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(54) **TOUCHLESS FOOD DISPENSER**

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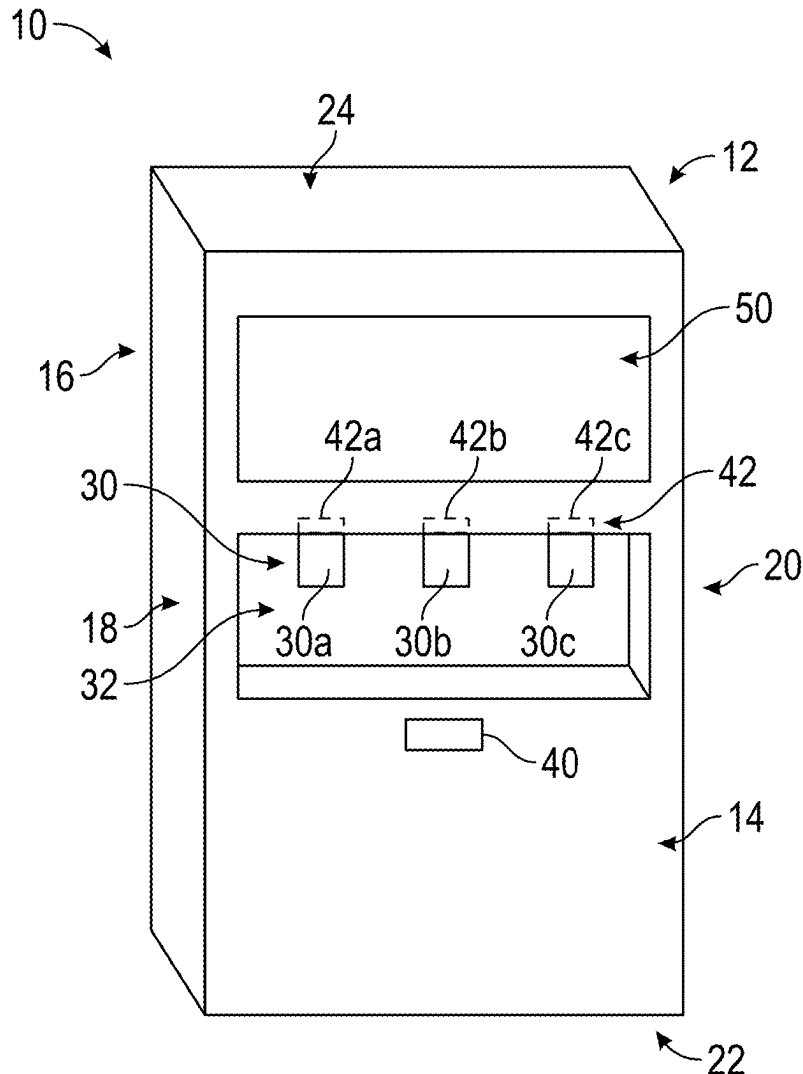
Related U.S. Application Data

(63) Continuation of application No. 18/421,630, filed on Jan. 24, 2024, now Pat. No. 12,318,045, which is a continuation of application No. 18/148,596, filed on Dec. 30, 2022, now Pat. No. 11,918,152.

(60) Provisional application No. 63/398,125, filed on Aug. 15, 2022.

(57) **ABSTRACT**

A touchless food dispenser. The touchless food dispenser includes one or more types of food stored therein, one or more removable nozzles, and one or more nozzle replacement mechanisms. The touchless food dispenser is configured to dispense the food through the one or more removable nozzles. The one or more nozzle replacement mechanisms are configured to remove the one or more removable nozzles and replaces the one or more removable nozzles with a different removable nozzle.



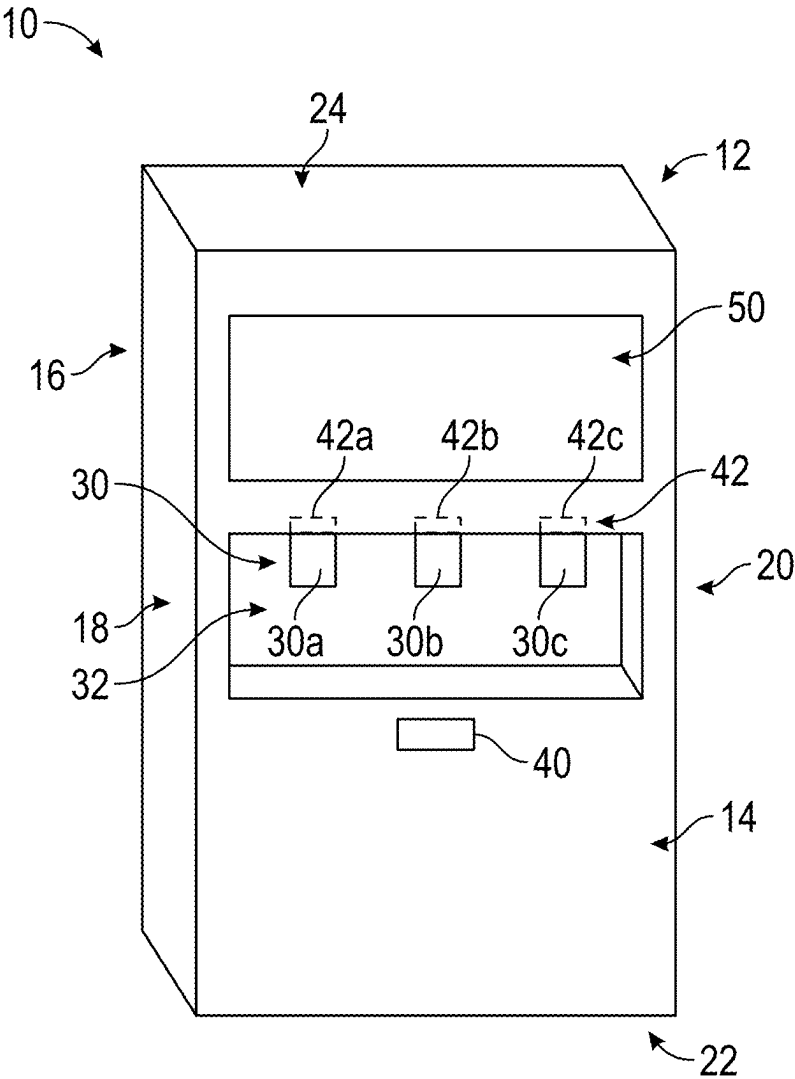
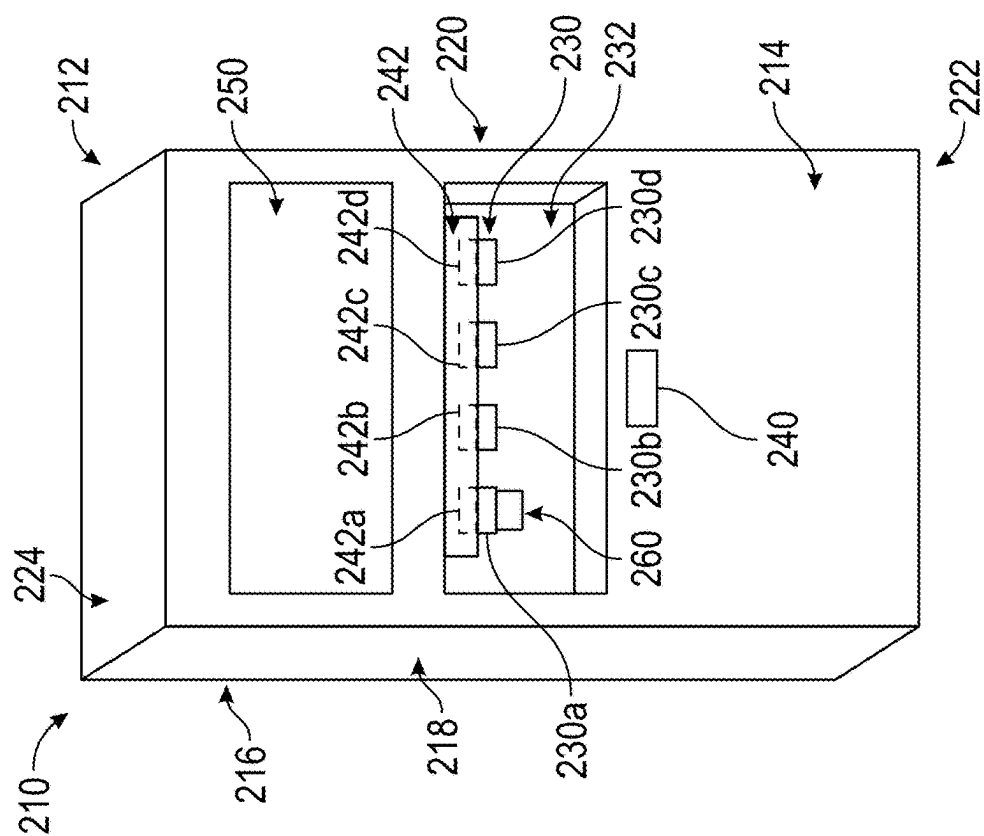
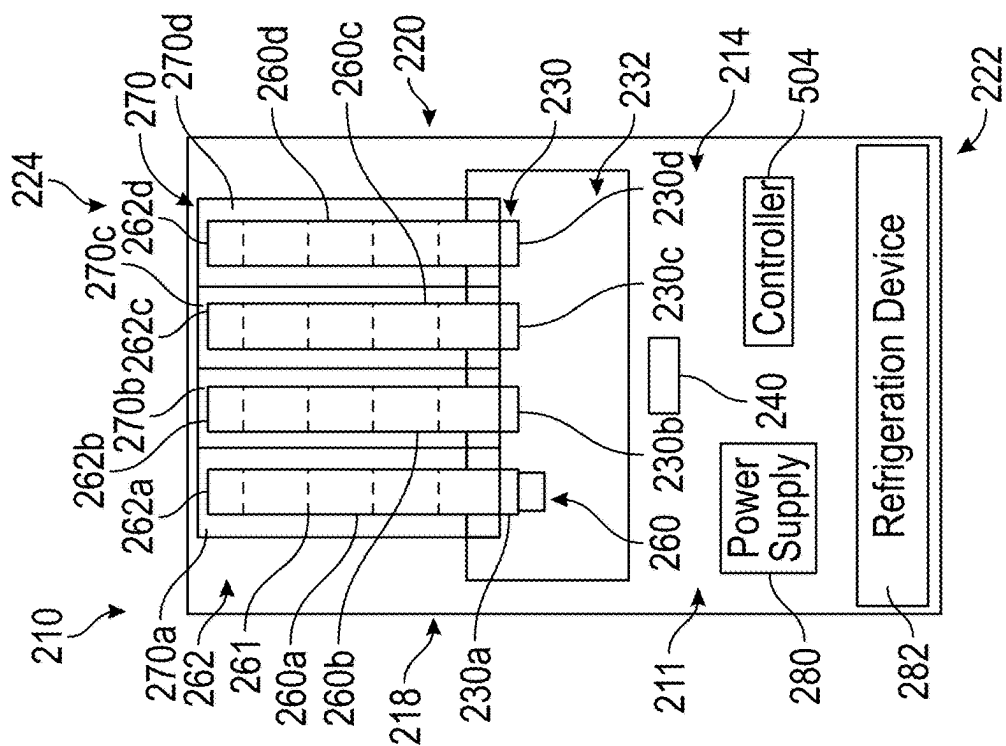


