little as 25 mg if any. Similarly, day-to-day heart rate fluctuations may be attenuated by an increase in magnesium or calcium intake. For example, an individual experiencing a persistently high resting heart rate may require 150 mg in magnesium supplementation. An individual partaking in significant physical activity while simultaneously struggling with an irregular or high heartbeat, may require 250 mg in magnesium supplementation.

[0072] While magnesium deficiency presents a set of risks described above, over-supplementation may in turn cause too much magnesium to buildup in the body. This may result in serious side effects including irregular heartbeat, low blood pressure, confusion, and slowed breathing. In some extreme cases magnesium surpluses may lead to a loss of consciousness and/or death.

[0001] In some instances, supplementation may depend on a combinatorial analysis. Female athletes require, on average, more iron than their male counterparts. Iron deficiency may result in fatigue, weakness, and dizziness. Conversely, iron overload increases the risk for liver diseases – including cirrhosis and cancer – diabetes, hypothyroidism, and hypogonadism.

[0002] In many cases, optimal vitamin and mineral supplementation is directly attributed to the diets of individuals, with daily fluctuations in dietary intake resulting in daily fluctuations in the need for vitamin and mineral supplementation. An individual with a fish-based diet will likely not require Omega-3 fatty acid supplementation, whereas an individual with a wheat-based diet likely will. Indeed, daily fluctuations in dietary intake will directly impact optimal supplement intake levels on that very same day as a means of maintaining a consistent and healthy diet. For example, a deficiency in Omega-3 fatty acid may result in

inflammation and increase risk for chronic disease. Alternatively, too much Omega-3 may result in blood clotting and bleeding.

[0003] By integrating data collected from an individual on an on-going basis, said individual's daily and weekly supplemental needs may be ascertained. With the ubiquity of smartphones and smart watches, an individual's biometrics (resting heart rate, heart rate trends, activity, sleep, stress, etc.), location (via GPS technology), and general dietary intake (via logging and computationally-powered meal counters) may be deduced every single day. This allows for both an algorithmic computation of optimal dietary supplementation on any given day (without the need for human input), while also creating an objective and dynamic feedback loop that evaluates the objective efficacy of the supplementation, and in-turn acts as a subsequent input variable to future algorithmically-derived optimal supplementation calculations.

[0004] By breaking down multivitamins into separate constituent individual vitamins or minerals and then in-turn breaking down these constituent individual vitamins or minerals into smaller doses, an individual is afforded substantially greater flexibility as to what volume of supplementation he or she will intake on any given day. The result is a feedback apparatus to govern vitamin and mineral supplementation over-time. A method may be used to generate input variables pertaining to age, weight, gender, exercise, vitals, activity, sleep, location, diet, etc., and through an interface, delivers the feedback to users. Subsequent feedback will integrate forward-looking and trailing biometrics and other input variables to evaluate the efficacy of its prior feedback, thus acting as an input variable in future feedback.

[0005] **FIG. 20** illustrates an example of the segmentation **2000** of a multivitamin into constituent parts, in accordance with some embodiments. In this embodiment, the segmentation is such that the supplementation needs of an individual for the constituent parts does not vary in exact proportion or in absolute correlation. **FIG. 21** illustrates an example of the segmentation **2100** of Vitamin D into reduced portions to affect an individual's ability to consume variable volumes of Vitamin D, in accordance with some embodiments. **FIG. 22** illustrates an example of the segmentation **2200** of Magnesium into reduced portions to affect an individual's ability to consume variable volumes of Magnesium, in accordance with some embodiments. **FIG. 23** illustrates an example of the segmentation **2300** of Omega-3 into reduced portions to affect an individual's ability to consume variable volumes of Omega-3, in

accordance with some embodiments. **FIG. 24** illustrates an example of the segmentation **2400** of a bottle of multivitamin into three separate bottles composed of the specifications and segmentations described above (in **FIGs. 20** to 23). **FIG. 25** illustrates an example of a box **2500** containing a multitude of bottles described in **FIG. 24**. The box **2500** in **FIG. 25** represents a single unit of purchase in this embodiment.

[0006] **FIG. 26** illustrates an example of variable dosages **2600** of Vitamin D for otherwise identical individuals, in accordance with some embodiments. In this embodiment, Vitamin D dosage is determined by the time of the year, the GPS location of the individual, and the weather patterns in said location. **FIG. 27** illustrates an example of a user interface **2700** in one embodiment. In this embodiment, a user views their biometrics, and within the same interface receives their suggested vitamin intake.

[0007] **FIG. 28** illustrates an example of an input method for the determination of vitamin intake, in accordance with some embodiments. In this embodiment, input variables consist of the date, the GPS location, the weather pattern, the user's activity, their logged exercise, their most recent resting heart rate, and their logged meals. In this instantiation, the user receives a suggestion to consume 3 units of Vitamin D, 4 units of Magnesium, and 2 units of Omega-3.

[0008] **FIG. 29** illustrates an example of how variations in input variables impacts suggested vitamin intake **2900** in one embodiment. In this instantiation, the user receives a suggestion to consume only 2 units of Vitamin D, 1 unit of Magnesium, and no Omega-3. **FIG. 30** illustrates an example of how variations in input variables impacts suggested vitamin intake **3000** in one embodiment. In this instantiation, the user receives a suggestion to consume no Vitamin D, 2 units of Magnesium, and 1 unit of Omega-3.

[0009] **FIG. 31** illustrates an example of the introduction of demographic input variables **3100** into the intake method, in accordance with some embodiments. In this instantiation, the user (who is a male) receives a suggestion to consume no Vitamin D, 2 units of Magnesium, and 1 unit of Omega-3. **FIG. 32** illustrates examples of variations **3200** in the demographic input variables in one embodiment. In this instantiation, the user is a female. The user receives a suggestion to consume no Vitamin D, 3 units of Magnesium, and 1 unit of Omega-3.

[0010] **FIG. 33** illustrates an example of an intake method component **3300** for the purpose of determining Vitamin D intake on any given day, in accordance with some embodiments.

[0011] **FIG. 34** illustrates an example of an intake method component **3400** for the purpose of determining Magnesium intake on any given day, in accordance with some embodiments.

[0012] **FIG. 35** illustrates an example of a vitamin intake suggestion **3500** utilizing an example intake algorithm, in accordance with some embodiments. **FIG. 36** illustrates an example of a vitamin intake suggestion **3600** utilizing an example intake method, in accordance with some embodiments.

[0013] In some embodiments, integrating data collected from an individual on an on-going basis, said individual's daily and weekly supplemental needs may be ascertained. With the ubiquity of smartphones and smart watches, an individual's biometrics (resting heart rate, heart rate trends, activity, sleep, stress, etc.), location (via GPS technology), and general dietary intake (via logging and AI-powered meal counters) may be deduced every single day. This allows for both an algorithmic computation of optimal dietary supplementation on any given day (without the need for human input), while also creating an objective and dynamic feedback loop that evaluates the objective efficacy of the supplementation, and in-turn acts as a subsequent input variable to future algorithmically-derived optimal supplementation calculations.

[0014] In some embodiments, by breaking down multivitamins into separate constituent individual vitamins or minerals, and then in-turn breaking down these constituent individual vitamins or minerals into smaller doses, an individual is afforded substantially greater flexibility as to what volume of supplementation he or she will intake on any given day.

[0015] In some embodiments, a temporally-situated feedback apparatus governs vitamin and mineral supplementation over-time. The device is configured to perform a method that generates input variables pertaining to age, weight, gender, exercise, vitals, activity, sleep, location, diet, etc., and through an interface, delivers the feedback to users.

Subsequent feedback will integrate forward-looking and trailing biometrics and other input variables to evaluate the efficacy of its prior feedback, thus acting as an input variable in future feedback.

[0016] **FIG. 37** illustrates, in a block schematic diagram, an example of a computing device **3700**, according to some embodiments. There is provided a schematic diagram of computing device **3700**, exemplary of an embodiment. As depicted, computing device **3700** includes at least one processor **3702**, memory **3704**, at least one I/O interface **3706**, and at least one network interface **3708**.

[0017] Each processor **3702** may be a microprocessor or microcontroller, a digital signal processing (DSP) processor, an integrated circuit, a field programmable gate array (FPGA), a reconfigurable processor, a programmable read-only memory (PROM), or any combination thereof.

[0018] Memory **3704** may include a computer memory that is located either internally or externally such as, for example, random-access memory (RAM), read-only memory (ROM), compact disc read-only memory (CDROM), electro-optical memory, magneto-optical memory, erasable programmable read-only memory (EPROM), and electrically-erasable programmable read-only memory (EEPROM), Ferroelectric RAM (FRAM).

[0019] Each I/O interface **3706** enables computing device **3700** to interconnect with one or more input devices, such as a keyboard, mouse, camera, touch screen and a microphone, or with one or more output devices such as a display screen and a speaker. I/O interface **3706** may also include application programming interfaces (APIs) which are configured to receive data sets in the form of information signals, including verbal communications recorded and digitized, and/or text input from users in response to queries posed to said users.

[0020] Each network interface **3708** enables computing device **3700** to communicate with other components, to exchange data with other components, to access and connect to network resources, to serve applications, and perform other computing applications by connecting to a network (or multiple networks) capable of carrying data including the Internet, Ethernet, plain old telephone service (POTS) line, public switch telephone network

(PSTN), integrated services digital network (ISDN), digital subscriber line (DSL), coaxial cable, fiber optics, satellite, mobile, wireless (e.g., Wi-Fi, WiMAX), SS7 signaling network, fixed line, local area network, wide area network, and others. Network interface **3708**, for example, may be used to communicate audio files (e.g., MP3, WAV, etc.) containing recorded verbal responses from a trusted cardholder device to the system for processing via a speech-to-text engine.

[0021] The discussion provides example embodiments of the inventive subject matter. Although each embodiment represents a single combination of inventive elements, the inventive subject matter is considered to include all possible combinations of the disclosed elements. Thus, if one embodiment comprises elements A, B, and C, and a second embodiment comprises elements B and D, then the inventive subject matter is also considered to include other remaining combinations of A, B, C, or D, even if not explicitly disclosed.

[0022] The embodiments of the devices, systems and methods described herein may be implemented in a combination of both hardware and software. These embodiments may be implemented on programmable computers, each computer including at least one processor, a data storage system (including volatile memory or non-volatile memory or other data storage elements or a combination thereof), and at least one communication interface.

[0023] Program code is applied to input data to perform the functions described herein and to generate output information. The output information is applied to one or more output devices. In some embodiments, the communication interface may be a network communication interface. In embodiments in which elements may be combined, the communication interface may be a software communication interface, such as those for inter-process communication. In still other embodiments, there may be a combination of communication interfaces implemented as hardware, software, and combination thereof.

[0024] Throughout the foregoing discussion, numerous references will be made regarding servers, services, interfaces, portals, platforms, or other systems formed from computing devices. It should be appreciated that the use of such terms is deemed to represent one or more computing devices having at least one processor configured to execute software instructions stored on a computer readable tangible, non-transitory medium. For example, a

server can include one or more computers operating as a web server, database server, or other type of computer server in a manner to fulfill described roles, responsibilities, or functions.

[0025] The technical solution of embodiments may be in the form of a software product. The software product may be stored in a non-volatile or non-transitory storage medium, which can be a compact disk read-only memory (CD-ROM), a USB flash disk, or a removable hard disk. The software product includes a number of instructions that enable a computer device (personal computer, server, or network device) to execute the methods provided by the embodiments.

[0026] The embodiments described herein are implemented by physical computer hardware, including computing devices, servers, receivers, transmitters, processors, memory, displays, and networks. The embodiments described herein provide useful physical machines and particularly configured computer hardware arrangements.

[0027] Although the embodiments have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein.

[0028] Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification.

[0029] As can be understood, the examples described above and illustrated are intended to be exemplary only.

WHAT IS CLAIMED IS:

1. A vaporizer device for dispensing chemical dosages, the device comprising:

two or more cartridges connected to a heating chamber, each cartridge holding a different chemical powder; and

a microprocessor for controlling valves associated with each cartridge such that amounts of each chemical powder are dispensed to the heating chamber based on a formula.

2. The vaporizer device of claim 1, wherein each cartridge holds a different strain of cannabis.

3. The vaporizer device of claim 1, wherein the formula is pre-set in a memory associated with the microprocessor.

4. The vaporizer device of claim 1, wherein the formula is selectable on the vaporizer.

5. The vaporizer device of claim 4, further comprising a selection unit for each cartridge for setting an amount of powder from that cartridge to be dispensed to the heating chamber.

6. The vaporizer device of claim 4, further comprising a selection unit for setting an amount of powder from each cartridge to be dispensed to the heating chamber.

7. The vaporizer device of claim 1, further comprising a wireless communication unit associated with the microprocessor for communication with an external device, wherein the formula is provided to the wireless communication unit from the external device.

8. The vaporizer device of claim 7, further comprising a fingertip pulse oximeter for tracking a health metric of a user of the vaporizer device, wherein the health metric is communicated to the external device via the wireless communication unit.

9. The vaporizer device of claim 8, wherein the health metric is a heart rate measurement.

10. The vaporizer device of claim 1, further configured to regulate a dosage amount.

11. The vaporizer device of claim 1, further configured to regulate a heating temperature.

12. A method for dispensing chemical dosages, the method comprising:

holding a different chemical powder in two or more cartridges of a vaporizer device; and

controlling, via a microprocessor of the vaporizer device, valves associated with each cartridge such that amounts of each chemical powder are dispensed to a heating chamber connected to the cartridges, the amount of each chemical powder dispensed based on a formula.

13. The method of claim 12, wherein each cartridge holds a different strain of cannabis.

14. The method of claim 12, wherein the formula is pre-set on the microprocessor.

15. The method of claim 12, wherein the formula is selectable on the vaporizer.

16. The method of claim 15, further comprising receiving, from a selection unit, individual selections of an amount of powder for each cartridge to be dispensed to the heating chamber.

17. The method of claim 15, further comprising receiving, from a selection unit, a selection of a formula for an amount of powder for each cartridge to be dispensed to the heating chamber.

18. The method of claim 12, further comprising receiving the formula from an external device in communication with a wireless communication unit associated with the microprocessor.

19. The method of claim 18, further comprising:

receiving, at a fingertip pulse oximeter, a health metric of a user of the vaporizer device; and

communicating, via the wireless communication unit, the health metric to the external device.

20. The method of claim 19, wherein the health metric is a heart rate measurement.

21. The method of claim 12, further configured to regulate a dosage amount.

22. The method of claim 12, further configured to regulate a heating temperature.

23. A vaporizer device for dispensing chemical dosages, the device comprising:

a removable cartridge connected to a heating chamber, the removable cartridge holding a combination of chemical powders; and

a microprocessor for controlling a valve associated with the cartridge such that the chemical powder is dispensed to the heating chamber;

wherein a plurality of removable cartridges may each comprise different formulas of chemical powder.

24. The vaporizer device of claim 23, further comprising a wireless communication unit associated with the microprocessor for communication with an external device, wherein a selection of a cartridge for the vaporizer device is provided to the wireless communication unit from the external device.

25. The vaporizer device of claim 24, further comprising a fingertip pulse oximeter for tracking a health metric of a user of the vaporizer device, wherein the health metric is communicated to the external device via the wireless communication unit.

26. The vaporizer device of claim 25, wherein the health metric is a heart rate measurement.

27. The vaporizer device of claim 23, further configured to regulate a dosage amount.

28. The vaporizer device of claim 23, further configured to regulate a heating temperature.

29. A method for dispensing chemical dosages, the method comprising:

holding a combination of chemical powders in a removable cartridge of a vaporizer device; and

controlling, via a microprocessor of the vaporizer device, valves associated with the cartridge such that the chemical powder is dispensed to a heating chamber connected to the cartridge;

wherein a plurality of removable cartridges may each comprise different formulas of chemical powder.

30. The method of claim 29, further comprising:

receiving, via a wireless communication unit associated with the microprocessor, a selection of a cartridge.

31. The method of claim 30, further comprising:

receiving, at a fingertip pulse oximeter, a health metric of a user of the vaporizer device; and

communicating, via the wireless communication unit, the health metric to the external device.

32. The method of claim 31, wherein the health metric is a heart rate measurement.

33. The method of claim 29, further comprising regulating a dosage amount.

34. The method of claim 29, further comprising regulating a heating temperature.

35. A system for generating formulas for a wellness objective based on a classification system of cannabis strains, the classification system based on Tetrahydrocannabinol (THC) and Cannabidiol (CBD) content of each strain, the system comprising:

a processor; and

a memory comprising a sequence of instructions which, when executed by the processor, configure the processor to:

receive an input from a user for a wellness objective;

determine a formula based on the wellness objective; and

communicate the formula via a mobile user interface.

36. The system of claim 35, wherein the processor is further configured to classify strains along three categories comprising:

strains high in THC and low in CBD;

strains with balanced THC and CBD content; and

strains with low THC and high CBD content.

37. The system of claim 35, wherein the processor is further configured to provide at least one of:

a cannabis formula; or

a suggestion for an action.

38. The system of claim 35, wherein the processor is further configured to:

track cannabis-use and user-information of a user; and

collect user biometric data.

39. The system of claim 38, wherein collected datapoints are stored to a database.

40. The system of claim 39, wherein stored datapoints are statistically and computationally continuously analyzed to optimize the formula.

41. The system as claimed in claim 40, wherein:

a clustering method is used to discover demographic groupings of users that behave in similar ways to cannabis consumption; and

a predictive method is used to generate a formula based on the collected datapoints.

42. A system for the automated and individualized delivery of chemical dosages on the basis of biometric and/or demographic information collected through a mobile device.

43. The system of claim 42, wherein biometric information includes heart rate and heart rate variability, sleep, and activity.

44. The system of claim 42, wherein demographic information includes age, weight, gender, and GPS location.

45. The system of claim 42, wherein chemical dosages relate to over-the-counter vitamins and supplements.

46. The system of claim 45, wherein vitamin D dosage is adjusted on the basis of GPS location and exposure to sunlight.

47. The system of claim 45, wherein magnesium dosage is adjusted on the basis of activity and exercise.

48. The system of claim 42, wherein chemical dosages relate to cannabis.

49. The system of claim 48, wherein cannabis intake is regulated by user-inputted information (benefits and side-effects) and device-collected information (heart rate, sleep).

50. A machine vision classifier comprising a processor and a memory storing instructions that when executed by the processor configure the processor to:

receive a name of a cannabis;

determine a strain classification for the cannabis; and

output the strain classification.