FIG. 1



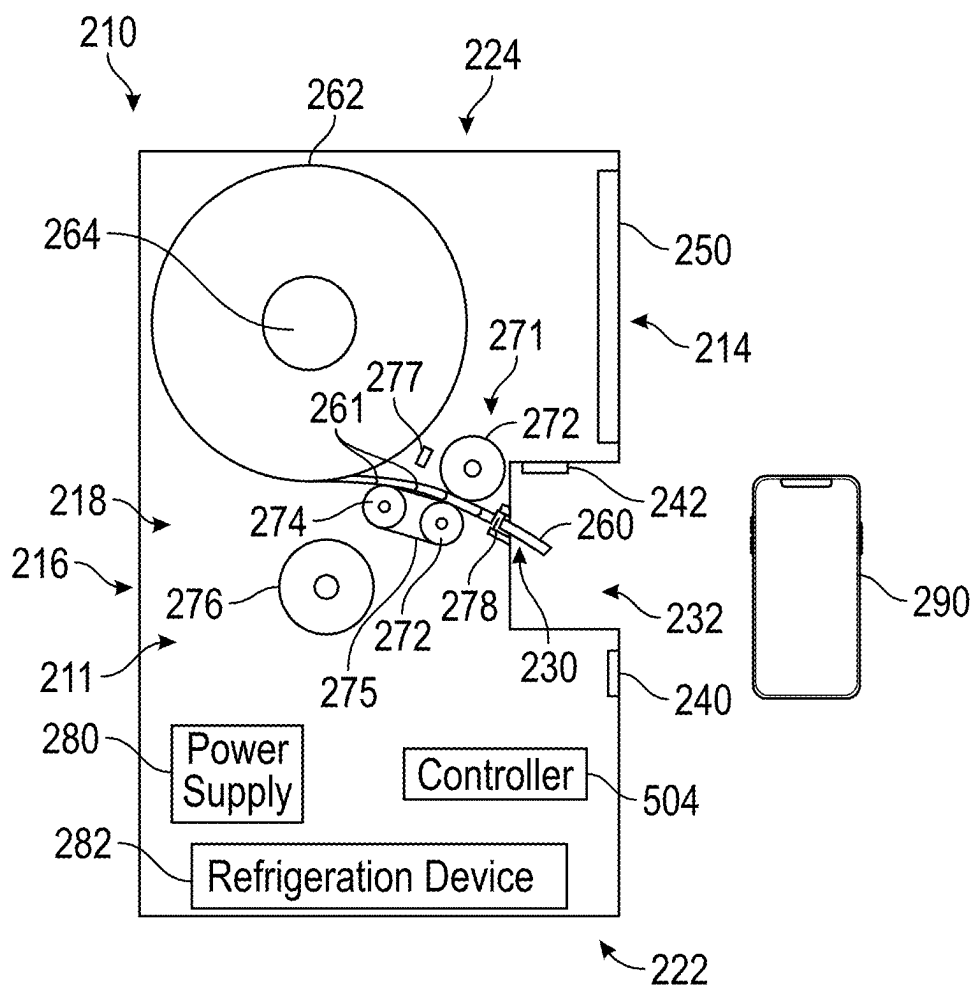


FIG. 2C

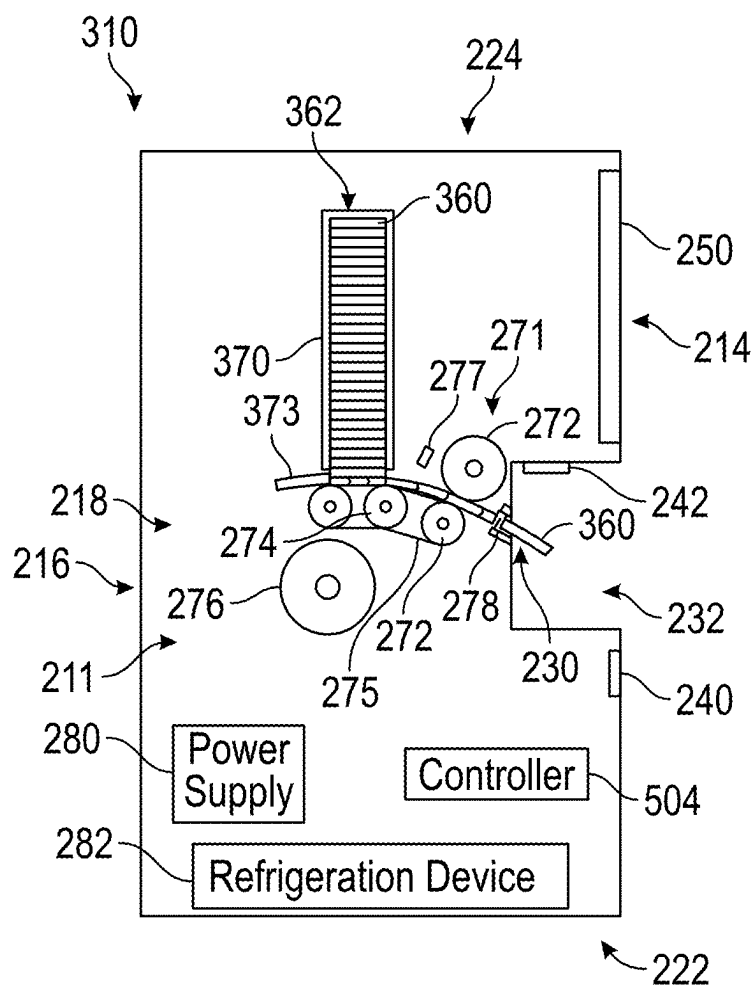


FIG. 3

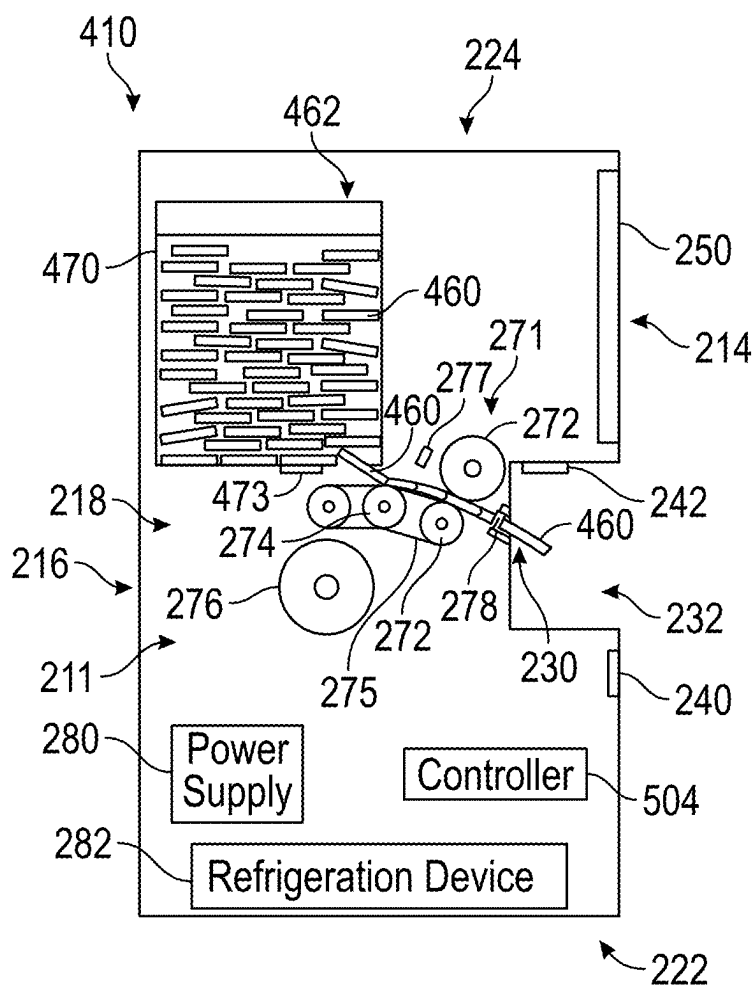


FIG. 4

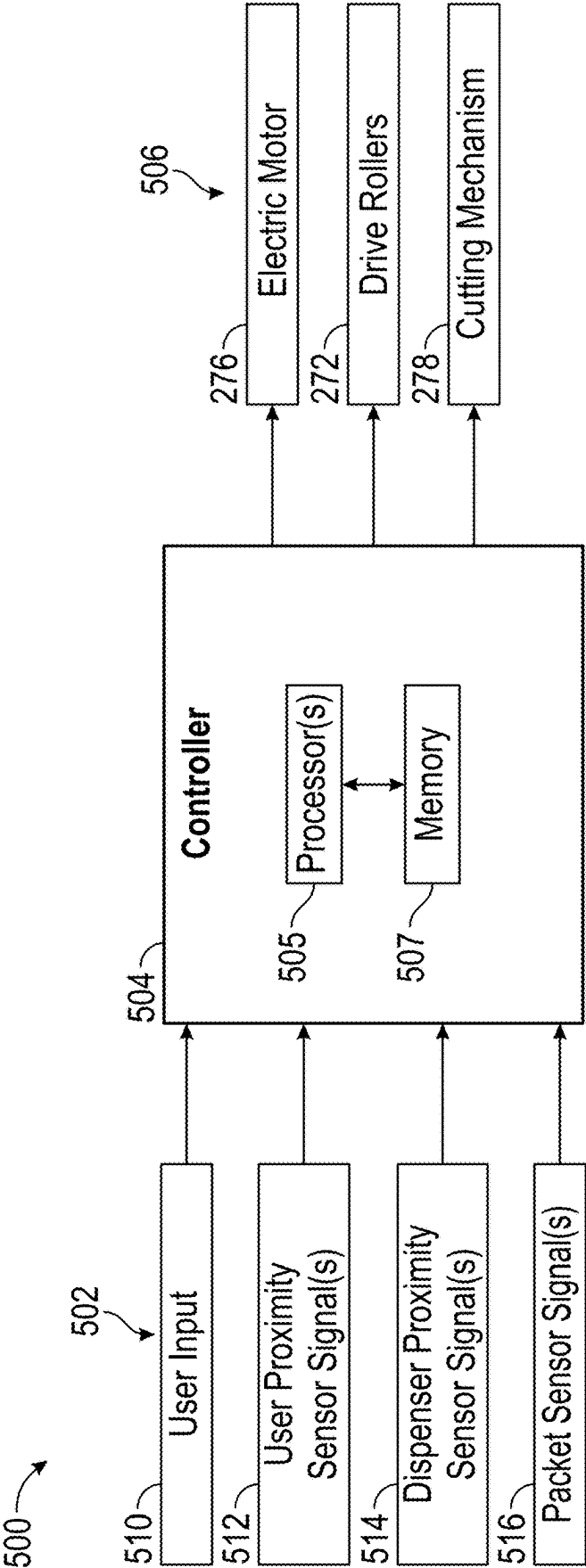


FIG. 5

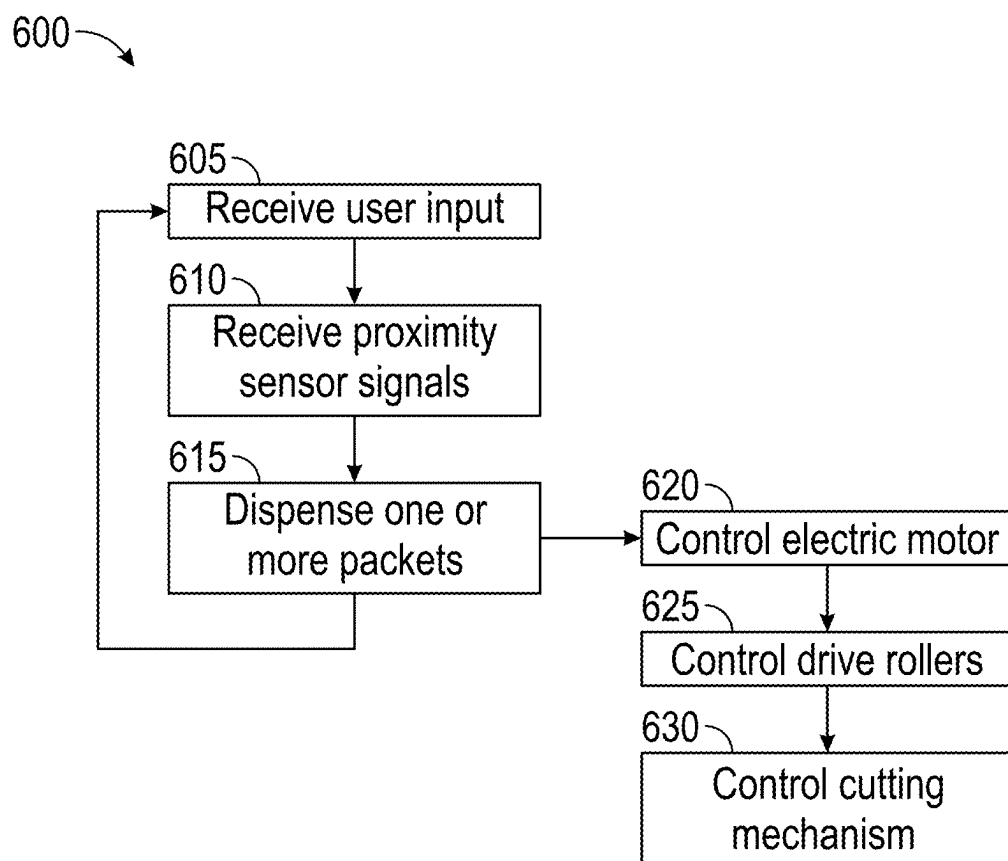


FIG. 6

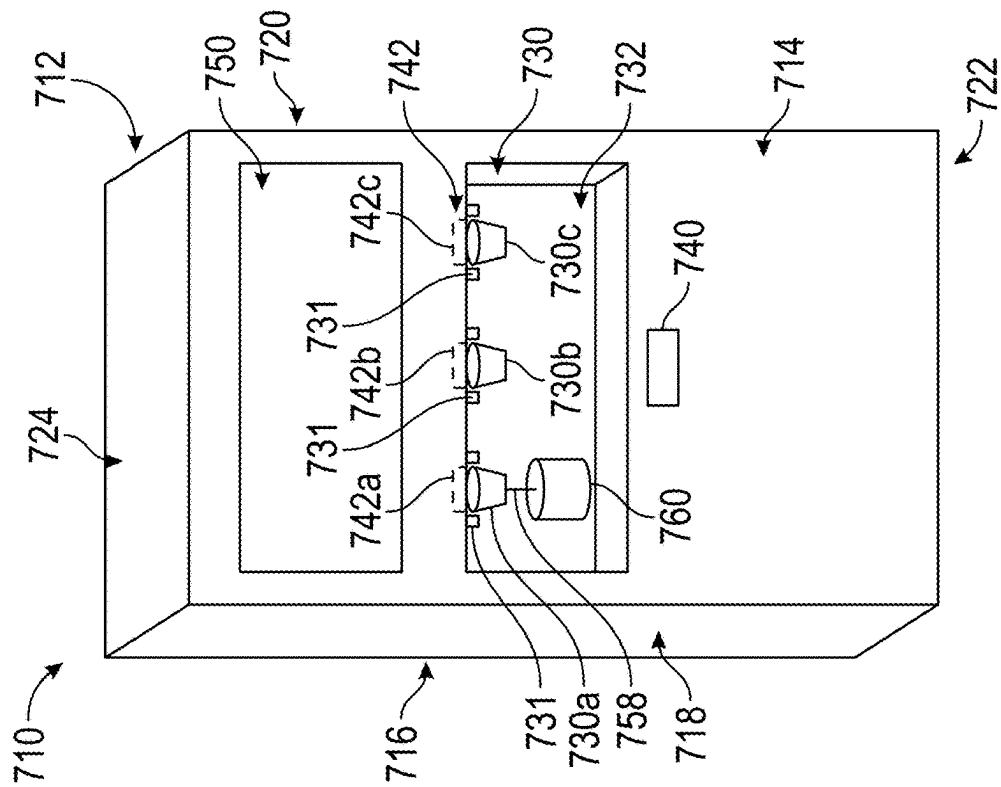


FIG. 7A