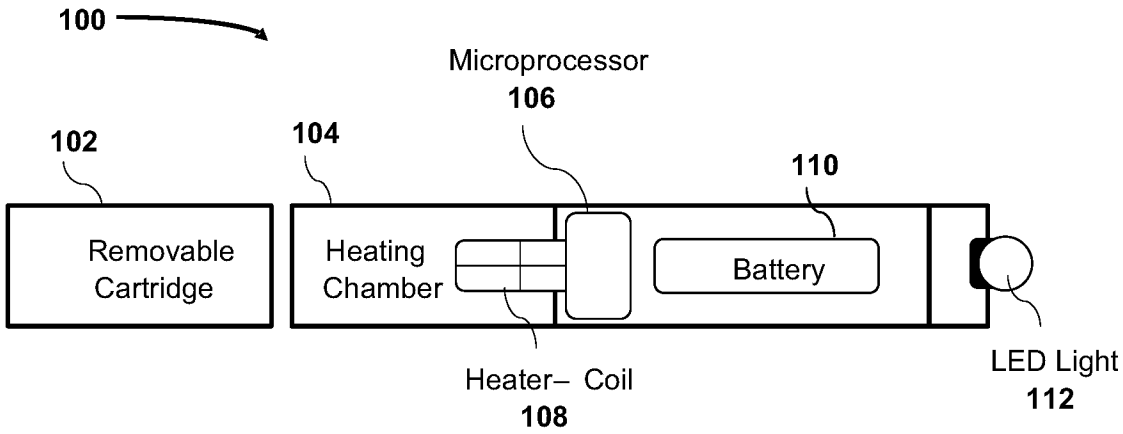
100
Microprocessor
106
102
104
110
Removable
Cartridge
Heating
Chamber
Battery
LED Light
112
Heater– Coil
108

FIG. 1

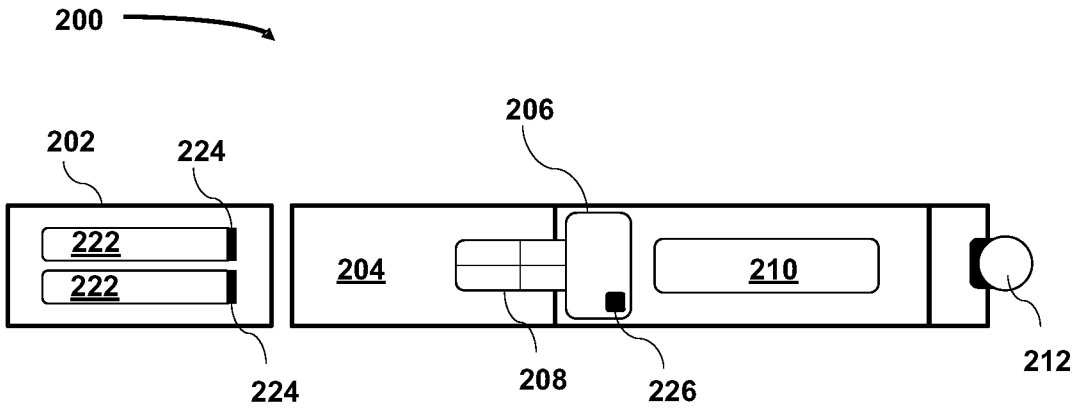
200
206
202
224
222
222
204
210
212
224
208
226

FIG. 2

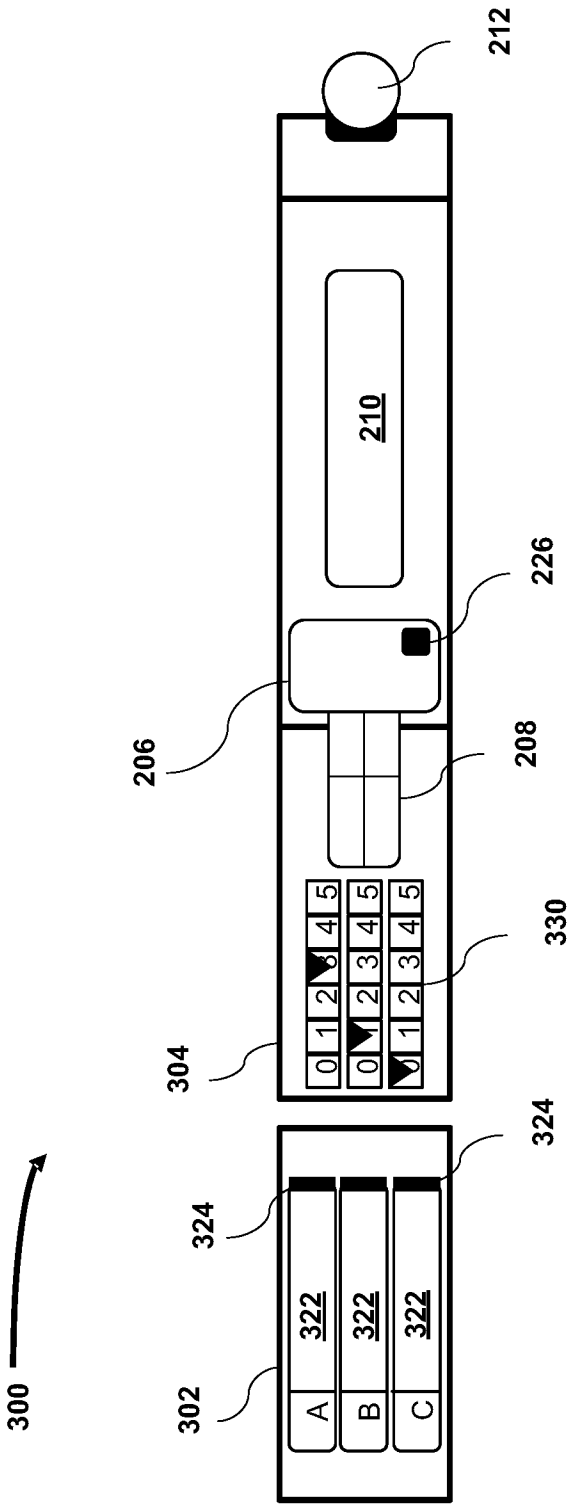

FIG. 3A

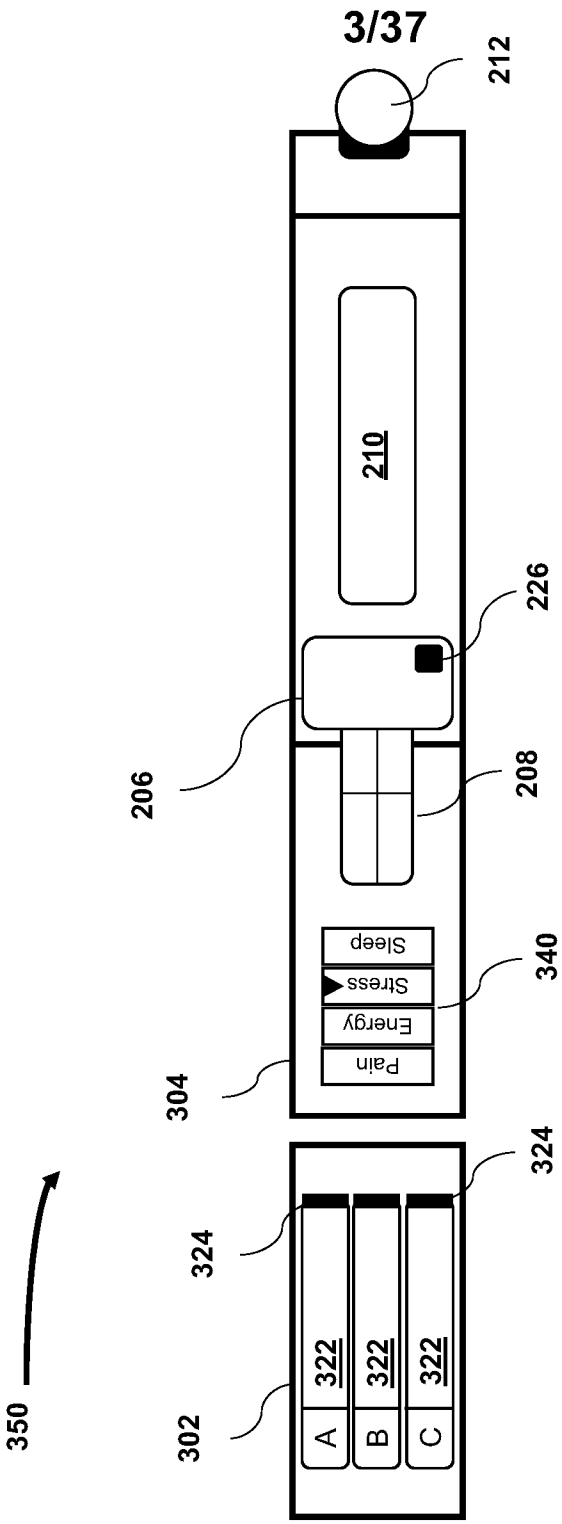
212
210
226
206
208
Sleep
Stress
Energy
Pain
340
304
324
324
322
322
322
A
B
C
302
350

FIG. 3B

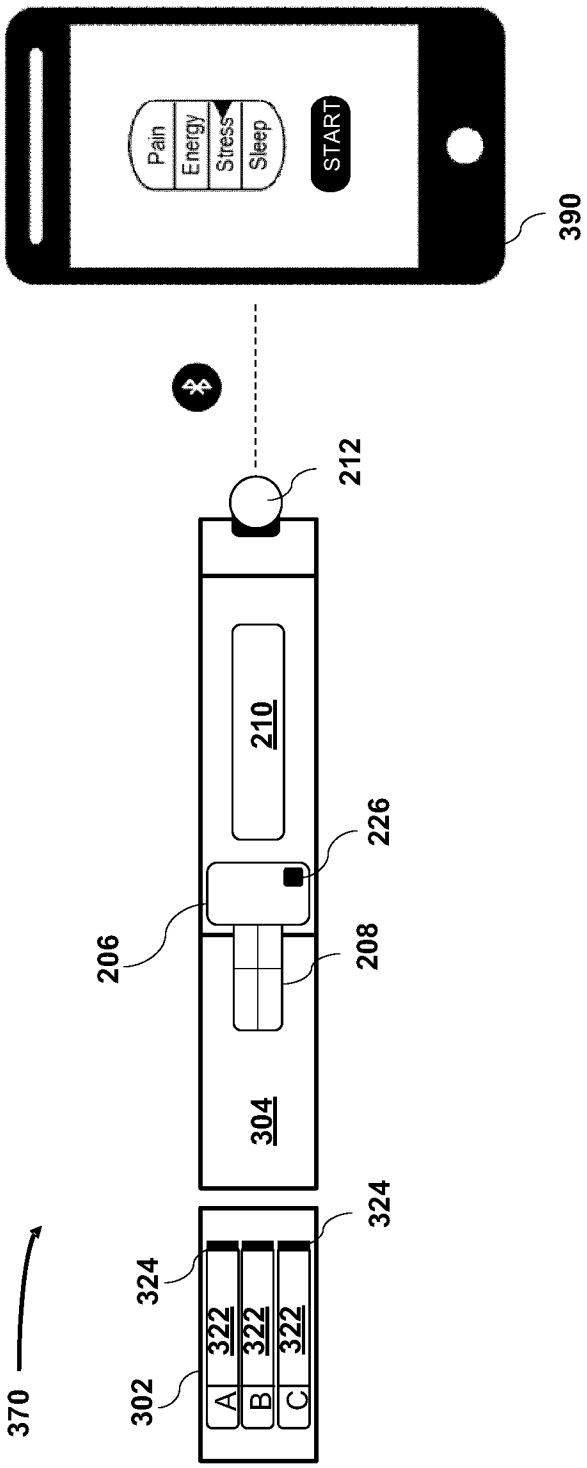
Pain
Energy
Stress
Sleep
START
390
212
210
226
206
208
304
324
324
322
322
322
A
B
C
302
370

FIG. 3C

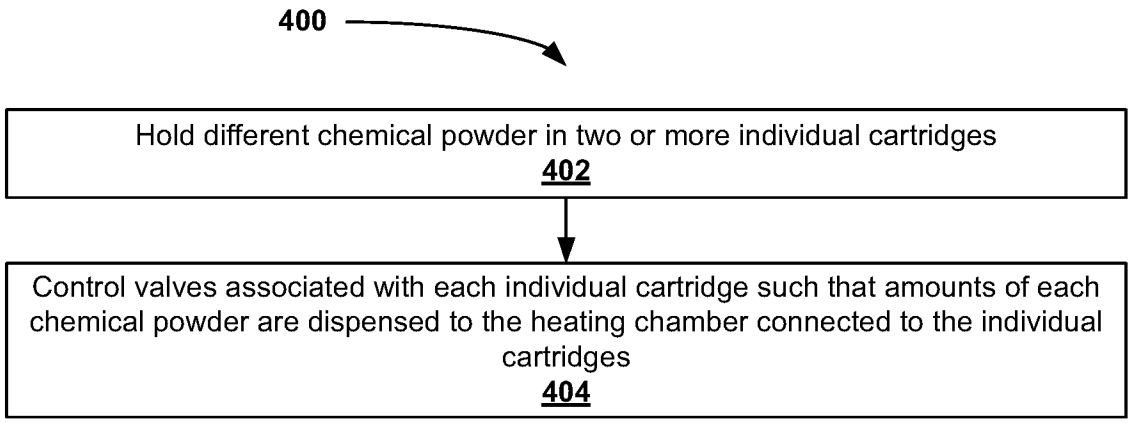
400
Hold different chemical powder in two or more individual cartridges
402
Control valves associated with each individual cartridge such that amounts of each chemical powder are dispensed to the heating chamber connected to the individual cartridges
404

FIG. 4

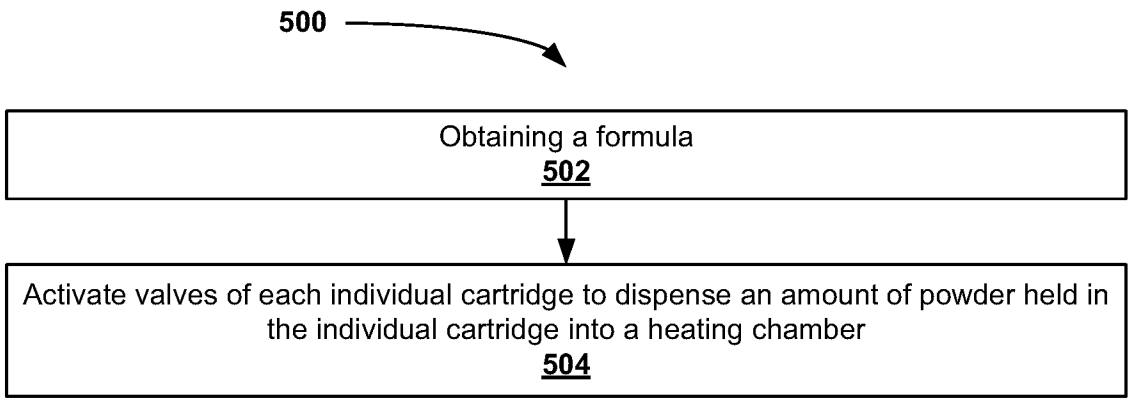
500
Obtaining a formula
502
Activate valves of each individual cartridge to dispense an amount of powder held in the individual cartridge into a heating chamber
504

FIG. 5

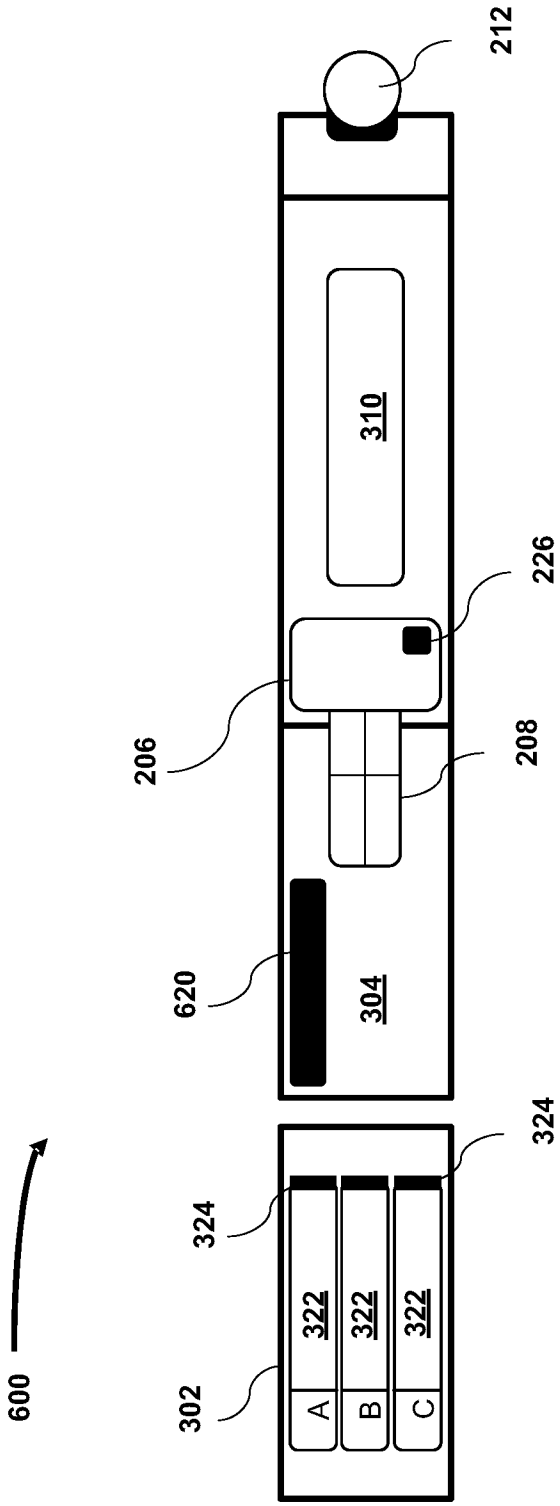

FIG. 6

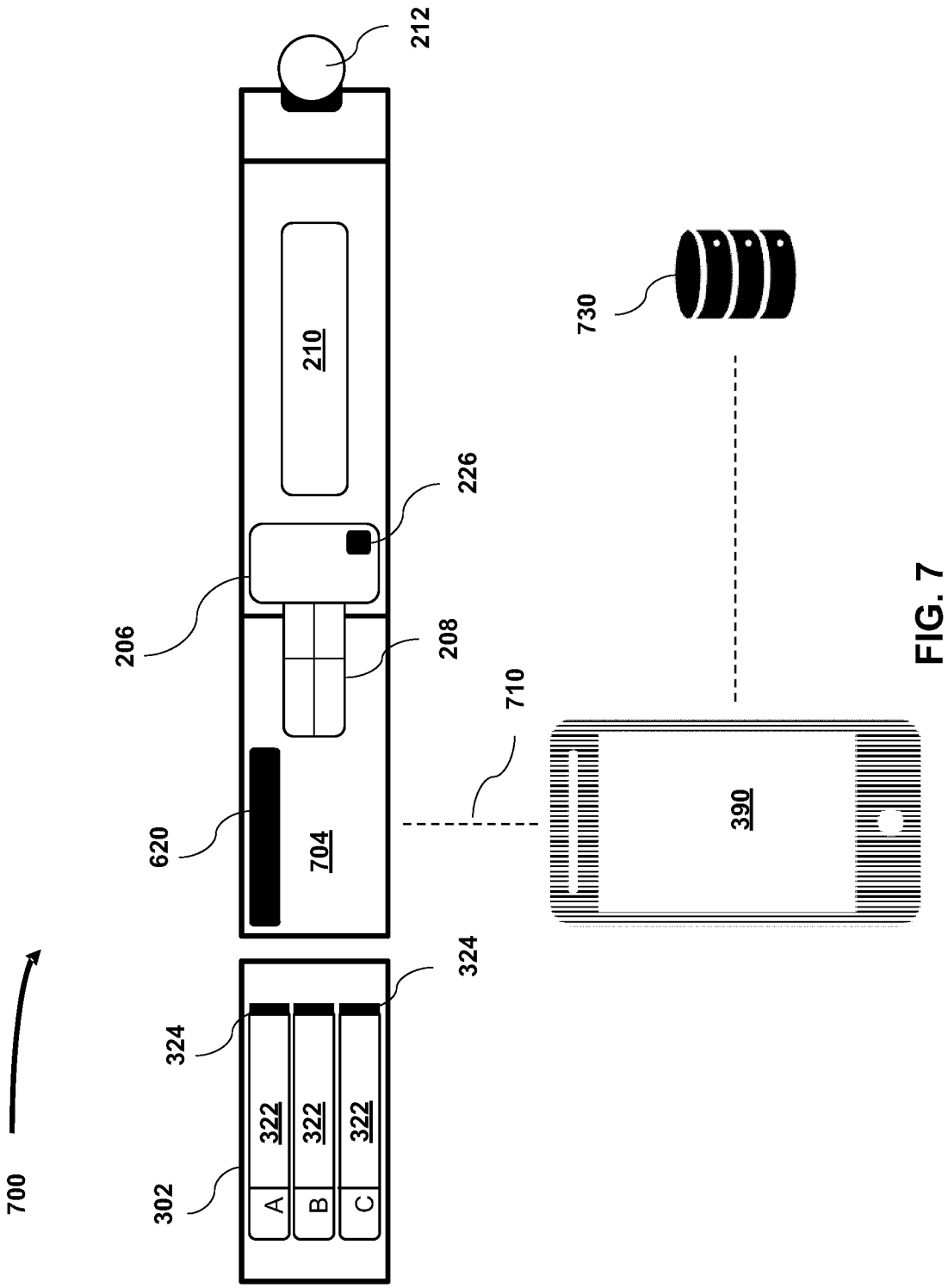
212
210
730
226
206
208
710
620
704
390
324
324
322
322
322
302
A
B
C
700