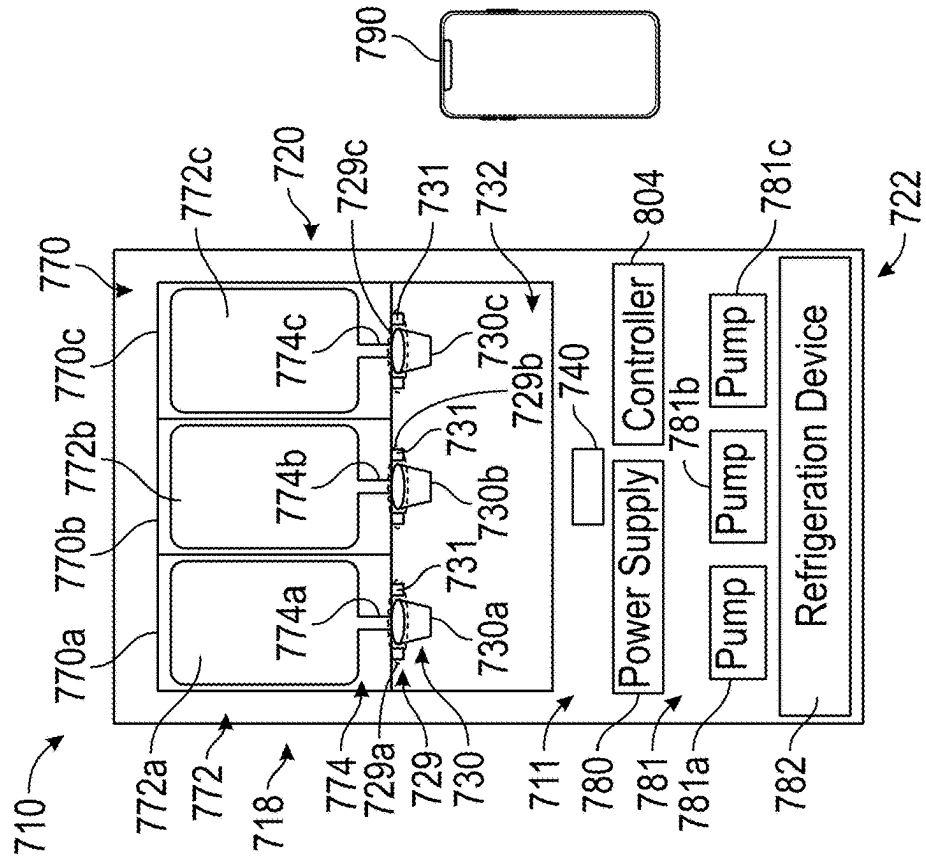


FIG. 7B

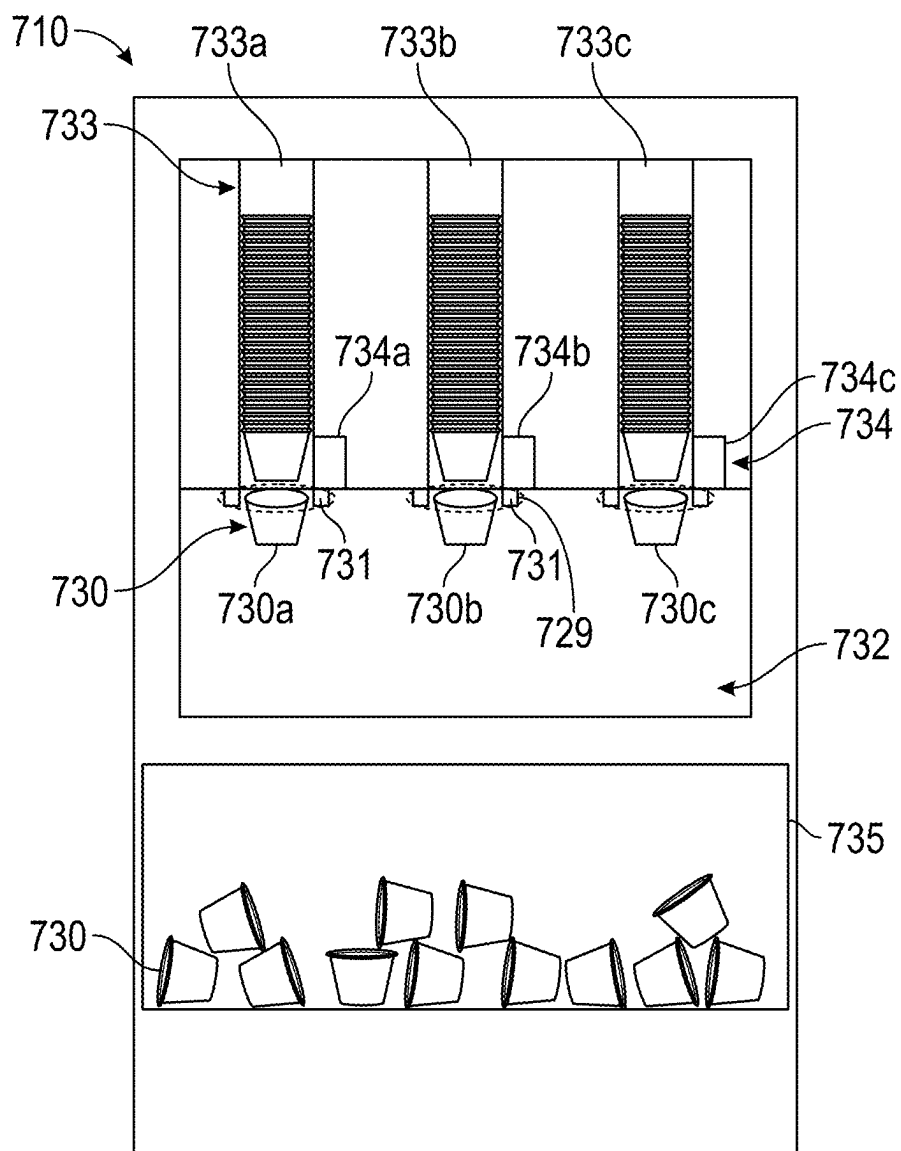


FIG. 7C

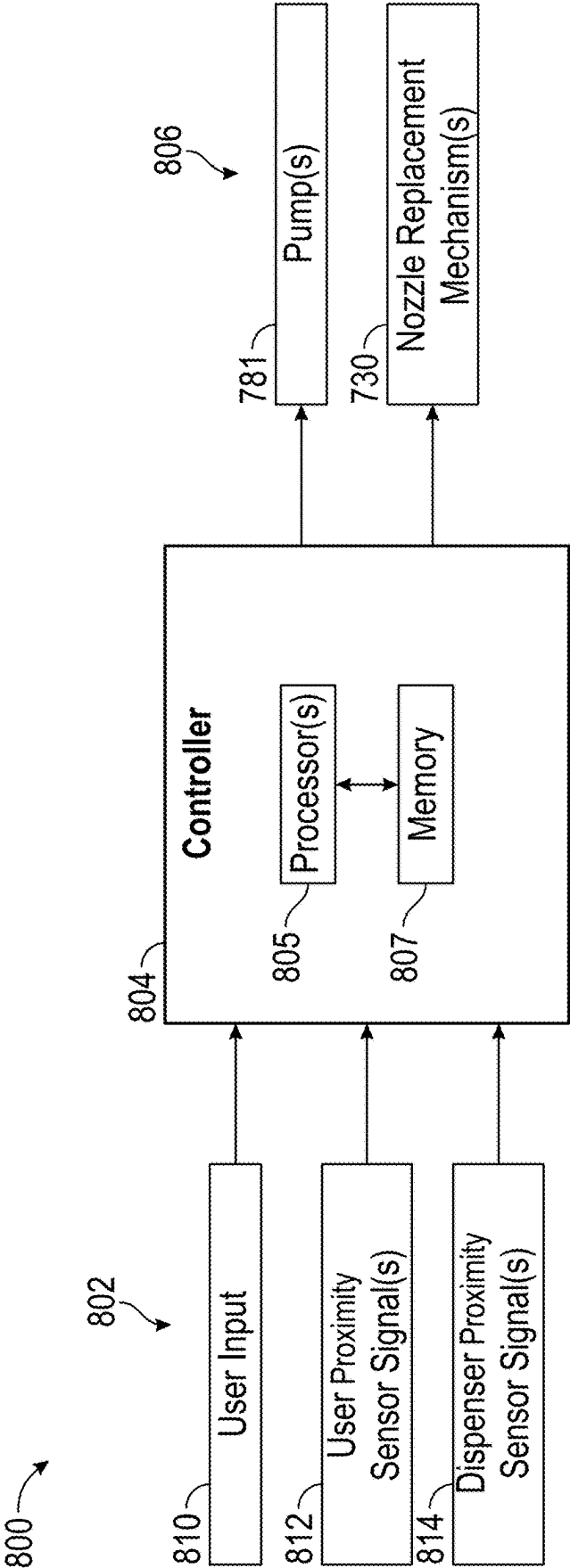
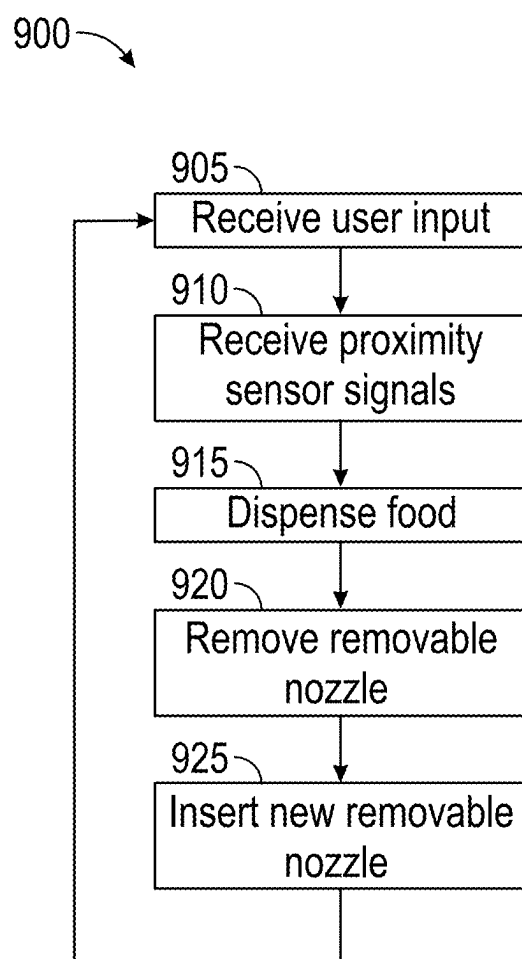