FIG. 7

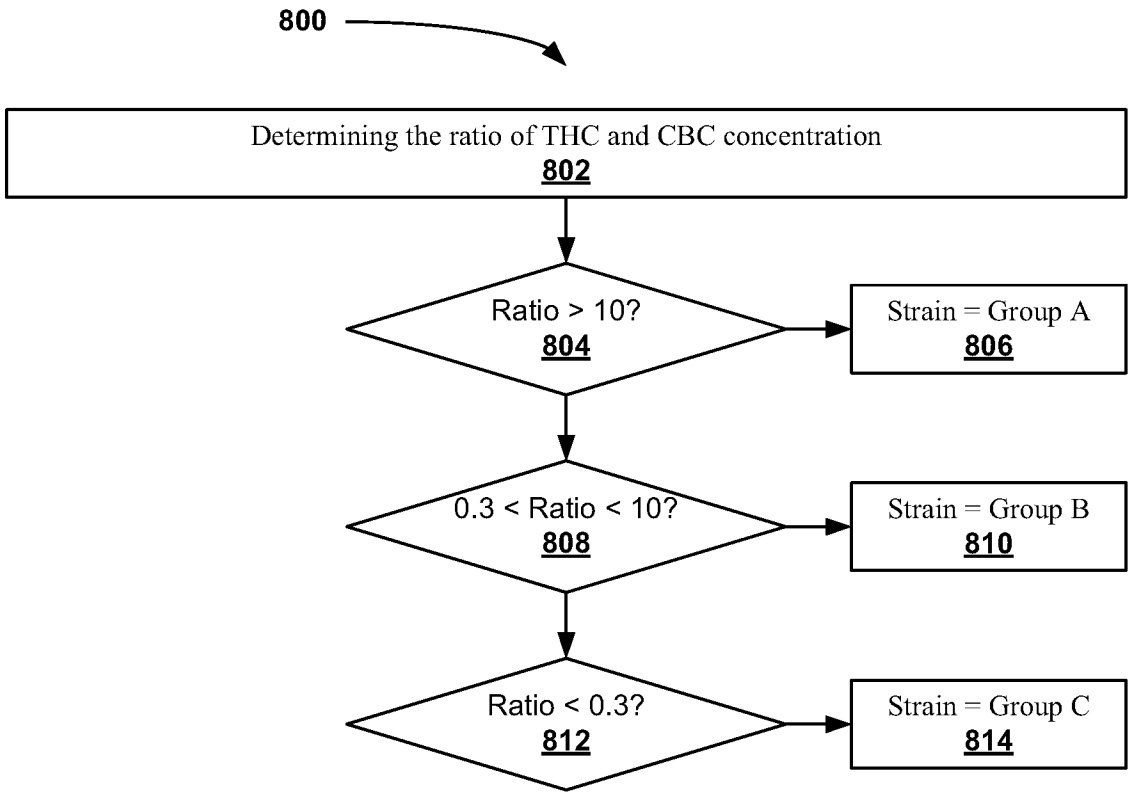
800
Determining the ratio of THC and CBC concentration
802
Ratio > 10?
804
Strain = Group A
806
0.3 < Ratio < 10?
808
Strain = Group B
810
Ratio < 0.3?
812
Strain = Group C
814

FIG. 8A

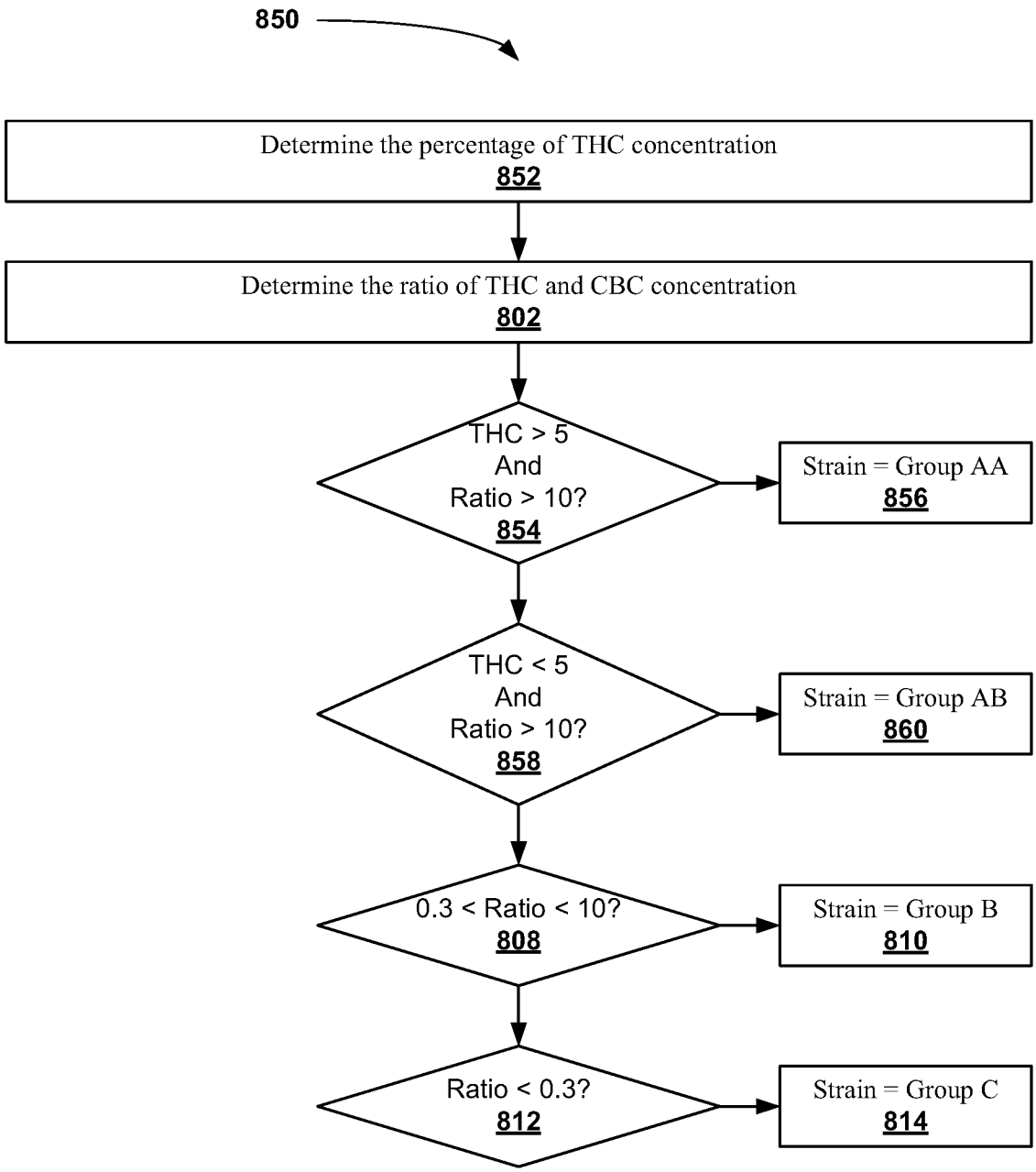
850
Determine the percentage of THC concentration
852
Determine the ratio of THC and CBC concentration
802
THC > 5
And
Ratio > 10?
854
Strain = Group AA
856
THC < 5
And
Ratio > 10?
858
Strain = Group AB
860
0.3 < Ratio < 10?
808
Strain = Group B
810
Ratio < 0.3?
812
Strain = Group C
814

FIG. 8B

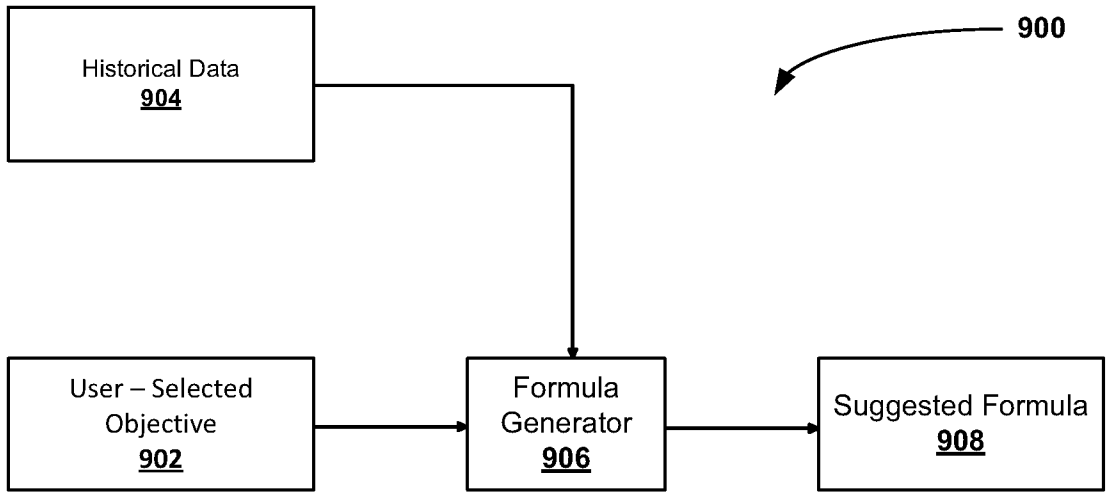
900
Historical Data
904
User – Selected Objective
902
Formula Generator
906
Suggested Formula
908

FIG. 9A

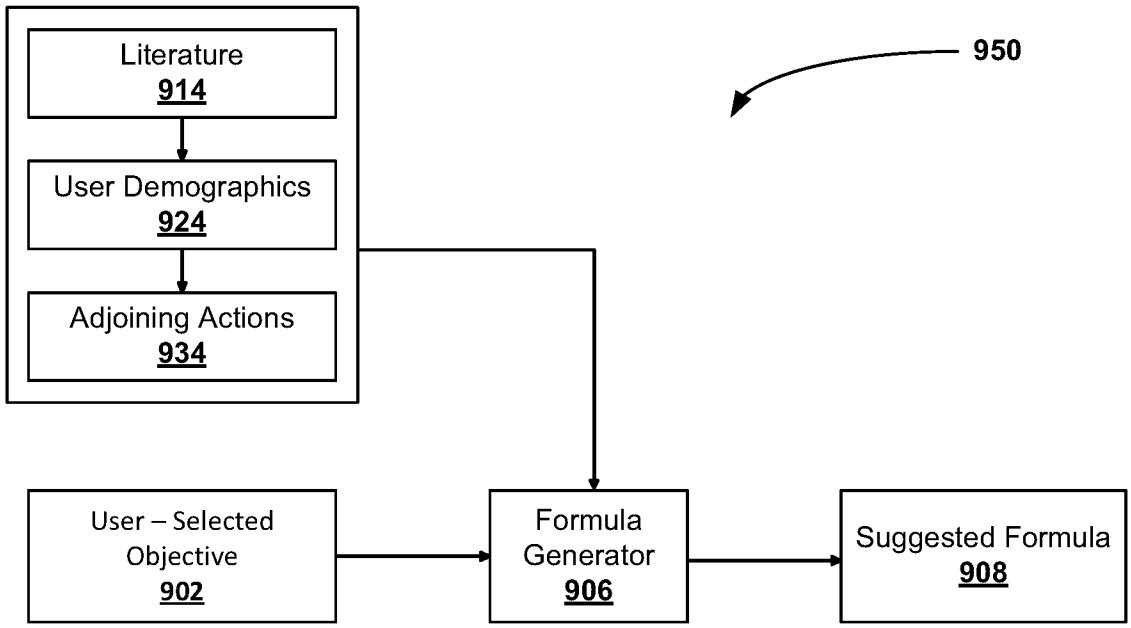
950
Literature
914
User Demographics
924
Adjoining Actions
934
User – Selected Objective
902
Formula Generator
906
Suggested Formula
908

FIG. 9B

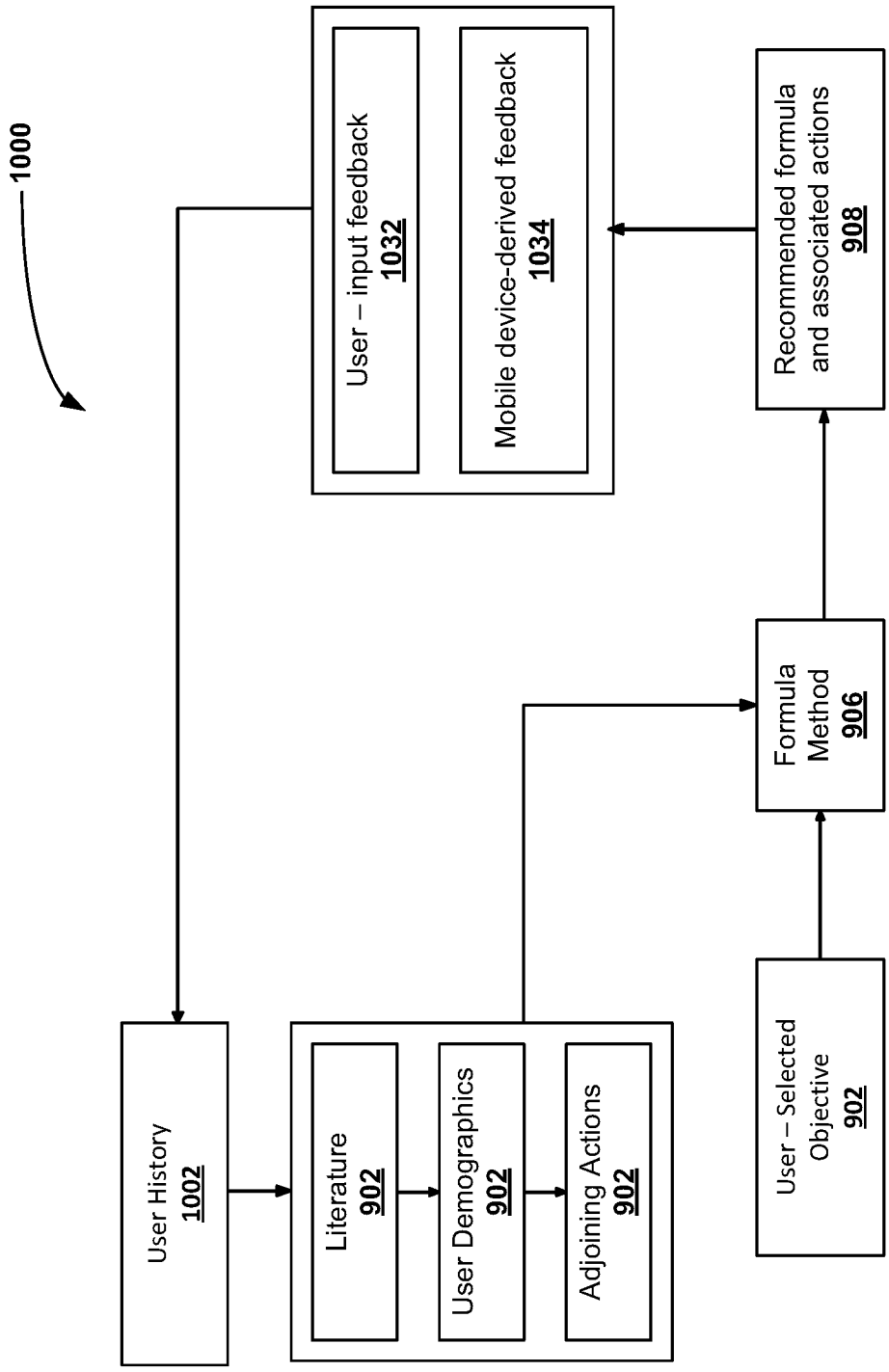
1000
User – input feedback
1032
Mobile device-derived feedback
1034
Recommended formula and associated actions
908
User History
1002
Literature
902
User Demographics
902
Adjoining Actions
902
Formula Method
906
User – Selected Objective
902

FIG. 10

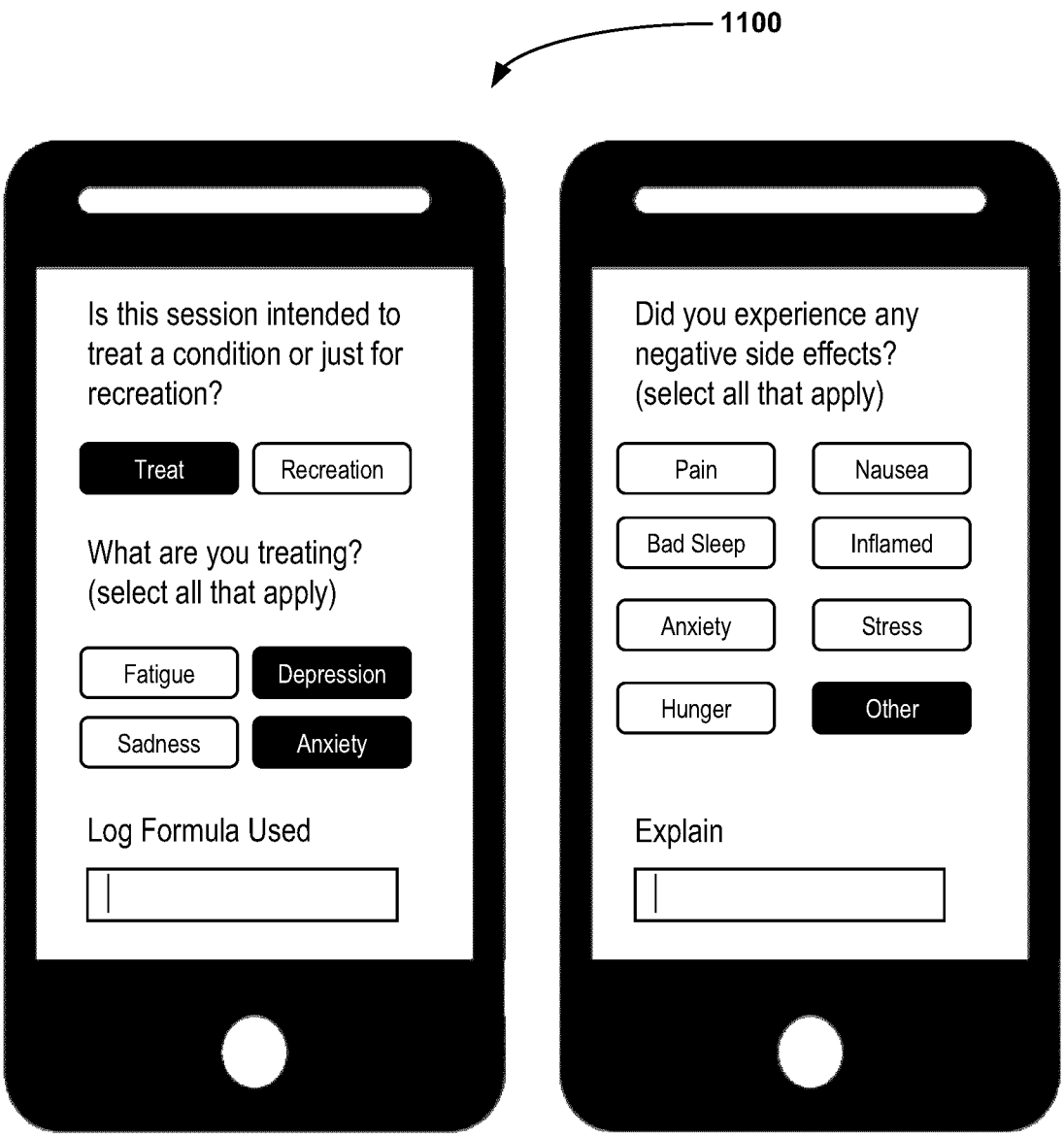
1100
Is this session intended to treat a condition or just for recreation?
Treat
Recreation
What are you treating? (select all that apply)
Fatigue
Depression
Sadness
Anxiety
Log Formula Used
Did you experience any negative side effects? (select all that apply)
Pain
Nausea
Bad Sleep
Inflamed
Anxiety
Stress
Hunger
Other
Explain

FIG. 11


1200
Take Heart Rate
View History
Begin Session
History
November 3rd, 2018
Pain Relief Session
4:30 pm to 4:45 pm
HR
75 bpm → 87 bpm

FIG. 12

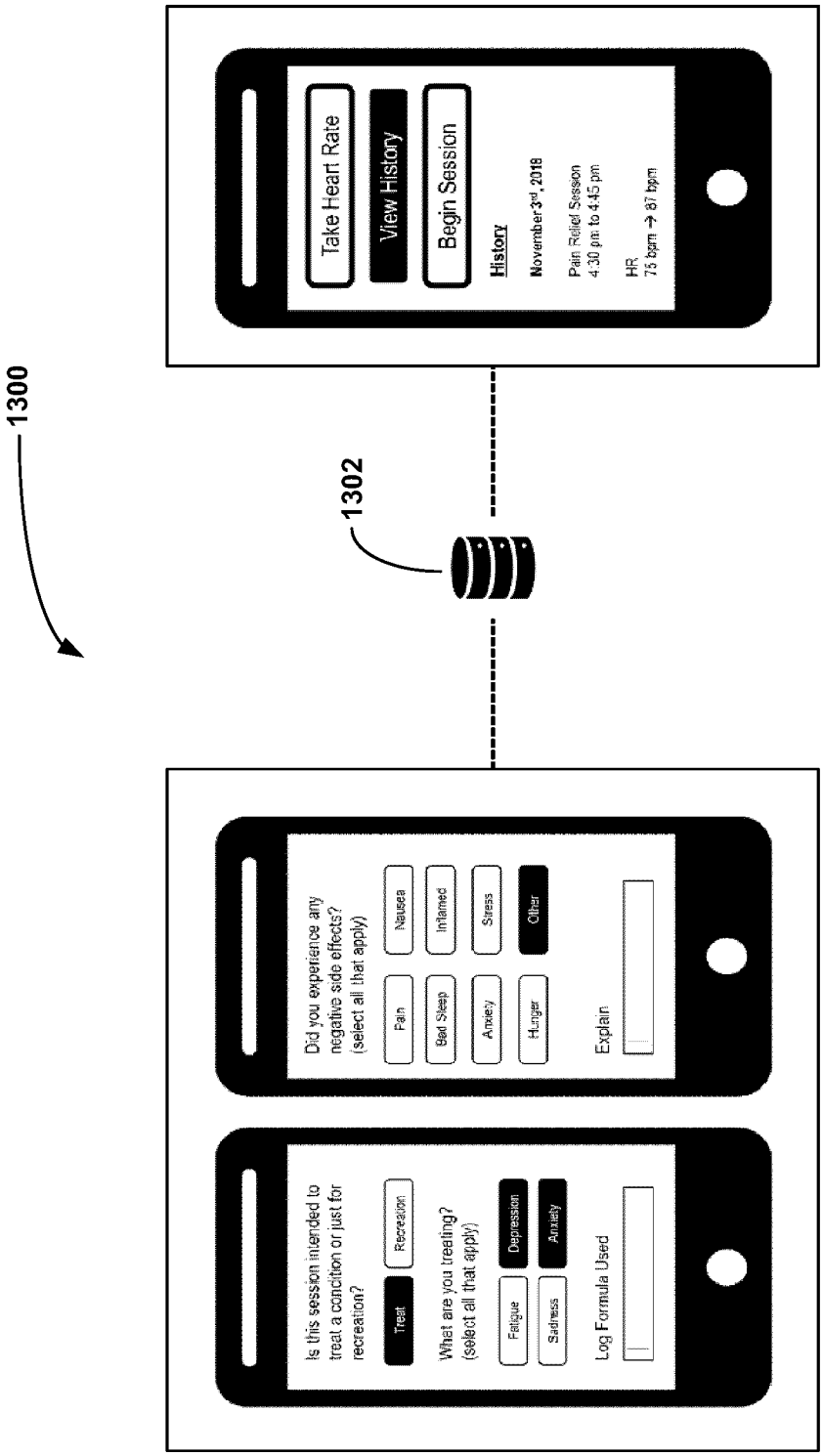
1300
1302
Take Heart Rate
View History
Begin Session
History
November 3rd, 2018
Pain Relief Session
4:30 pm to 4:45 pm
HR
75 bpm → 87 bpm
Did you experience any negative side effects? (select all that apply)
Pain
Nausea
Bad Sleep
Inflamed
Anxiety
Stress
Hunger
Other
Explain
Is this session intended to treat a condition or just for recreation?
Treat
Recreation
What are you treating? (select all that apply)
Fatigue
Depression
Sadness
Anxiety
Log Formula Used

FIG. 13

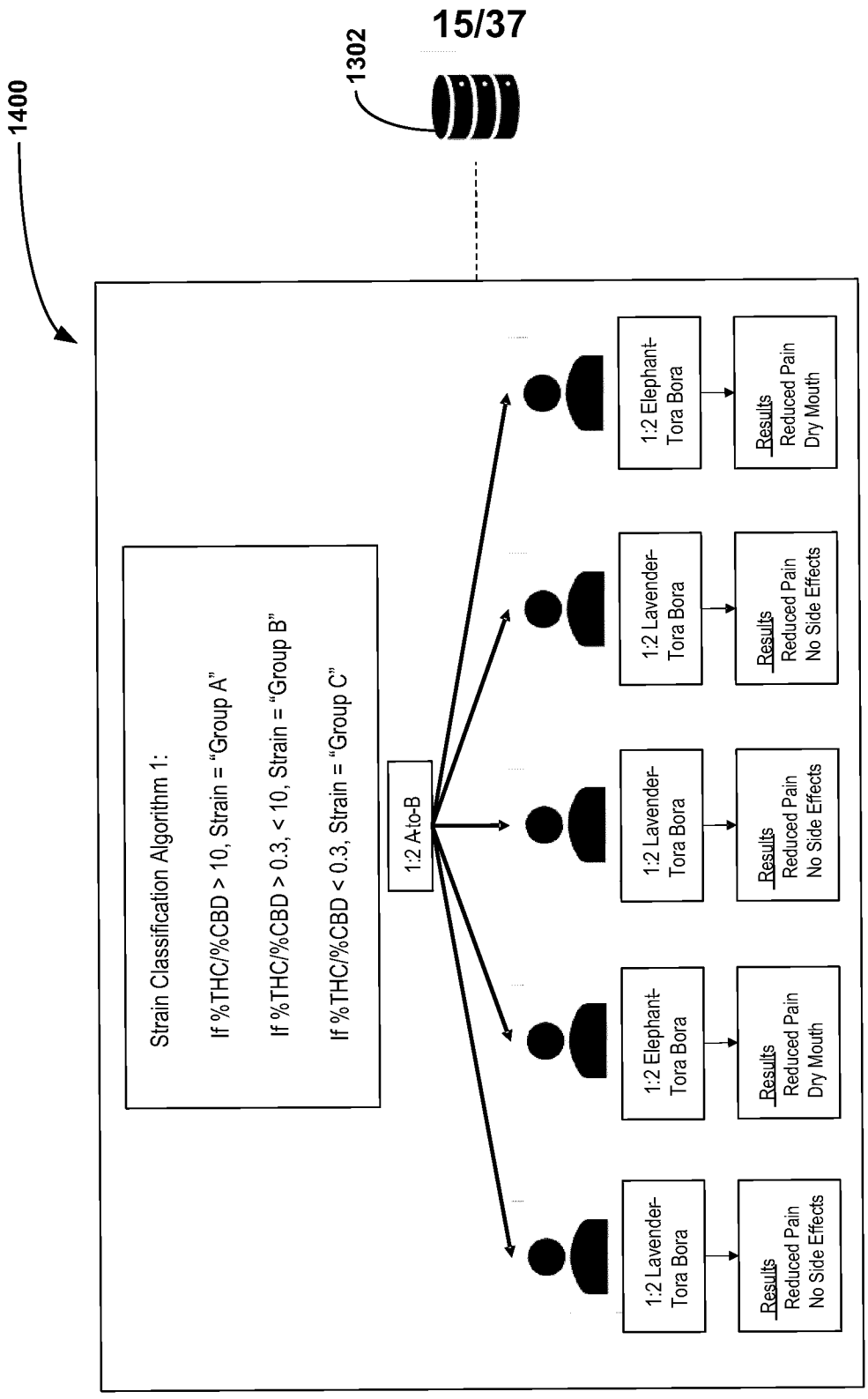
1400
1302
Strain Classification Algorithm 1:
If %THC/%CBD > 10, Strain = "Group A"
If %THC/%CBD > 0.3, < 10, Strain = "Group B"
If %THC/%CBD < 0.3, Strain = "Group C"
1:2 A-to-B
1:2 Lavender-Tora Bora
Results
Reduced Pain
No Side Effects
1:2 Elephant-Tora Bora
Results
Reduced Pain
Dry Mouth
1:2 Lavender-Tora Bora
Results
Reduced Pain
No Side Effects
1:2 Lavender-Tora Bora
Results
Reduced Pain
No Side Effects
1:2 Elephant-Tora Bora
Results
Reduced Pain
Dry Mouth

FIG. 14

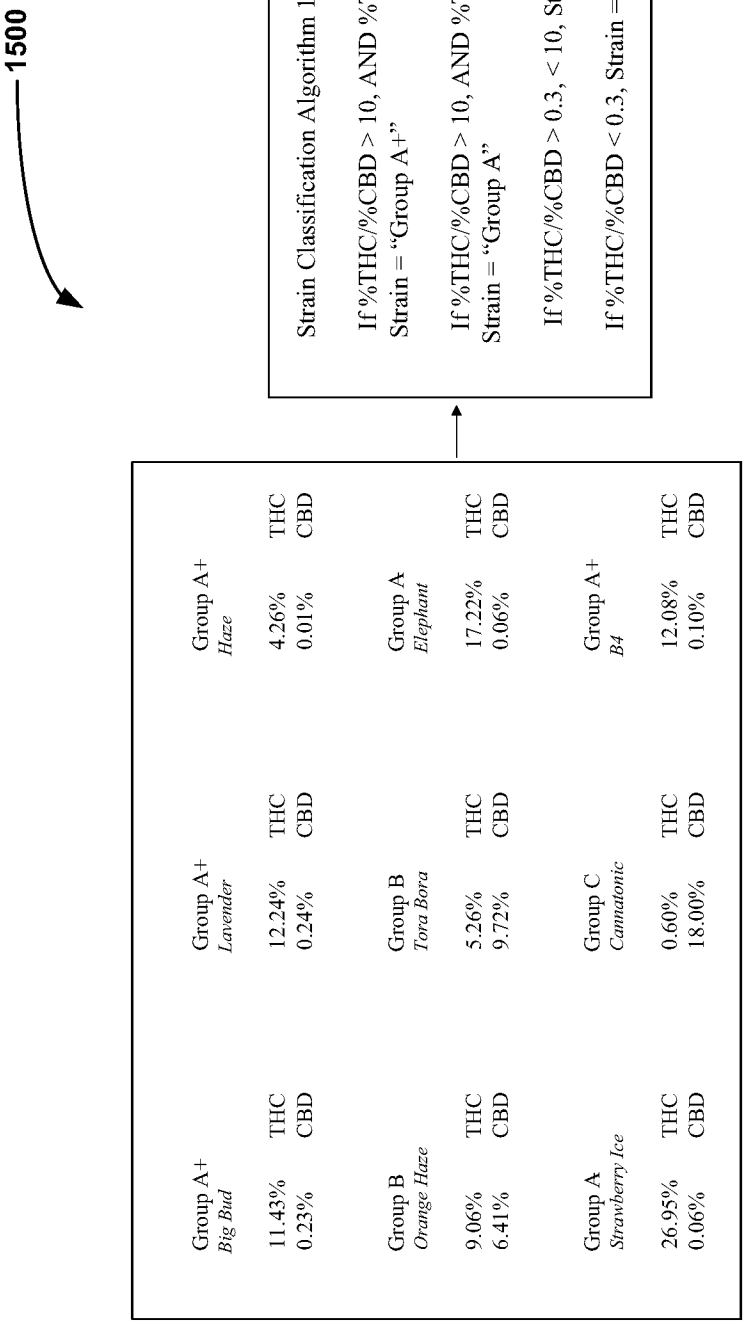
1500
Strain Classification Algorithm 1:
If %THC/%CBD > 10, AND %THC < 15%
Strain = "Group A+"
If %THC/%CBD > 10, AND %THC > 15%
Strain = "Group A"
If %THC/%CBD > 0.3, < 10, Strain = "Group B"
If %THC/%CBD < 0.3, Strain = "Group C"
Group A+
Big Bud
11.43% THC
0.23% CBD
Group A+
Lavender
12.24% THC
0.24% CBD
Group A+
Haze
4.26% THC
0.01% CBD
Group B
Orange Haze
9.06% THC
6.41% CBD
Group B
Tora Bora
5.26% THC
9.72% CBD
Group A
Elephant
17.22% THC
0.06% CBD
Group A
Strawberry Ice
26.95% THC
0.06% CBD
Group C
Cannatonic
0.60% THC
18.00% CBD
Group A+
B4
12.08% THC
0.10% CBD

FIG. 15

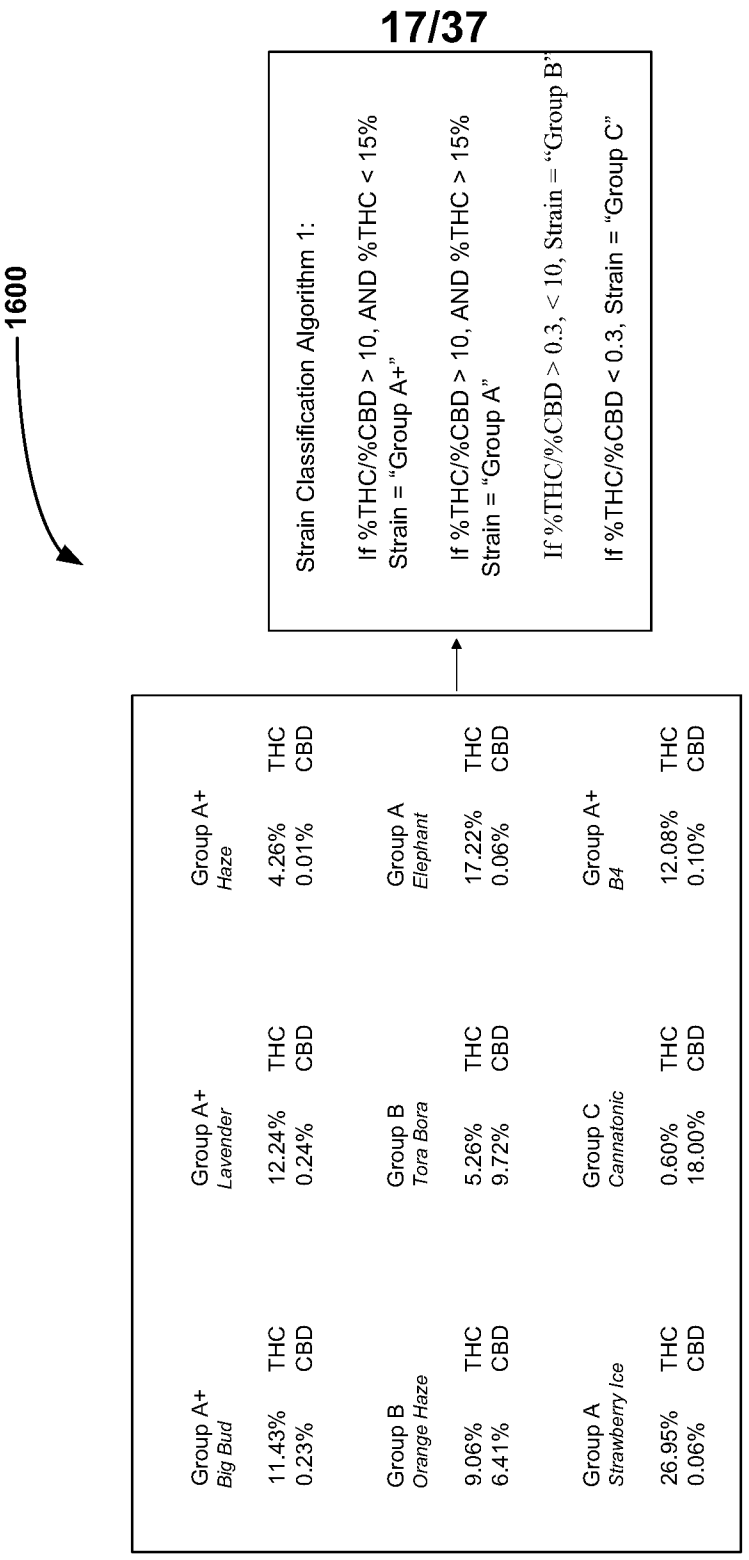
1600
Strain Classification Algorithm 1:
If %THC/%CBD > 10, AND %THC < 15%
Strain = "Group A+"
If %THC/%CBD > 10, AND %THC > 15%
Strain = "Group A"
If %THC/%CBD > 0.3, < 10, Strain = "Group B"
If %THC/%CBD < 0.3, Strain = "Group C"
Group A+
Big Bud
11.43% THC
0.23% CBD
Group A+
Lavender
12.24% THC
0.24% CBD
Group A+
Haze
4.26% THC
0.01% CBD
Group B
Orange Haze
9.06% THC
6.41% CBD
Group B
Tora Bora
5.26% THC
9.72% CBD
Group A
Elephant
17.22% THC
0.06% CBD
Group A
Strawberry Ice
26.95% THC
0.06% CBD
Group C
Cannatonic
0.60% THC
18.00% CBD
Group A+
B4
12.08% THC
0.10% CBD