FIG. 8

**FIG. 9**

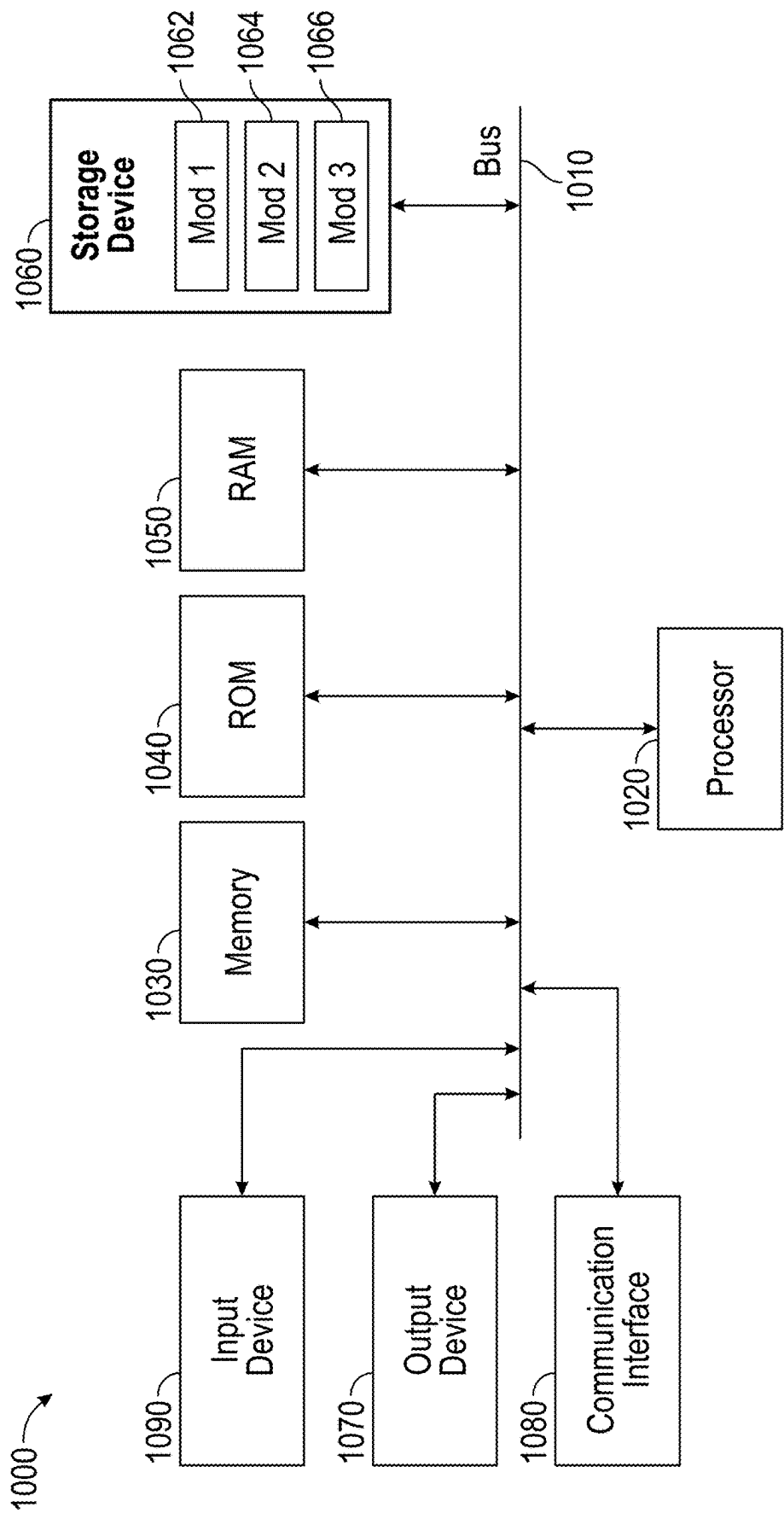


FIG. 10

TOUCHLESS FOOD DISPENSER**CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] This application is a continuation of U.S. patent application Ser. No. 18/421,630, filed Jan. 24, 2024, which is a continuation of U.S. patent application Ser. No. 18/148,596, filed Dec. 30, 2022, issued as U.S. Pat. No. 11,918,152, which claims priority to U.S. Provisional Patent Application No. 63/398,125, filed Aug. 15, 2022, the entire contents of which are hereby incorporated by reference in their entirety. The present application is related to co-pending U.S. patent application Ser. No. 18/148,555, filed Dec. 30, 2022, issued as U.S. Pat. No. 11,935,352, the entire content of which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a touchless food dispenser.

BACKGROUND

[0003] Food, such as, condiments, spices, etc., is provided by many different types of food vendors, such as restaurants, concessions, food courts, food trucks, etc. Such food can be provided in packets (e.g., packets of condiments, packets of spices, etc.), and/or can be provided in a dispenser such that the food is dispensed from the dispenser.

BRIEF SUMMARY

[0004] According to an embodiment, a touchless food dispenser includes one or more types of food stored therein, one or more removable nozzles, wherein the touchless food dispenser is configured to dispense the food through the one or more removable nozzles, and one or more nozzle replacement mechanisms that are configured to remove the one or more removable nozzles and replace the one or more removable nozzles with a different removable nozzle.

[0005] According to an embodiment, a method of dispensing food from a touchless food dispenser includes receiving a selected type of food to dispense from a touchless food dispenser, the touchless food dispenser storing one or more types of food therein, dispensing the selected type of food through one or more removable nozzles from the touchless food dispenser with, and removing, with one or more nozzle replacement mechanisms, the one or more removable nozzles and replacing, with the one or more nozzle replacement mechanisms, the one or more removable nozzles with a different removable nozzle.

[0006] According to an embodiment, a touchless food dispenser control system includes a touchless food dispenser comprising one or more types of food stored therein and one or more removable nozzles and a controller configured to control the touchless food dispenser to dispense the food through the one or more removable nozzles, and to remove, with one or more nozzle replacement mechanisms, the one or more removable nozzles and replace, with the one or more nozzle replacement mechanisms, the one or more removable nozzles with a different removable nozzle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The foregoing and other features and advantages will be apparent from the following, more particular,

description of various exemplary embodiments, as illustrated in the accompanying drawings, wherein like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements.

[0008] FIG. 1 illustrates a schematic, front perspective view of a touchless food dispenser, according to an embodiment of the present disclosure.

[0009] FIG. 2A illustrates a schematic, front perspective view of a touchless food dispenser, according to another embodiment of the present disclosure.

[0010] FIG. 2B illustrates a schematic, front cutaway view of the touchless food dispenser of FIG. 2A, according to the present disclosure.

[0011] FIG. 2C illustrates a schematic, side cutaway view of the touchless food dispenser of FIG. 2A, according to the present disclosure.

[0012] FIG. 3 is a schematic, side cutaway view of a touchless food dispenser, according to another embodiment.