FIG. 16

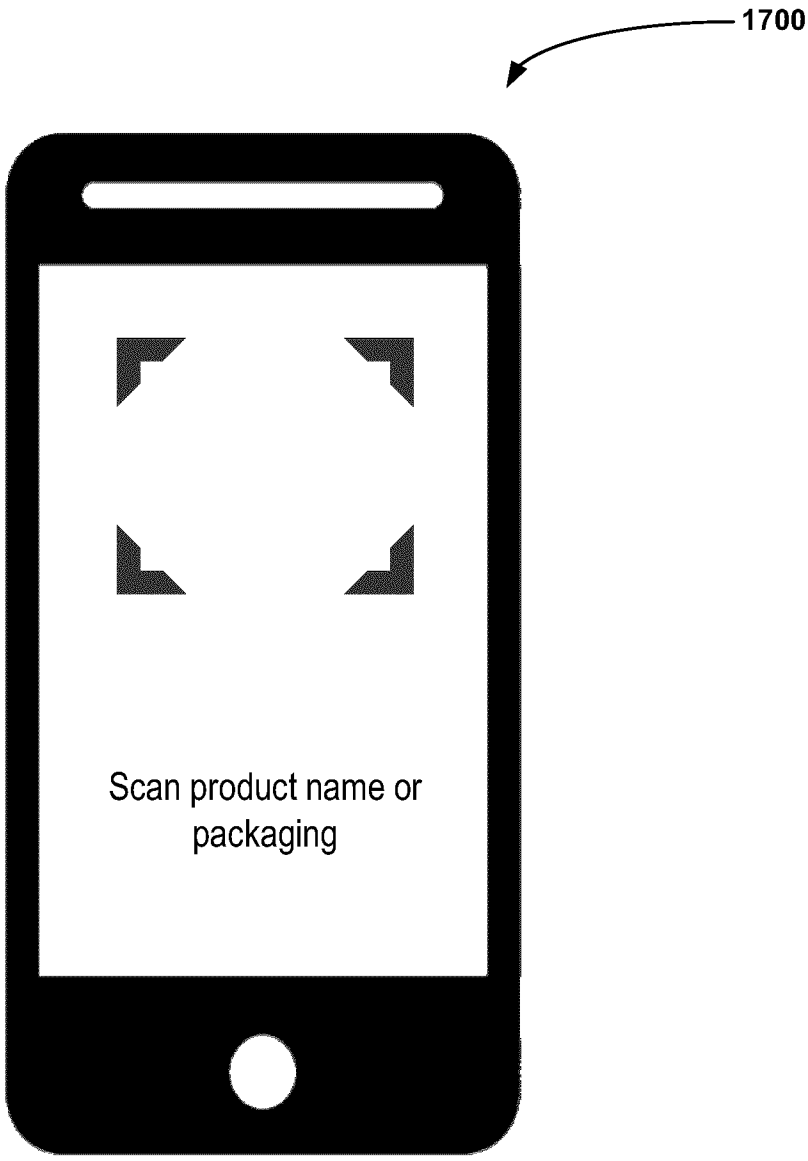

FIG. 17

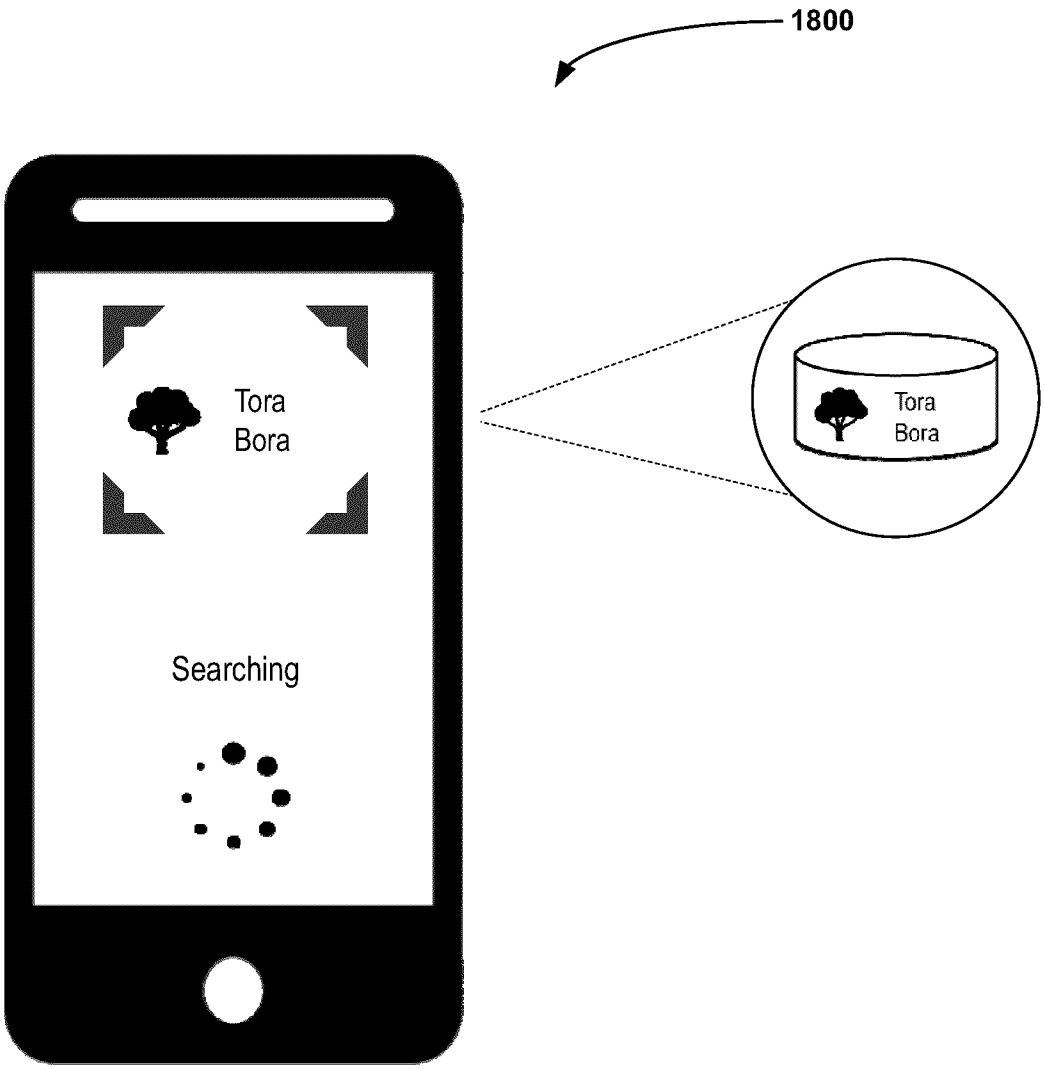

FIG. 18

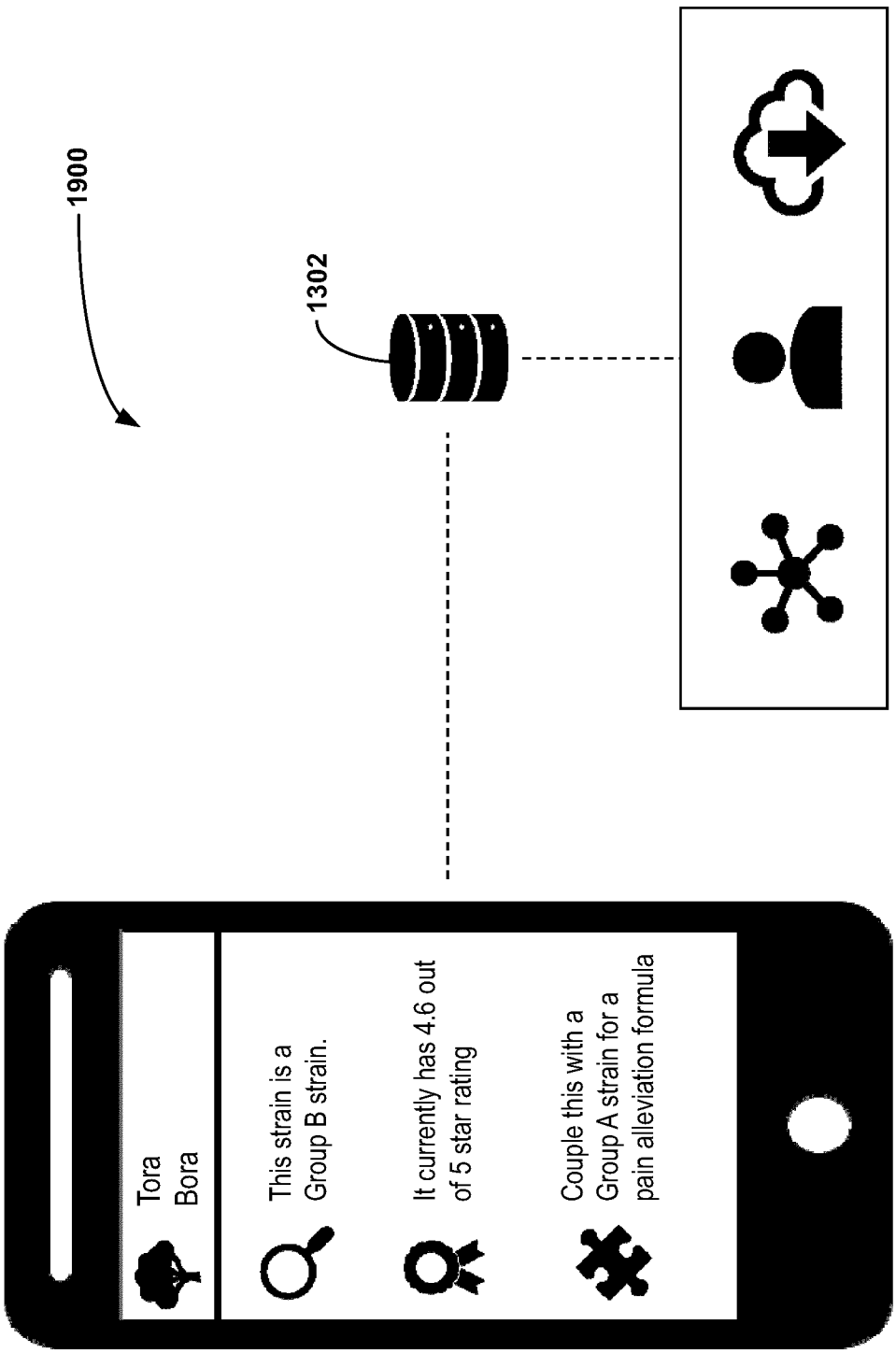
1900
1302
Tora
Bora
This strain is a Group B strain.
It currently has 4.6 out of 5 star rating
Couple this with a Group A strain for a pain alleviation formula

FIG. 19

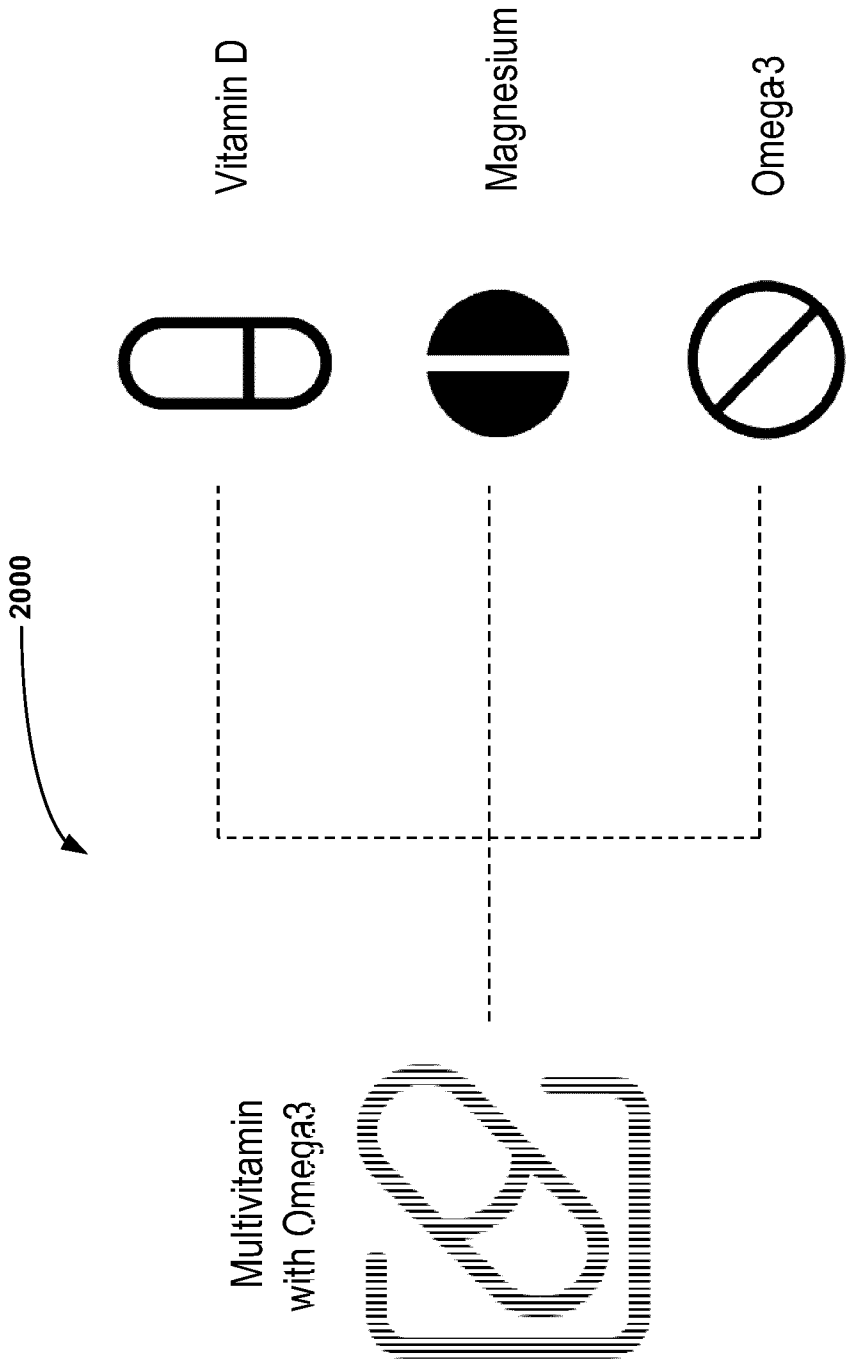

FIG. 20

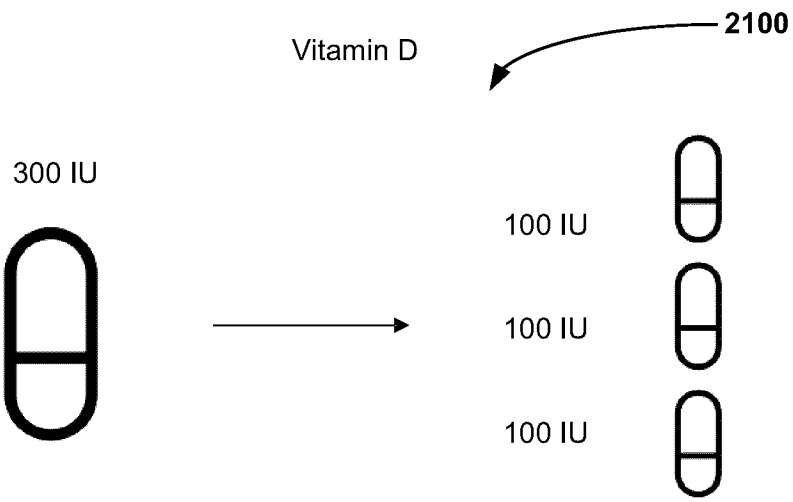
2100
Vitamin D
300 IU
100 IU
100 IU
100 IU

FIG. 21

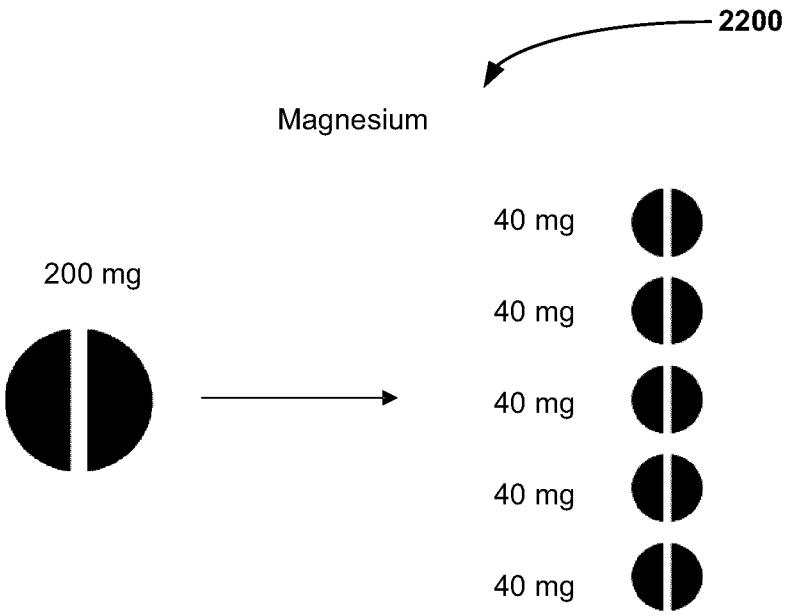
2200
Magnesium
200 mg
40 mg
40 mg
40 mg
40 mg
40 mg

FIG. 22

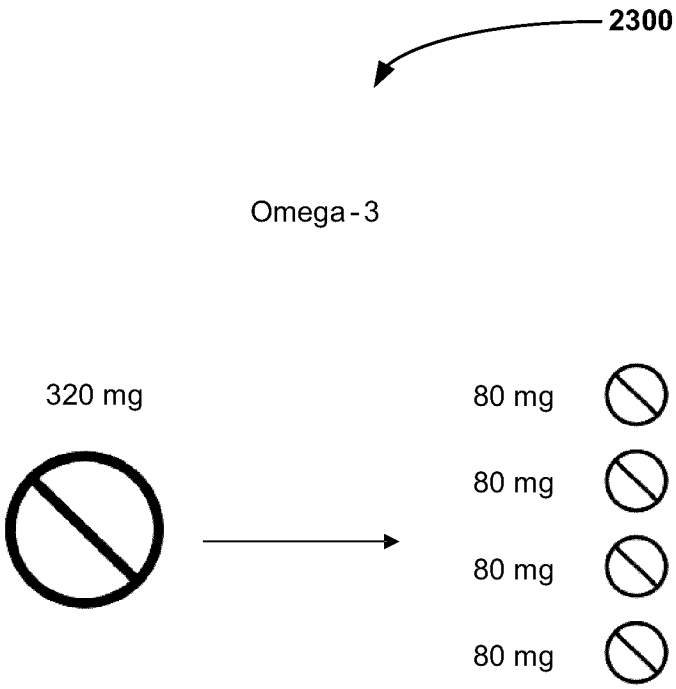

FIG. 23

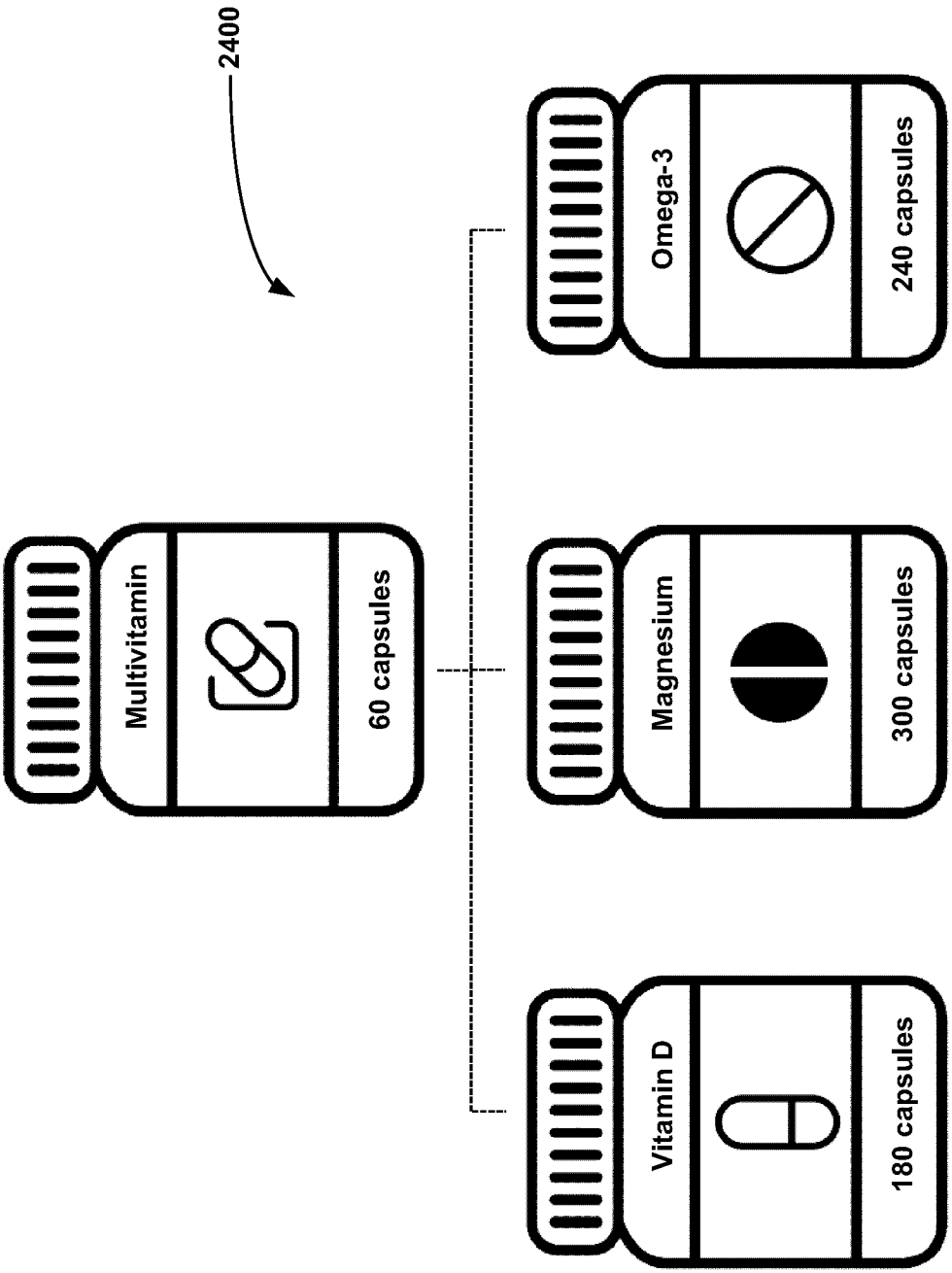
2400
Multivitamin
60 capsules
Omega-3
240 capsules
Magnesium
300 capsules
Vitamin D
180 capsules

FIG. 24

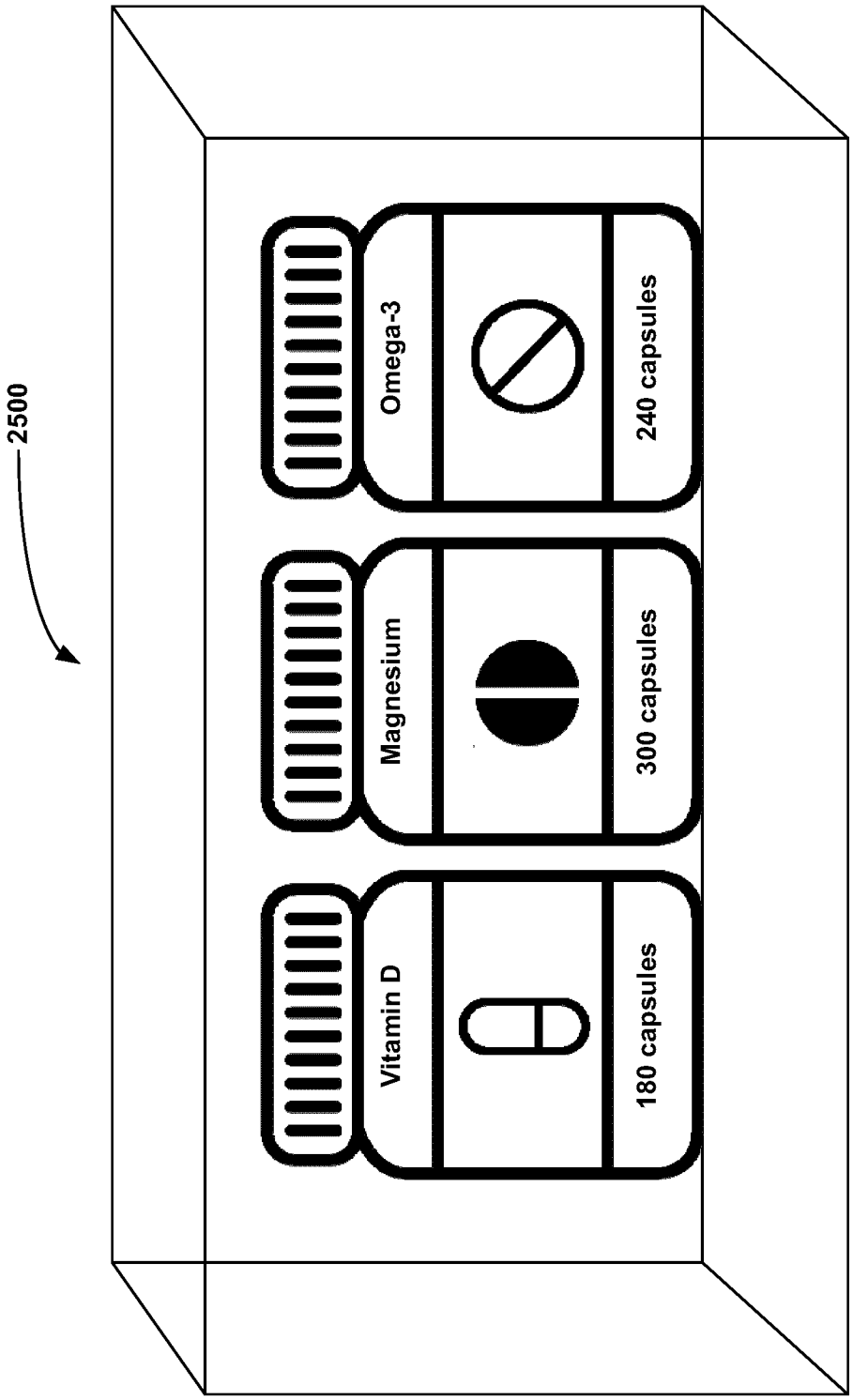
2500
Omega-3
240 capsules
Magnesium
300 capsules
Vitamin D
180 capsules

FIG. 25

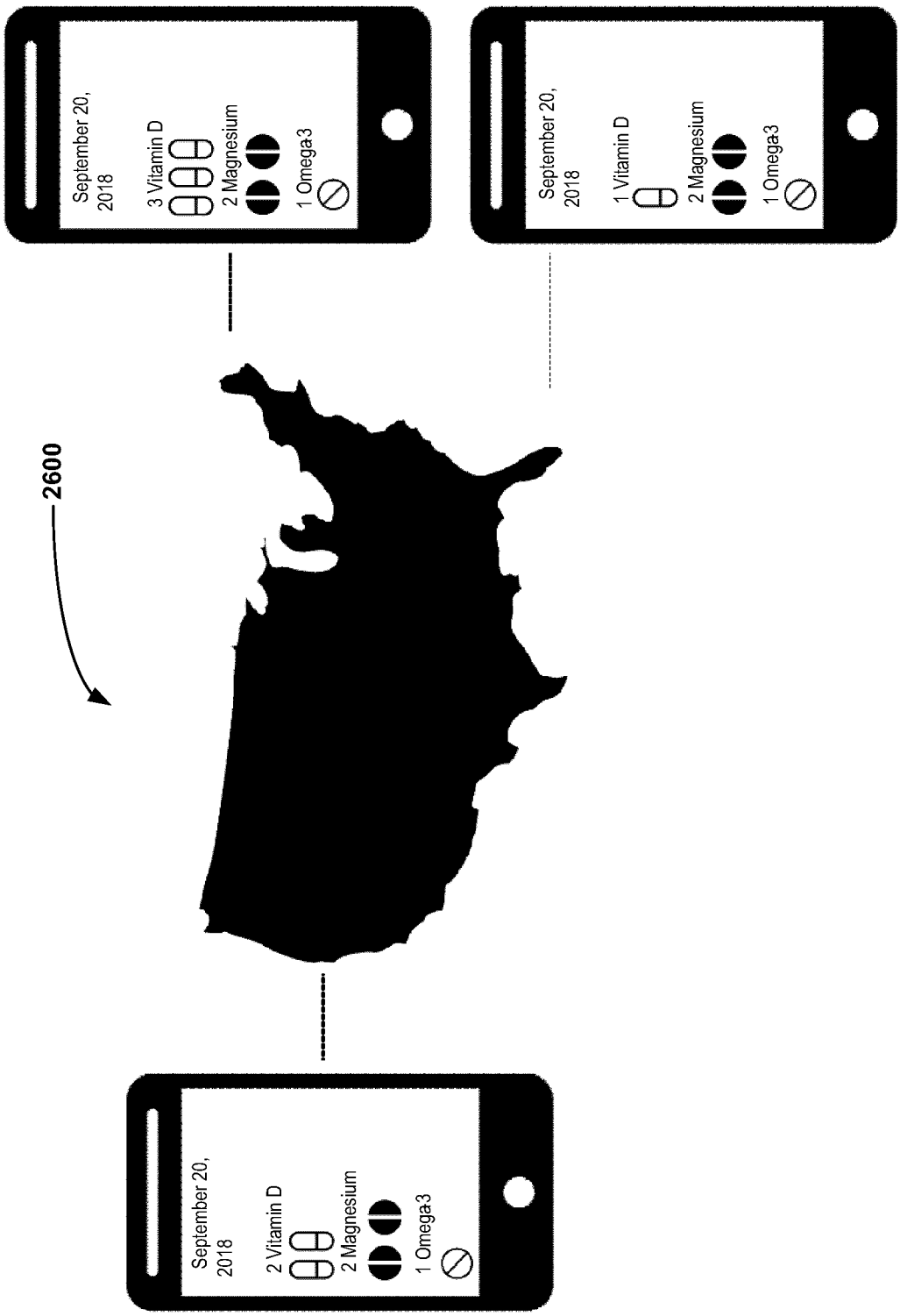
2600
September 20, 2018
3 Vitamin D
2 Magnesium
1 Omega3
September 20, 2018
1 Vitamin D
2 Magnesium
1 Omega3
September 20, 2018
2 Vitamin D
2 Magnesium
1 Omega3

FIG. 26

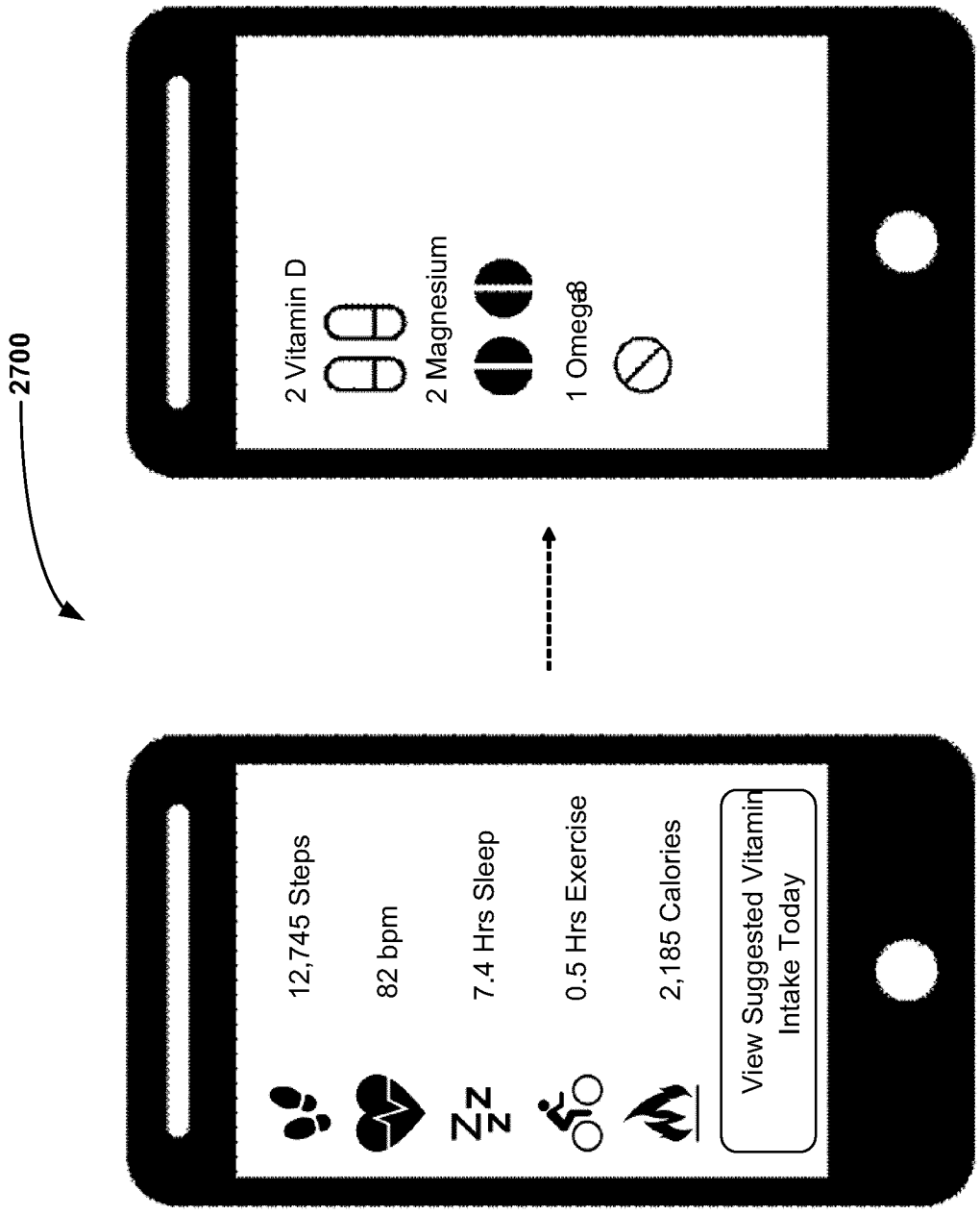
2700
12,745 Steps
82 bpm
7.4 Hrs Sleep
0.5 Hrs Exercise
2,185 Calories
View Suggested Vitamin Intake Today
2 Vitamin D
2 Magnesium
1 Omega-3

FIG. 27

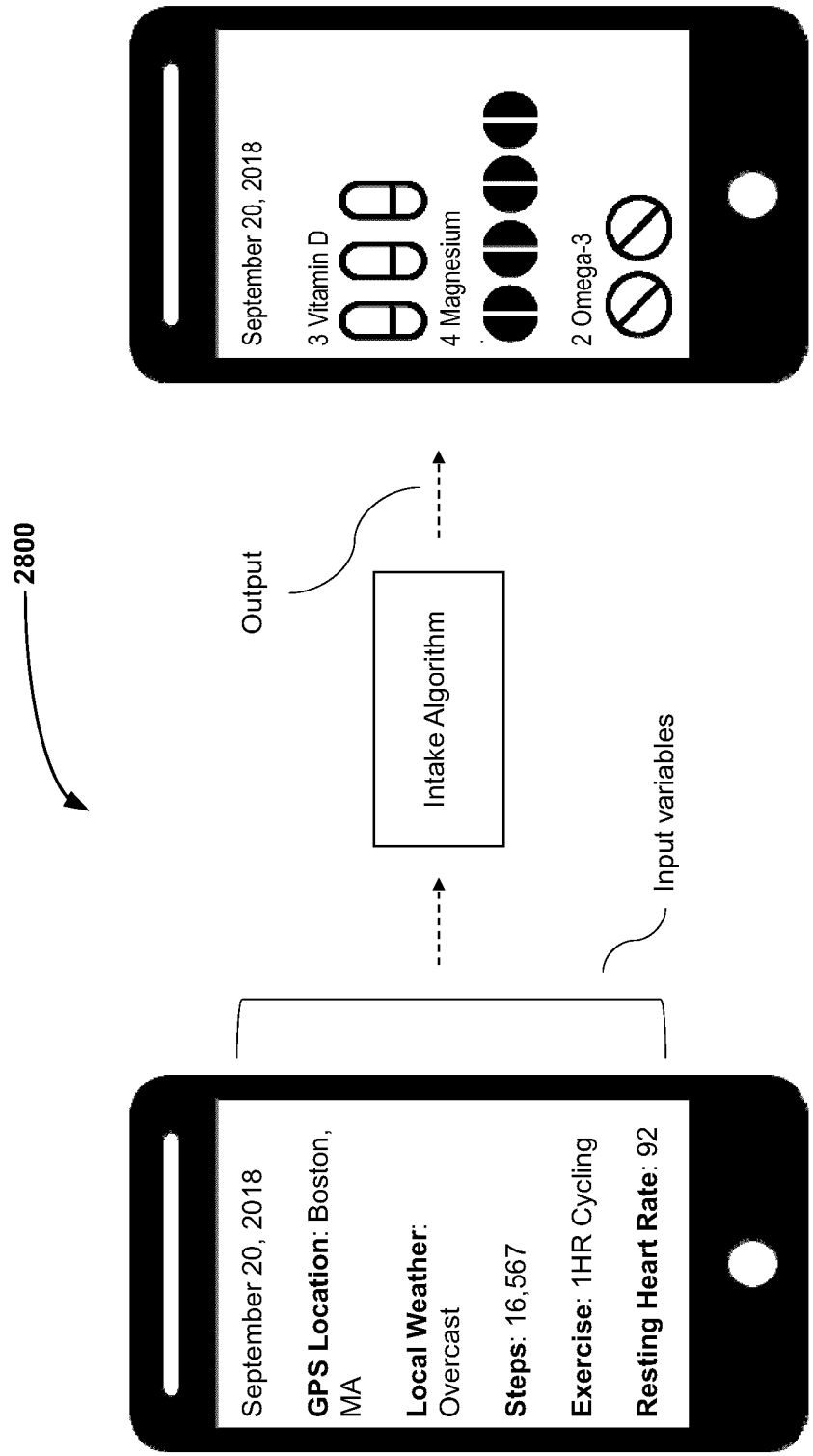
2800
September 20, 2018
GPS Location: Boston, MA
Local Weather: Overcast
Steps: 16,567
Exercise: 1HR Cycling
Resting Heart Rate: 92
Input variables
Intake Algorithm
Output
September 20, 2018
3 Vitamin D
4 Magnesium
2 Omega-3