[0013] FIG. 4 is a schematic, side cutaway view of a touchless food dispenser, according to another embodiment.

[0014] FIG. 5 is a block diagram of a touchless food dispenser control system, according to an embodiment of the present disclosure.

[0015] FIG. 6 is a flow diagram of a method of dispensing food from a touchless food dispenser, according to an embodiment of the present disclosure.

[0016] FIG. 7A illustrates a schematic, front perspective view of a touchless food dispenser, according to another embodiment of the present disclosure.

[0017] FIG. 7B illustrates a schematic, front cutaway view of the touchless food dispenser of FIG. 7A, according to the present disclosure.

[0018] FIG. 7C is a schematic, front cutaway view of the touchless food dispenser of FIG. 7A, according to the present disclosure.

[0019] FIG. 8 is a block diagram of a touchless food dispenser control system, according to another embodiment of the present disclosure.

[0020] FIG. 9 is a flow diagram of a method of dispensing food from a touchless food dispenser, according to another embodiment of the present disclosure.

[0021] FIG. 10 illustrates a computer system, according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0022] Various embodiments are discussed in detail below. While specific embodiments are discussed, this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components and configurations may be used without departing from the spirit and scope of the present disclosure.

[0023] As used herein, the terms “first,” “second,” “third,” “fourth,” etc., may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components.

[0024] The terms “front,” “rear,” “top,” “bottom,” “right side,” and “left side” refer to relative positions of the touchless food dispenser based on the orientation shown in FIGS. 1, 2A, and 5A.

[0025] The terms “coupled,” “fixed,” “attached,” “connected,” and the like, refer to both direct coupling, fixing, attaching, or connecting as well as indirect coupling, fixing, attaching, or connecting through one or more intermediate components or features, unless otherwise specified herein.

[0026] The singular forms “a,” “an,” and “the” include plural references unless the context clearly dictates otherwise.

[0027] As used herein, “automated” or “automatic,” or the like, are used to describe functions that are done without user intervention (e.g., by a controller).

[0028] As used herein, “touchless” refers to an apparatus that is operated by means of gestures from a user rather than by touching a control or interface on the apparatus. For example, the touchless food dispensers disclosed herein dispense a food item (e.g., condiments, spices, chopped food, or the like) without a user touching the touchless food dispenser to control the dispensing.

[0029] As used herein, a “condiment” is a supplemental food that is added to food to impart or enhance its flavor. For example, a “condiment” includes food sauces (e.g., ketchup, mustard, relish, mayonnaise, BBQ, sauces, fruit sauces, tomato sauces, etc.), desert sauces and toppings (e.g., chocolate, strawberry, sprinkles, etc.), and prepared sauces such as Hollandaise sauces, salad dressings, liquids (e.g., oil, vinegar, etc.), syrups, etc.

[0030] As used herein, a “spice” is a seed, a fruit, a root, bark, or other plant substance primarily used for flavoring or coloring food. For example, spices (e.g., salt, pepper, oregano, cumin, etc.) have a definite flavor, aroma, intensity, and color to be used for enhancing the flavor and aroma of foods.

[0031] As used herein, a “packet” or a “pouch” is a package or container that contains a single-serving of food therein. Such packets can be made of paper, foil, plastic, or any other type of packing material. The single-serving can include any size, any amount, and/or any weight of food based on the type of food that the packet contains. For example, a single-serving of mayonnaise can be larger than a single-serving of ketchup, or vice-versa. A packet of a food can be, for example, less than one half ounce (0.5 oz), less than one ounce (1 oz), less than two ounces (2 oz), less than three ounces (3 oz), or any size containing a single-serving of the food. In preferred embodiments, a packet of food is less than one ounce (1 oz) or less than one half ounce (0.5 oz).

[0032] As used herein, the term “perforation” refers to the point of separation between individual packets of food and can be defined by a score, an opening, or a row of openings formed in the packets such that an individual packet can be separated from the other packets within a roll of packets.

[0033] Food, such as, condiments, spices, solid food, liquid foods (e.g., syrup, vinegar, oil), etc., is provided by many different types of food vendors, such as restaurants, supermarkets, concessions, food courts, food trucks, airports, ski lodges, etc. Such food can be provided in packets (e.g., packets of condiments, packets of spices, etc.), and/or can be provided in a dispenser such that the food is dispensed from the dispenser. In either method of providing the food, a user, such as a customer or an employee, needs to physically touch the packets or the dispenser (e.g., a handle of the dispenser that the user pushes to dispense the food). The packets, the dispensers, or the food itself, collects bacteria or viruses since multiple users touch the packets, the dispensers, and/or the food. Thus, providing food in such a way is unsanitary and can lead to cross-contamination on the packets, the dispenser, and the food. Further, some dispensers may include nozzles or the like that can be removed from the dispenser, cleaned, and replaced into the dispenser. Such

nozzles are supposed to be cleaned daily to insure cleanliness of the nozzles. However, often the nozzles are not cleaned as much as required, and/or the nozzles are not properly or entirely cleaned. Accordingly, such nozzles are also unsanitary.

[0034] Another problem with providing food in such ways is that the amount of food dispensed or provided is inconsistent. For example, an employee may provide more packets to a customer than the customer actually uses, or the customer may dispense more food than they actually use. Further, the amount of food dispensed from the dispenser is unregulated and is dependent on how the user pushes down on the handle to pump the food from the dispenser. The excess packets or the excess food that is dispensed is often disposed of when the user does not use the excess food. Accordingly, by providing the food in such ways is wasteful and creates unnecessary costs for the business owner supplying the food.

[0035] Further, such methods of providing the food can be difficult or tedious for the employee or for the customer. For example, the packets of food (e.g., condiment packets) are difficult and time-consuming to manually open one by one. Often, the dispensers are manual dispensers that the user needs to manually push the handle to dispense the food. In some instances, the dispenser can include a machine that dispenses the food when the user pushes and holds a button. In such instance, the user still needs to physically touch the dispenser to dispense the food.

[0036] Therefore, there is a need for a touchless food dispenser, as disclosed herein. The touchless food dispensers of the present disclosure provide for an apparatus that automatically dispenses food without the user having to physically touch the touchless food dispenser. The food can include condiments, spices, chopped or sliced food (e.g., lettuce, onions, tomatoes, etc.), or any type of dispensable food. The touchless food dispenser can dispense the food, for example, onto another food item (e.g., onto a hamburger), into a receptacle (e.g., a condiment cup), onto a plate, into the user's hand (e.g., a condiment packet), or otherwise can dispense food from the touchless food dispenser. The touchless food dispensers can store various types of food for dispensing. For example, the touchless food dispensers can store different types of condiments, different types of spices, different types of chopped food, or combinations thereof (e.g., can store condiments, spices, and chopped food together).

[0037] The user can use gestures (e.g., moving a hand in front of the dispenser) to automatically dispense the desired food. In this way, the touchless food dispensers disclosed herein can dispense food without the user physically touching the food. The touchless food dispensers of the present disclosure can be configured for use by employees (e.g., back of the house), for use by customers (e.g., back of the house), or for use by any type of user. The touchless food dispensers can dispense a predetermined amount of food therein. For example, an operator, such as a business owner, can configure or otherwise program the touchless food dispenser with the predetermined amount of food to dispense every time a user gestures to dispense food. The predetermined amount of food can be measured by weight (e.g., ounces), by volume (e.g., fluid ounces, milliliters, etc.), or the like. In some embodiments, the user can input a desired amount of food to dispense. For example, the user can input a number of servings to dispense. The

servings can include a predetermined serving size (e.g., 1 serving equal to 1 fluid ounce of food, or 1 serving equal to 1 packet of food, etc.). The user can use a smartphone or the like to input the desired amount of servings to dispense. A mobile application can store the user's preferences or the like such that the user can dispense the same amount of food (e.g., by scanning a barcode, a QR code, or the like) from the touchless food dispenser.

[0038] In some embodiments, the touchless food dispenser can dispense packets of food (e.g., packets of condiments, packets of spices, etc.). The packets can be coupled together and bundled into a roll. As the packets are dispensed from the touchless food dispenser, the roll can unwind. When the roll is depleted of packets, the roll can be removed from the touchless food dispenser and replaced with a new roll of packets. The touchless food dispenser can automatically open the packets as the packets are being dispensed. In some embodiments, the touchless food dispenser can dispense the food from the packets.

[0039] In another embodiment, the touchless food dispenser stores the food therein and dispenses the food directly, rather than dispensing packets. For example, the touchless food dispenser can store various types of food in different vats, reservoirs, bags, or the like. The touchless food dispenser can pump or otherwise force the food out of the touchless food dispenser when the user gestures in front of the touchless food dispenser. The touchless food dispenser includes removable nozzles through which the food is dispensed. The removable nozzles include single-use nozzles that are removed from the touchless food dispenser after food has been dispensed through the nozzle. The removable nozzles can be removed and replaced with a new removable nozzle each time food has been dispensed. In some embodiments, the removable nozzles define a receptacle for receiving the food therein. The food can be dispensed into the removable nozzle and the user can take the removable nozzle with the food therein. In some embodiments, the touchless food dispenser can automatically remove and replace the removable nozzles.