FIG. 28

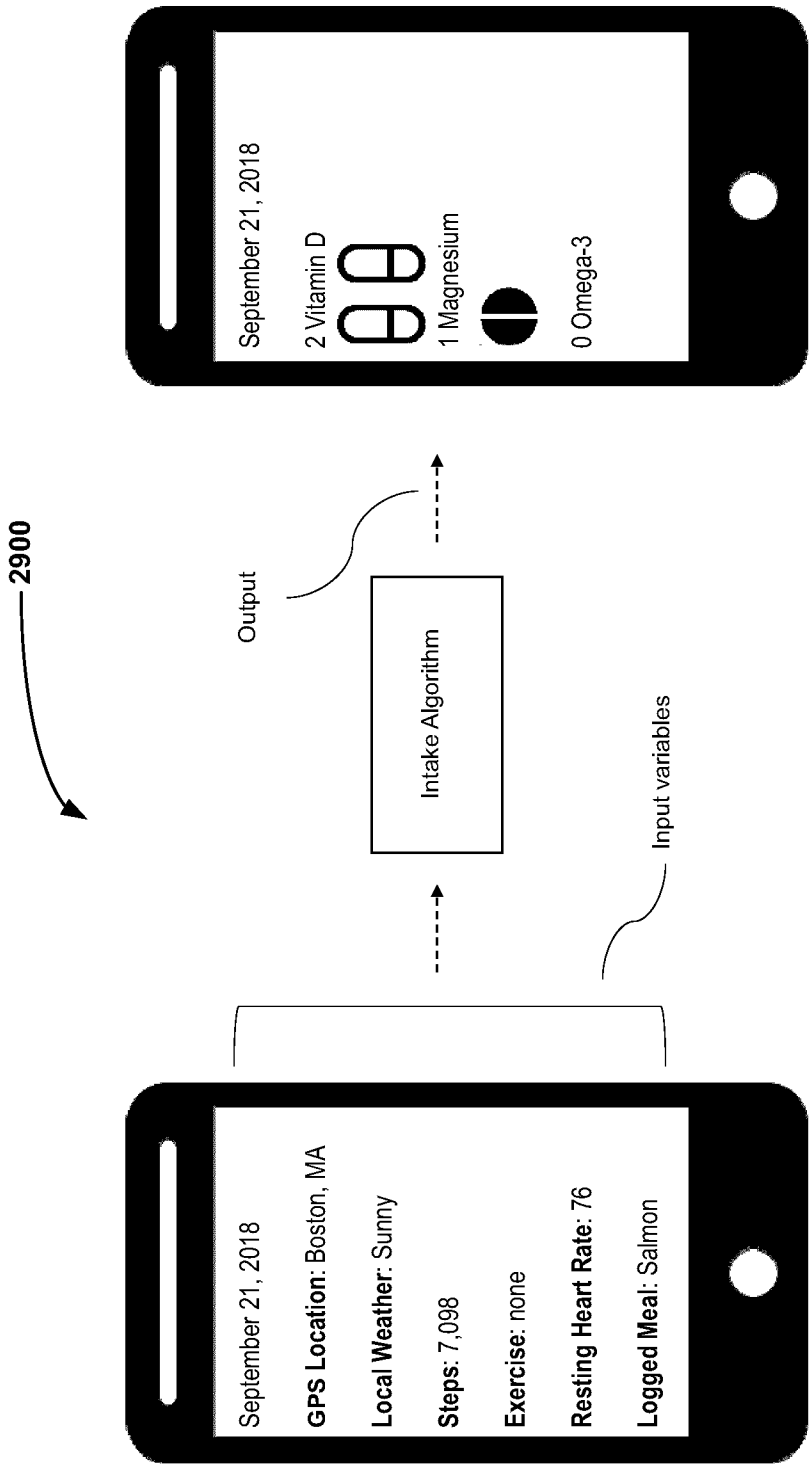
2900
September 21, 2018
GPS Location: Boston, MA
Local Weather: Sunny
Steps: 7,098
Exercise: none
Resting Heart Rate: 76
Logged Meal: Salmon
Input variables
Intake Algorithm
Output
September 21, 2018
2 Vitamin D
1 Magnesium
0 Omega-3

FIG. 29

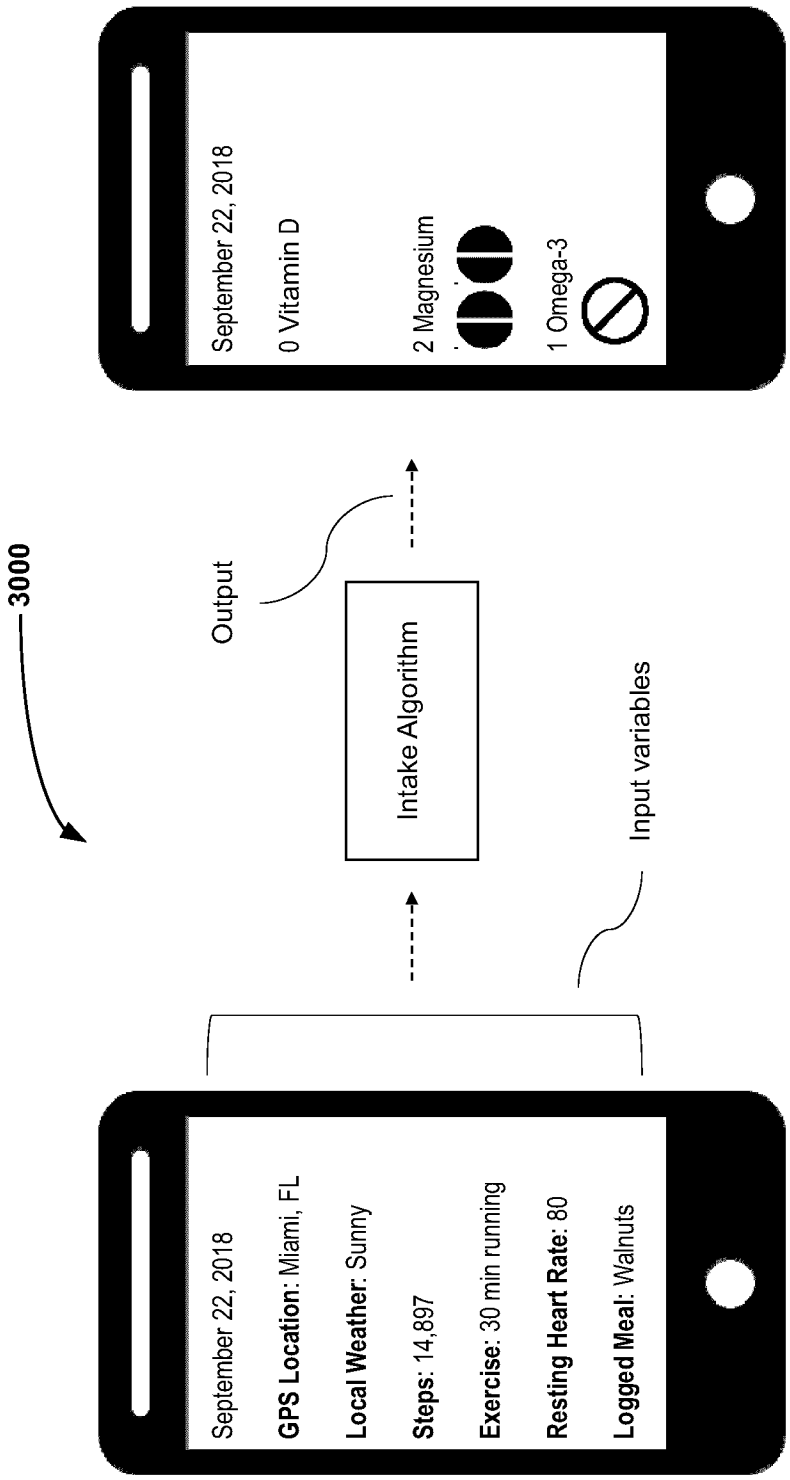
3000
September 22, 2018
GPS Location: Miami, FL
Local Weather: Sunny
Steps: 14,897
Exercise: 30 min running
Resting Heart Rate: 80
Logged Meal: Walnuts
Input variables
Intake Algorithm
Output
September 22, 2018
0 Vitamin D
2 Magnesium
1 Omega-3

FIG. 30

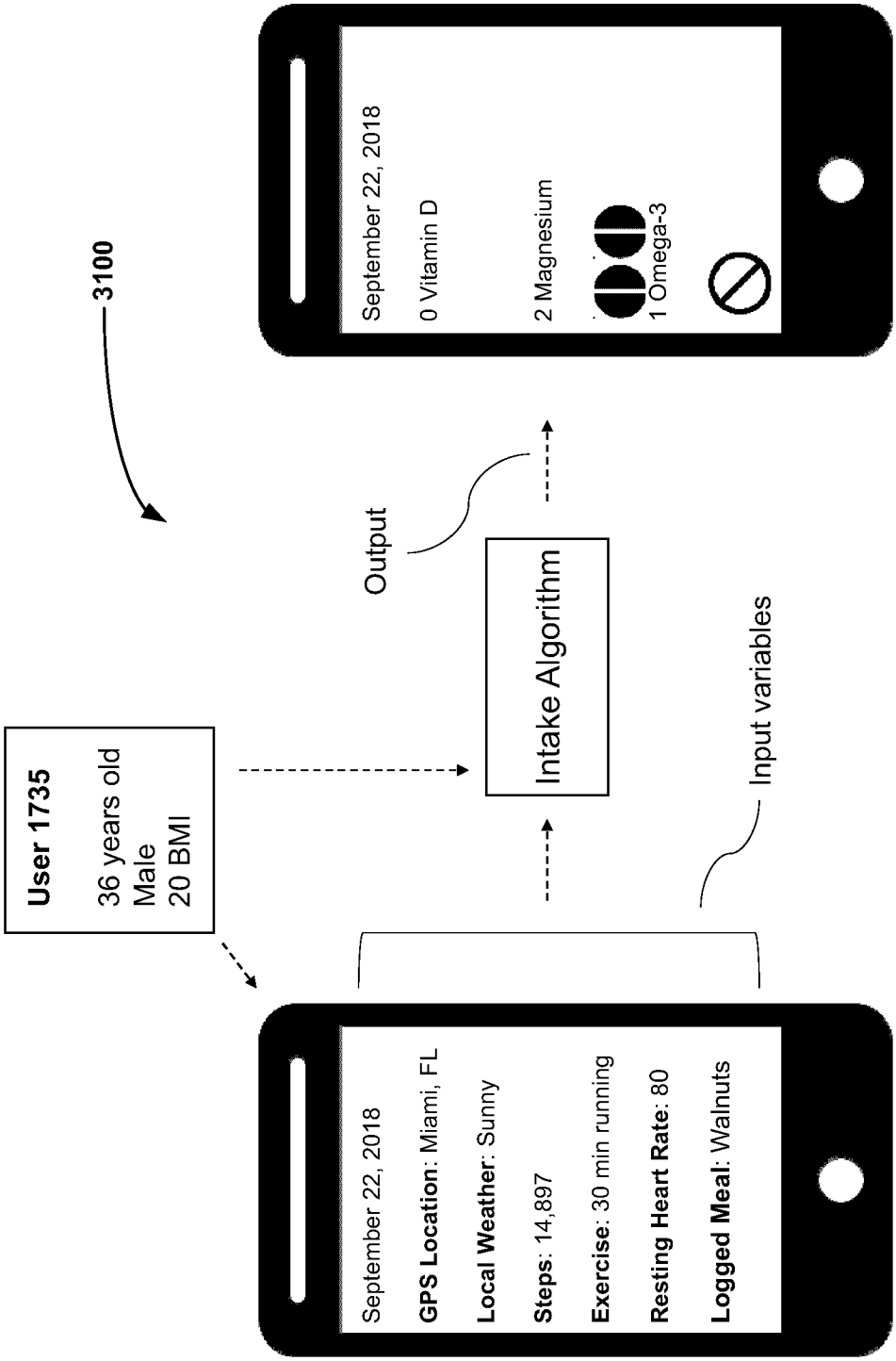
3100
User 1735
36 years old
Male
20 BMI
Intake Algorithm
Output
Input variables
September 22, 2018
GPS Location: Miami, FL
Local Weather: Sunny
Steps: 14,897
Exercise: 30 min running
Resting Heart Rate: 80
Logged Meal: Walnuts
September 22, 2018
0 Vitamin D
2 Magnesium
1 Omega-3

FIG. 31

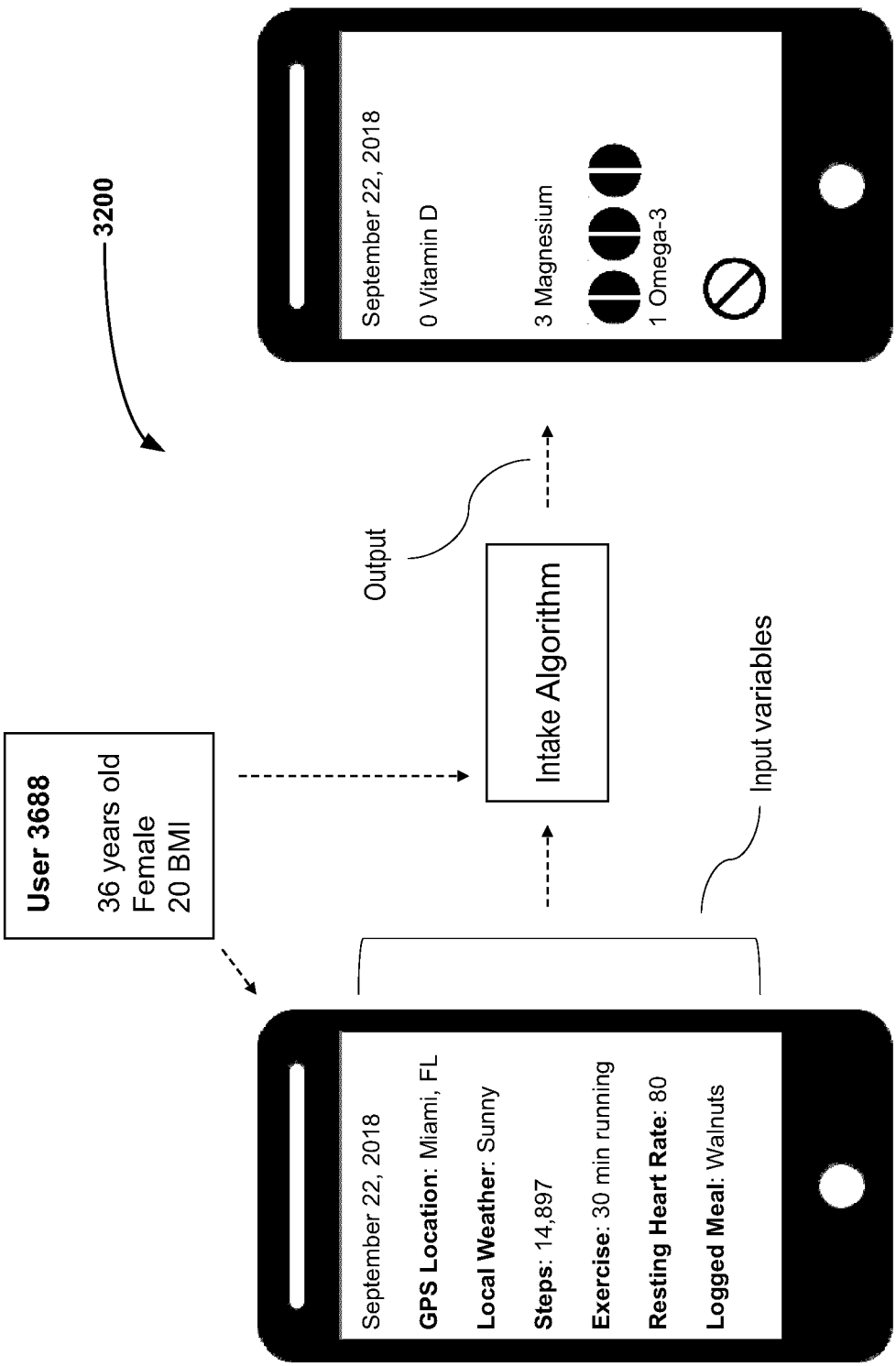
3200
User 3688
36 years old
Female
20 BMI
Intake Algorithm
Output
Input variables
September 22, 2018
GPS Location: Miami, FL
Local Weather: Sunny
Steps: 14,897
Exercise: 30 min running
Resting Heart Rate: 80
Logged Meal: Walnuts
September 22, 2018
0 Vitamin D
3 Magnesium
1 Omega-3

FIG. 32

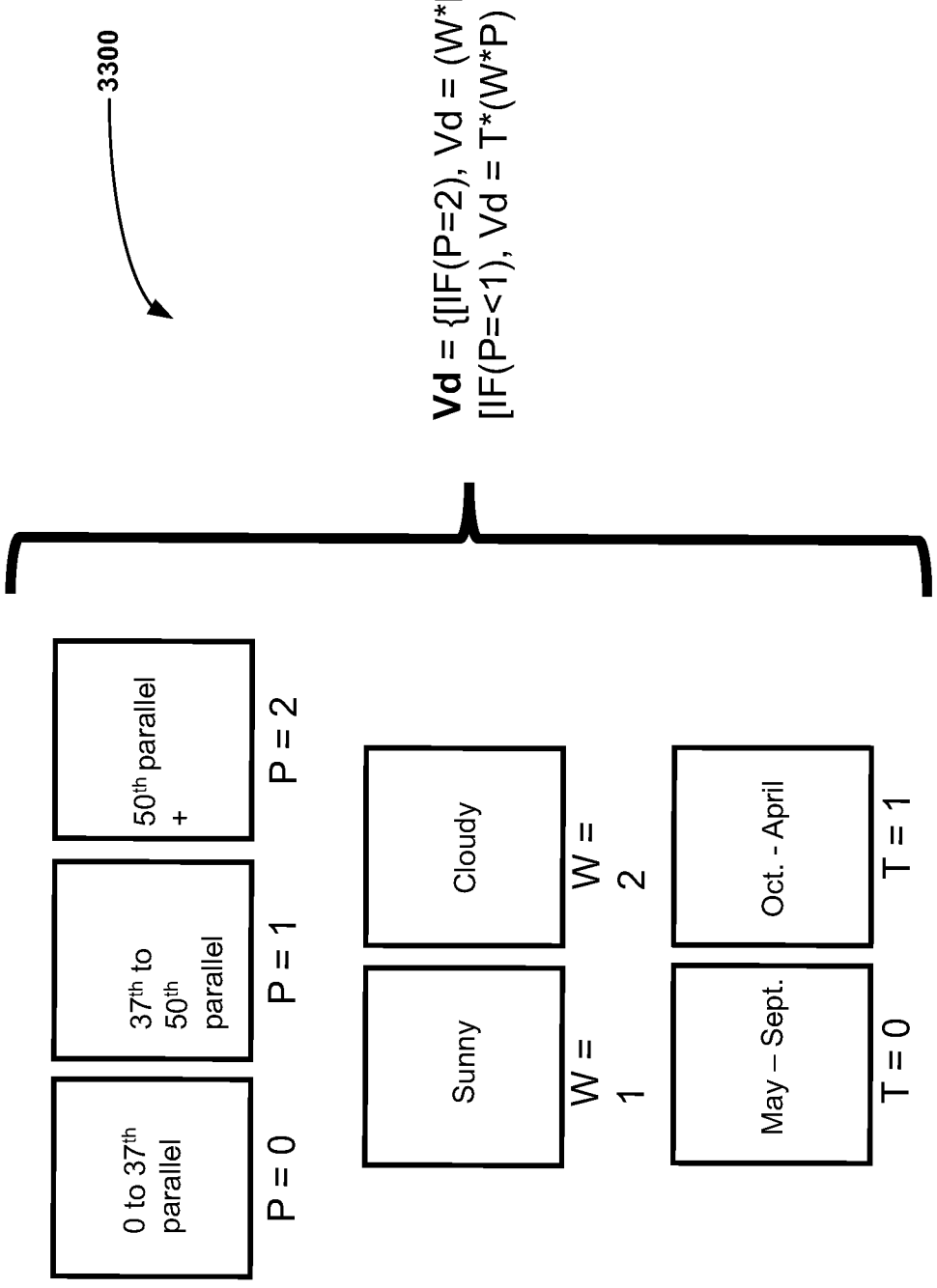
3300
Vd = {[IF(P=2), Vd = (W*P) + T],
[IF(P=<1), Vd = T*(W*P) + 1]}
0 to 37th parallel
P = 0
37th to 50th parallel
P = 1
50th parallel +
P = 2
Sunny
W = 1
Cloudy
W = 2
May – Sept.
T = 0
Oct. - April
T = 1