[0040] Thus, the touchless food dispensers disclosed herein provide for dispensers that do not require users to physically touch the dispenser to cause the dispenser to dispense the food. The amount of food dispensed can be controlled, as detailed above, such that wasted food is reduced. Accordingly, the touchless food dispensers disclosed herein provide for various embodiments of a sanitary and portion-regulated apparatus to solve the problems detailed above.

[0041] Referring now to the drawings, FIG. 1 illustrates a schematic, front perspective view of a touchless food dispenser 10, according to an embodiment of the present disclosure. The arrangement of the components of the touchless food dispenser 10 shown in FIG. 1 are exemplary only, and the components may be arranged in any configuration, as desired, without deviating from the present disclosure. The touchless food dispenser 10 includes a casing 12 that defines a front side 14, a rear side 16, a left side 18, a right side 20, a bottom side 22, and a top side 24, per the orientation of the touchless food dispenser 10 shown in FIG. 1. While the exemplary embodiment shows the casing 12 having a generally rectangular configuration, the casing 12 of the touchless food dispenser 10 can have any configuration, shape, and/or size, as desired. The touchless food dispenser 10 can store one or more types of food within the

casing 12 for being dispensed from the touchless food dispenser 10 (e.g., out of the casing 12), as detailed further below. For example, the touchless food dispenser 10 can store condiments, spices, chopped foods (e.g., onions, lettuce, tomatoes, etc.), or the like for being dispensed from the touchless food dispenser 10 into a receptacle (e.g., a condiment cup), onto a food item (e.g., onto a hamburger), or otherwise dispensed out of the touchless food dispenser 10. In some embodiments, the touchless food dispenser 10 can dispense out packets of food (e.g., a packet of ketchup) such that a user can grab or otherwise take the dispensed packets of food from the touchless food dispenser 10, as detailed further below.

[0042] The touchless food dispenser 10 includes one or more dispensing mechanisms 30 for dispensing one or more types of food, such as one or more condiments, from the touchless food dispenser 10. The one or more dispensing mechanisms 30 can include slots, nozzles, apertures, or any other dispensing mechanisms. In the exemplary embodiment, the one or more dispensing mechanisms 30 include three such dispensing mechanisms 30 including as a first dispensing mechanism 30a, a second dispensing mechanism 30b, and a third dispensing mechanism 30c. The one or more dispensing mechanisms 30 may include any number of dispensing mechanisms 30 for dispensing any number of types of food, as desired. The touchless food dispenser 10 includes a dispensing area 32 in which the one or more dispensing mechanisms 30 are oriented to dispense the food.

[0043] The touchless food dispenser 10 also includes one or more user proximity sensors 40 and one or more dispenser proximity sensors 42. The one or more user proximity sensors 40 are positioned and oriented to detect a user in front of, or otherwise near or proximate, the touchless food dispenser 10. The one or more user proximity sensors 40 produce signals indicative of when something (e.g., a user) is positioned in front of the touchless food dispenser 10. The signals from the one or more user proximity sensors 40 may be used to control the dispensing of the food from the touchless food dispenser 10, as detailed further below. For example, the signals from the one or more user proximity sensors 40 may be used to prevent dispensing of the food from the touchless food dispenser 10 when no signal is generated (e.g., there is no user in front of the touchless food dispenser 10). The one or more user proximity sensors 40 can include any type of proximity sensor for detecting the presence of nearby objects without any physical contact. For example, the proximity sensors can include a capacitive proximity sensor, a photoelectric proximity sensor, an optical proximity sensor, or the like. The proximity sensors can include any type of sensor for detecting an object, such as cameras, sonar, lidar, etc.

[0044] The one or more dispenser proximity sensors 42 are positioned and oriented to detect an object, such as a receptacle for receiving the dispensed food, a food item, a user's hand, etc., in front of, or below, a respective dispensing mechanism 30. The one or more dispenser proximity sensors 42 include a proximity sensor associated with each of the one or more dispensing mechanisms 30. For example, the one or more dispenser proximity sensors 42 include one or more first dispenser proximity sensors 42a associated with the first dispensing mechanism 30a, one or more second dispenser proximity sensors 42b associated with the second dispensing mechanism 30b, and one or more third dispenser proximity sensors 42c associated with the third

dispensing mechanism 30c. The one or more dispenser proximity sensors 42 produce signals indicative of when something (e.g., a receptacle, a food item, a user's hand, etc.) is positioned below or in front of a respective dispensing mechanism 30. The signals from the one or more dispenser proximity sensors 42 may be used to control the dispensing of the food from the touchless food dispenser 10, as detailed further below. For example, the signals from the one or more dispenser proximity sensors 42 may be used to prevent dispensing of the food from the touchless food dispenser 10 when no signal is generated (e.g., there is no receptacle, no food item, no hand, etc. in front of, or below, a respective dispensing mechanisms 30). The one or more dispenser proximity sensors 42 can include any type of proximity sensor for detecting the presence of nearby objects without any physical contact. For example, the proximity sensors can include a capacitive proximity sensor, a photoelectric proximity sensor, an optical proximity sensor, or the like. The proximity sensors can include any type of sensor for detecting an object, such as cameras, sonar, lidar, etc.

[0045] In some embodiments, the touchless food dispenser 10 includes a display 50. The display 50 can display the various types of food that are available in the touchless food dispenser 10 for dispensing, can display a selected type of food for dispensing from the touchless food dispenser 10, can display an amount of food being dispensed, and/or can display advertisements, pictures, video or text. In some embodiments, the display 50 can function as a user input device to configure aspects of the touchless food dispenser 10. For example, the display 50 can display a graphical user interface configured to receive input from a user. In this way, the display 50 can include a touch screen display. In some embodiments, other forms of user interfaces may be utilized, such as physical keyboards, a computer mouse, gestures, or wireless communications for receiving input from a computing device, such as a mobile phone or the like, as detailed further below. In some embodiments, the display 50 may receive user input to configure a predetermined amount of food to dispense, to receive a selection of a type of food to dispense, or to configure other aspects of the touchless food dispenser 10.

[0046] In operation, the touchless food dispenser 10 can detect a user is in proximity of the touchless food dispenser 10 (e.g., by receiving the signal from the one or more user proximity sensors 40). When the user is in proximity to the touchless food dispenser 10, the user can select a particular type of food to dispense from the touchless food dispenser 10. For example, the user can gesture (e.g., with the user's hand) in front of, or below, a particular dispensing mechanism 30. The touchless food dispenser 10 can detect the user is in proximity to the particular dispensing mechanism 30 based on a signal received from the dispenser proximity sensor 42 associated with the particular dispensing mechanism 30. Based on the signal received from the dispenser proximity sensor 42, the touchless food dispenser 10 then dispenses a portion of the food from the dispensing mechanism 30. Thus, the touchless food dispenser 10 dispenses food without the user having to physically touch the touchless food dispenser 10 to cause the touchless food dispenser 10 to dispense the food.

[0047] In some embodiments, the touchless food dispenser 10 dispenses a predetermined amount of food every time a user gestures in front of, or below, a particular dispensing

mechanism 30. For example, the touchless food dispenser 10 can be programmed or can otherwise store a predetermined amount of food (e.g., fluid ounces, milliliters, etc.) for dispensing. When the user gestures in front of, or below, the particular dispensing mechanism 30, the touchless food dispenser 10 dispenses the predetermined amount of food and then stops dispensing food until the user or another user gestures in front of, or below, the particular dispensing mechanism 30 again. In some embodiments, the touchless food dispenser 10 can dispense the food for as long as the user is gesturing in front of, or below, the particular dispensing mechanism 30. In some embodiments, the user can input a selection of a type of food to dispense and/or an amount of food to dispense via, for example, the display 50, a computing device (e.g., a smartphone), or the like. The user can then gesture in front of, or below, the particular dispensing mechanism 30 and the touchless food dispenser 10 will dispense the selected type of food and/or the selected amount of food when the user gestures in front of, or below, a particular dispensing mechanism 30.

[0048] Additional features and aspects of the present disclosure will become apparent as detailed below with respect to FIGS. 2A to 8.

[0049] FIGS. 2A to 2C illustrate various views of a touchless food dispenser 210, according to another embodiment. FIG. 2A illustrates a schematic, front perspective view of the touchless food dispenser 210, FIG. 2B illustrates a schematic, front cutaway view of the touchless food dispenser 210 with a front portion of the touchless food dispenser 210 removed such that an inner portion 211 of the touchless food dispenser 210 is shown, and FIG. 2C illustrates a schematic right side cutaway view of the touchless food dispenser 210 with a side of the touchless food dispenser 210 removed such that the inner portion 211 of the touchless food dispenser 210 is shown. The touchless food dispenser 210 can be utilized as the touchless food dispenser 10, shown and described with respect to FIG. 1. The arrangement of the components of the touchless food dispenser 210 shown in FIGS. 2A to 2C are exemplary only, and the components may be arranged in any configuration, as desired, without deviating from the present disclosure.