FIG. 33

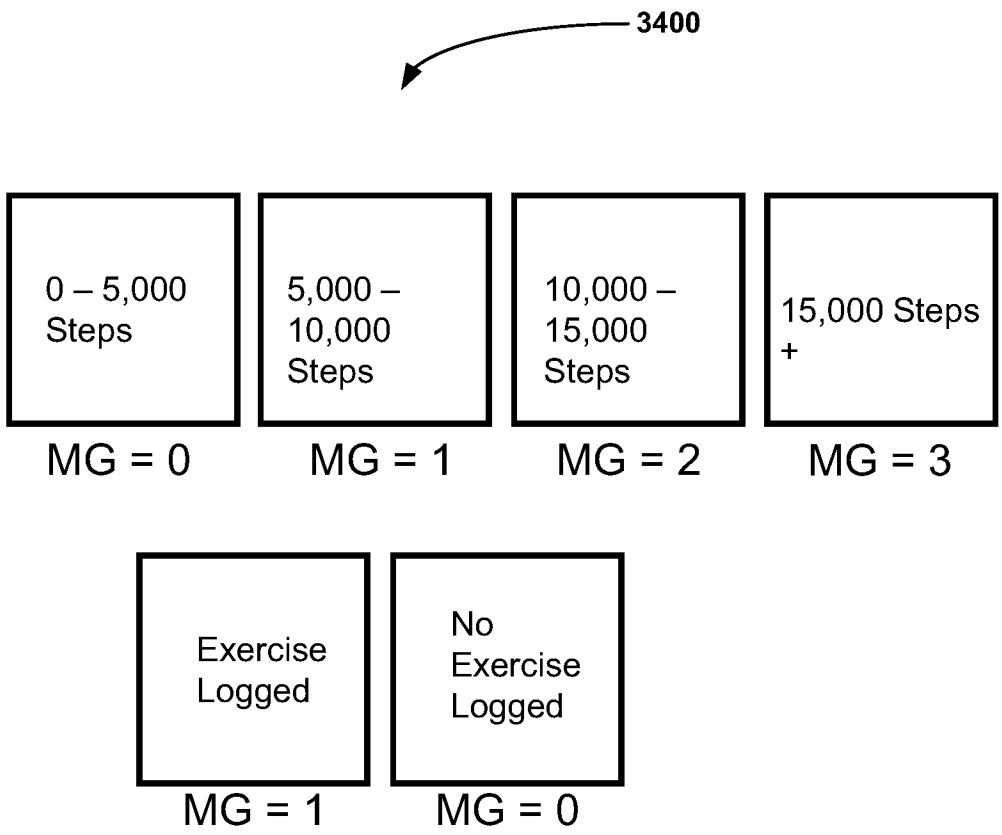
3400
0 – 5,000 Steps
5,000 – 10,000 Steps
10,000 – 15,000 Steps
15,000 Steps +
MG = 0
MG = 1
MG = 2
MG = 3
Exercise Logged
No Exercise Logged
MG = 1
MG = 0

FIG. 34

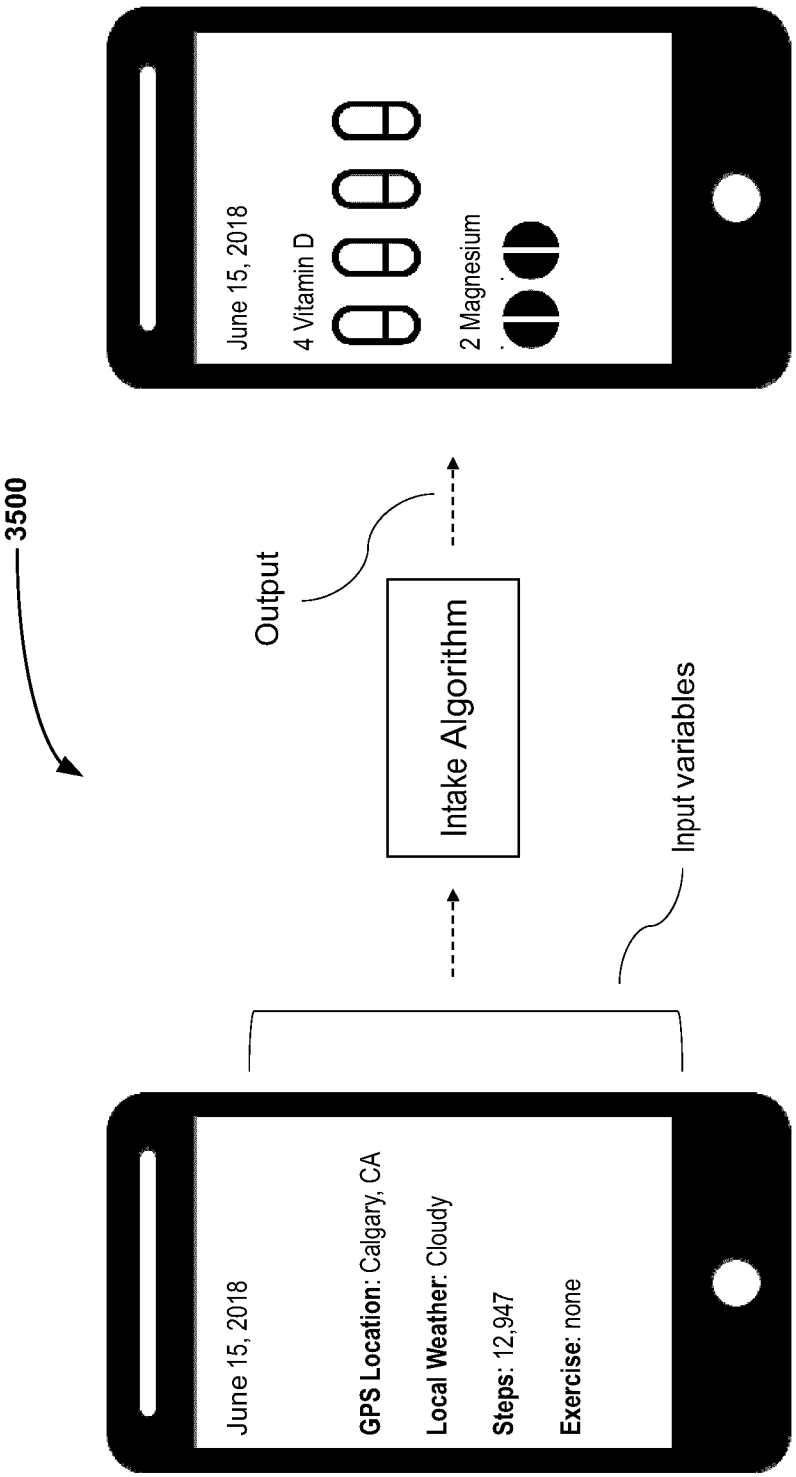
3500
June 15, 2018
GPS Location: Calgary, CA
Local Weather: Cloudy
Steps: 12,947
Exercise: none
Input variables
Intake Algorithm
Output
June 15, 2018
4 Vitamin D
2 Magnesium

FIG. 35

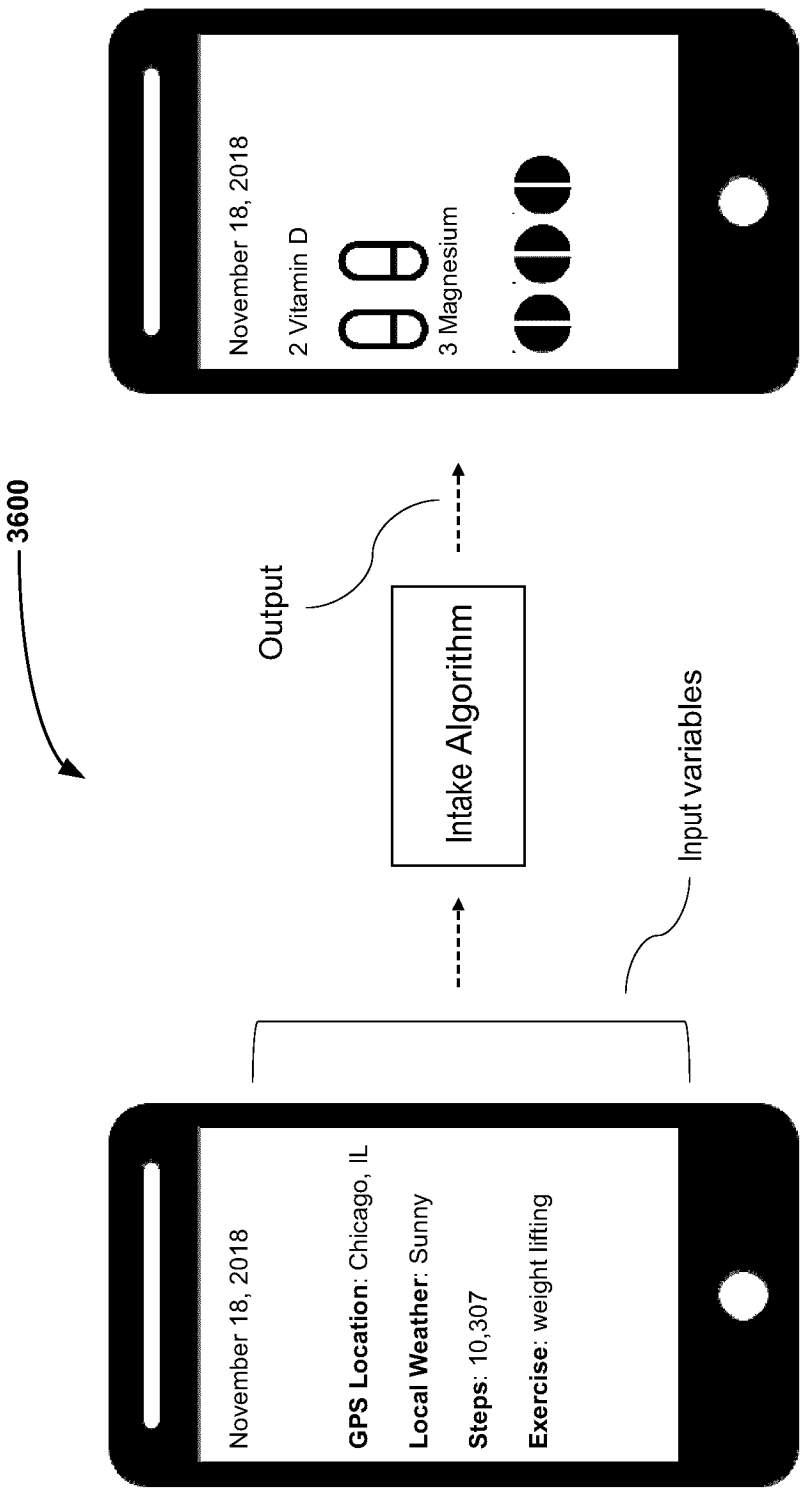
3600
November 18, 2018
GPS Location: Chicago, IL
Local Weather: Sunny
Steps: 10,307
Exercise: weight lifting
Input variables
Intake Algorithm
Output
November 18, 2018
2 Vitamin D
3 Magnesium

FIG. 36

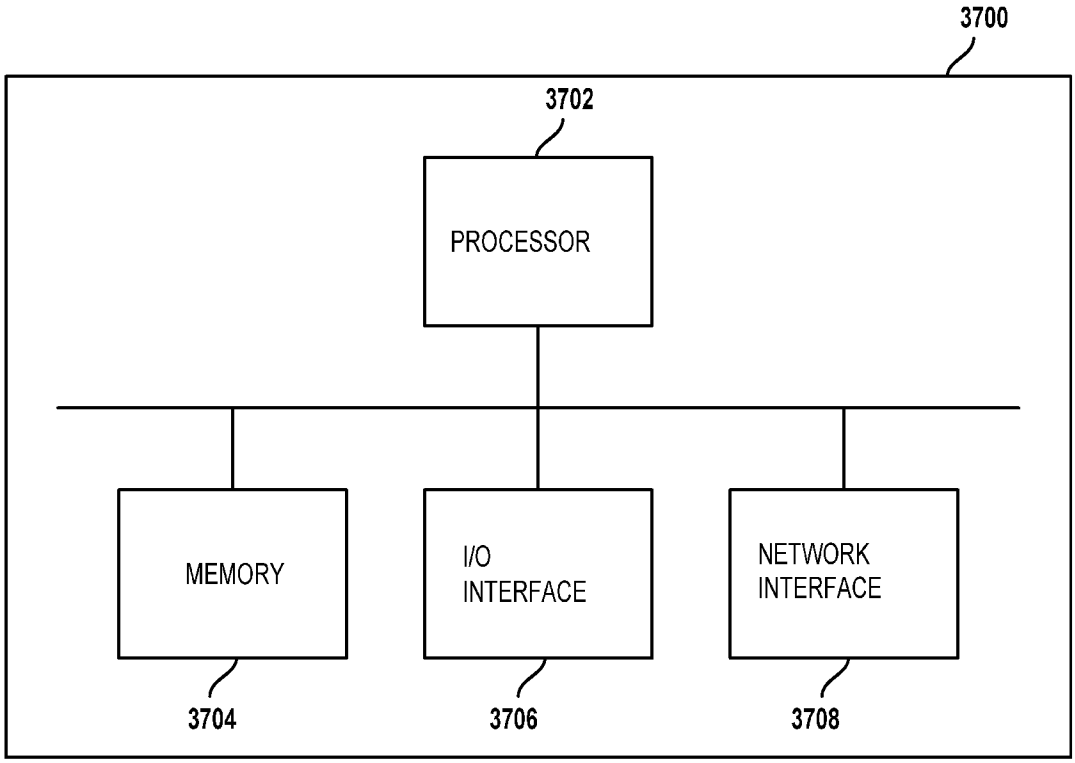
3700
3702
PROCESSOR
MEMORY
I/O
INTERFACE
NETWORK
INTERFACE
3704
3706
3708

FIG. 37

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2018/051489

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A61M 15/00*** (2006.01), ***A61B 5/00*** (2006.01), ***A61B 5/024*** (2006.01), ***A61M 11/00*** (2006.01), ***G16H 20/10*** (2018.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: A61M 15/00 (2006.01), A61B 5/00 (2006.01), A61B 5/024 (2006.01), A61M 11/00 (2006.01), G16H 20/10 (2018.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
ORBIT.
Keywords: cannabis, vaporizer, strains, powder, cartridges, heart rate, heat+, ratio, mix+, concentration, oximeter,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US2015/0090253 A1 (FARROW, D.) 02 April 2015 (02-04-2015) *[0037], [0044], [0045], [0047], [0050], [0057], [0058] & Fig. 3*	1-34
Y	WO2016/001926 A1 (DAVIDSON, P. et al.) 07 January 2016 (07-01-2016) *page 13, lines 3-9; page 14, lines 1-4; page 14, line 22 – page 15, line 2; page 20, line 15 – page 21, line 26; page 56, line 18 – page 57, line 29 & Figure 15*	1-7, 10-18, 21-24, 27-30, 33-34
Y	WO2017/055795 A1 (BAKER, D. et al.) 06 April 2017 (06-04-2017) * page 17, line 29 – page 18, line 3; page 18, line 30 – page 19, line 2*	8, 9, 19, 20, 25, 26, 31, 32
A, P	WO2018/057058 A1 (NEWBERRY, R.) 29 March 2018 (29-03-2018) *Whole document*	1-32
A	WO2017/122196 A1 (DAVIDSON, P. et al.) 20 July 2017 (20-07-2017) *Whole document*	1-32

☐ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier application or patent but published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 24 January 2019 (24-01-2019)	Date of mailing of the international search report 20 February 2019 (20-02-2019)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476	Authorized officer Robilyn Vanos (819) 639-7919

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2018/051489

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☑ Claim Nos.: 35-50
because they relate to subject matter not required to be searched by this Authority, namely:

Claims 35-50 are directed to a scheme, which the International Searching Authority is not required to search under PCT Rule 39.1(iii). The claimed subject matter is directed to a scheme for collecting information, performing calculations and generating a report. No new hardware, software, or technology is disclosed; instead known or unspecified hardware and software are being used in the manner in which it was intended.

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

UNITY

The claims are directed to a plurality of inventive concepts as follows:

Group A: Claims 1-34; **Group B:** Claims 35-49; and **Group C:** Claim 50.

Group A is directed toward a vaporizer device for dispensing chemical dosages;
Group B is directed toward a system for generating formulas for a wellness objective; and
Group C is directed toward a machine vision classifier.

The claims must be limited to one inventive concept as set out in PCT Rule 13.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☑ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2018/051489

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2015090253A1	02 April 2015 (02-04-2015)	US2015090253A1	02 April 2015 (02-04-2015)
		US9730472B2	15 August 2017 (15-08-2017)
		CA2866283A1	05 December 2014 (05-12-2014)
		CA2866283C	09 February 2016 (09-02-2016)
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		AU2015283589A1	09 February 2017 (09-02-2017)
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		CA2953069A1	07 January 2016 (07-01-2016)
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		EP3160554A4	18 April 2018 (18-04-2018)
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		IL249837A	30 August 2018 (30-08-2018)
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		RU2017102233A3	28 November 2018 (28-11-2018)
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		RU2017102234A3	12 December 2018 (12-12-2018)
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		RU2017102235A3	23 November 2018 (23-11-2018)
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		US2017136196A1	18 May 2017 (18-05-2017)
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