[0050] Referring to FIG. 2A, the touchless food dispenser 210 includes a casing 212 that defines a front side 214, a rear side 216, a left side 218, a right side 220, a bottom side 222, and a top side 224, per the orientation of the touchless food dispenser 210 shown in FIG. 2A. While the exemplary embodiment shows the casing 212 having a generally rectangular configuration, the casing 212 of the touchless food dispenser 210 can have any configuration, shape, and/or size, as desired. The touchless food dispenser 210 can store one or more types of food within the casing 212 for being dispensed from the touchless food dispenser 210, as detailed further below. For example, the touchless food dispenser 210 can store packets 260 of condiments, spices, chopped foods (e.g., onions, lettuce, tomatoes, etc.), or the like for being dispensed from the touchless food dispenser 210 (e.g., out of the casing 212) into a receptacle (e.g., a condiment cup), onto a food item (e.g., onto a hamburger), or otherwise dispensed out of the touchless food dispenser 210. The packets 260 can be bundled together in a roll and dispensed from the touchless food dispenser 210, as detailed further below.

[0051] The touchless food dispenser 210 includes one or more dispensing mechanisms, such as one or more apertures

230 for dispensing one or more types of food from the touchless food dispenser **210**. The one or more apertures **230** can include holes or slots for dispensing the food or packets **260** of the food from the touchless food dispenser **210**. In the exemplary embodiment, the one or more apertures **230** include four such apertures **230** including as a first aperture **230a**, a second aperture **230b**, a third aperture **230c**, and a fourth aperture **230d**. The one or more apertures **230** may include any number of apertures **230** for dispensing any number of types of food, as desired, and may be sized and shaped for dispensing food from the packets **260** or for dispensing the packets directly from the touchless food dispenser **210**. The touchless food dispenser **210** includes a dispensing area **232** in which the one or more apertures **230** are oriented to dispense the food or the packets **260** of food from the touchless food dispenser **210**.

[0052] The touchless food dispenser **210** also includes one or more user proximity sensors **240** and one or more dispenser proximity sensors **242**. The one or more user proximity sensors **240** are positioned and oriented to detect a user in front of, or otherwise near or proximate, the touchless food dispenser **210**, as detailed above with respect to the user proximity sensors **40** of FIG. 1. The one or more dispenser proximity sensors **242** are positioned and oriented to detect an object, such as a receptacle for receiving the dispensed food, a food item, a user's hand, etc., in front of, or below, a respective apertures **230**, as detailed above with respect to the dispenser proximity sensors **42** of FIG. 1. The one or more dispenser proximity sensors **242** include a proximity sensor associated with each of the one or more apertures **230**. For example, the one or more dispenser proximity sensors **242** include one or more first dispenser proximity sensors **242a** associated with the first aperture **230a**, one or more second dispenser proximity sensors **242b** associated with the second aperture **230b**, one or more third dispenser proximity sensors **242c** associated with the third aperture **230c**, and one or more fourth dispenser proximity sensors **242d** associated with the fourth aperture **230d**.

[0053] In some embodiments, the touchless food dispenser **210** includes a display **250**. The display **250** can display the various types of food that are available in the touchless food dispenser **210** for dispensing, can display a selected type of food for dispensing from the touchless food dispenser **210**, can display an amount of food being dispensed, and/or can display advertisements, pictures, video or text, as detailed above with respect to the display **50** of FIG. 1.

[0054] FIG. 2B shows the front side **214** of the inner portion **211** of the touchless food dispenser **210**. As shown in FIG. 2B, the touchless food dispenser **210** includes one or more rolls **262** of packets **260**. In the exemplary embodiment, the one or more rolls **262** of packets **260** include a first roll **262a** of first packets **260a** of food, a second roll **262b** of second packets **260b** of food, a third roll **262c** of third packets **260c** of food, and a fourth roll **262d** of fourth packets **260d** of food. Each roll **262** of packets **260** can include a different type of food. For example, the first packets **260a** include a first type of food (e.g., ketchup), the second packets **260b** include a second type of food (e.g., mustard), the third packets **260c** include a third type of food (e.g., relish), and the fourth packets **260d** include a fourth type of food (e.g., mayonnaise). The rolls **262** of packets **260** may include any number of rolls with any number of different types of food. The packets **260** of a respective roll **262** are coupled or otherwise connected together to form the

respective roll **262**. An individual packet **260** can be separated from the other packets **260** of the roll **262** when the individual packet **260** is dispensed from the touchless food dispenser **210**, as detailed further below. In some embodiments, the rolls **262** can include a single packet **260** of food without perforations or other separations. In such embodiments, the touchless food dispenser **210** can dispense the food from the packet **260** out of the touchless food dispenser **210** without dispensing individual packets **260**.

[0055] The packets **260** of food can include one or more perforations **261** (only one of which is labeled in FIG. 2B for clarity) that separate each packet **260** of a respective roll **262**. Perforations refers to the point of separation between individual packets **260** of food and can be defined by a score, an opening, or a row of openings formed in the packets **260** such that an individual packet **260** can be separated from the other packets **260** of the respective roll **262**. The perforations **261** are dimensioned to define an edge of an individual packet **260** and to assist in separation of individual packets **260** from the respective roll **262**. Each roll **262** includes many perforations **261** separating the many different packets **260** on the respective roll **262**. Each roll **262** can include any number of packets **260** as desired.

[0056] The touchless food dispenser **210** includes one or more food storage containers **270** for storing one or more types of food. For example, the one or more rolls **262** of packets **260** are mounted and stored within a respective food storage container **270**. In the exemplary embodiment, the one or more food storage containers **270** include a first food storage container **270a** that stores the first roll **262a**, a second food storage container **270b** that stores the second roll **262b**, a third food storage container **270c** that stores the third roll **262c**, and a fourth food storage container **270d** that stores the fourth roll **262d**. The food storage containers **270** may include any number of food storage containers with any number of different types of food. In some embodiments, the touchless food dispenser **210** includes a single food storage container **270** that stores the various rolls **262**. Each food storage container **270** may include a door or the like for providing access to the food storage container **270**. In this way, an operator of the touchless food dispenser **210** can insert the rolls **262** into the food storage containers **270**. In some embodiments, the touchless food dispenser **210** includes a single door that opens all of the food storage containers **270** at once. In some embodiments, each food storage container **270** includes a separate door such that each food storage container **270** can be opened individually. Thus, the rolls **262** can be removed and replaced with new rolls **262** when the rolls **262** are empty (e.g., after all or nearly all of the packets **260** of a roll **262** have been dispensed).

[0057] The touchless food dispenser **210** also includes a power supply **280**, a refrigeration device **282**, and a controller **504**. The power supply **280** provides electric power to the various electronic components of the touchless food dispenser **210**. The power supply **280** can include, for example, a power chord that plugs into a corresponding power outlet, one or more batteries, or any other type of power supply. The refrigeration device **282** can control the climate (e.g., the temperature) within the touchless food dispenser **210** such as to control the temperature of the food that is stored within the touchless food dispenser **210**. In some embodiments, the touchless food dispenser includes a heating device to heat aspects of the touchless food dis-

penser 210. In exemplary embodiments, the heating and/or refrigeration devices may heat or cool the touchless food dispenser 210 to a specified temperature or within a specified temperature range to heat or to cool the food stored within the touchless food dispenser 210. The controller 504 can control aspects of the touchless food dispenser 210 to automatically dispense a portion of the food, as detailed further below.

[0058] FIG. 2C shows the right side 220 of the inner portion 211 of the touchless food dispenser 210. As shown in FIG. 2C, the touchless food dispenser 210 includes one or more mounting rollers 264 for mounting a respective roll 262 of packets 260 thereon. In this way, the rolls 262 are mounted within the inner portion 211 of the touchless food dispenser 210. The mounting rollers 264 can include a removable portion such that the rolls 262 can be removed and replaced with a new roll 262 when a respective roll 262 runs out or is otherwise low on packets 260. The packets 260 are arranged to be fed through the respective apertures 230 when the touchless food dispenser 210 is controlled to dispense the packets 260. For example, the apertures 230 are sized and shaped to receive the packets 260.

[0059] The touchless food dispenser 210 includes a powered roller assembly 271. The powered roller assembly 271 includes one or more drive rollers 272, one or more sensor rollers 274, and one or more electric motors 276. The one or more drive rollers 272 are generally cylindrical, rotatable rollers. The one or more drive rollers 272 are mechanically connected to the electric motor 276 to drive the one or more drive rollers 272 via a transmission. The transmission includes one or more gears or the like, or may include a belt and pulley, wheels, or other such power transmitting devices to transmit power from the electric motor 276 to the one or more drive rollers 272 to drive (e.g., to rotate) the one or more drive rollers 272. A belt 275 is looped about one of the driver rollers 272 and one of the sensor rollers 274. When the roll 262 of packets 260 of food is mounted within the touchless food dispenser 210, the packets 260 of the roll 262 are fed, or driven, by the belt 275 and towards the aperture 230 as the one or more drive rollers 272 rotate. As the packets 260 are driven between the one or more drive rollers 272, the one or more driver rollers 272 pinch or otherwise squeeze the packets 260. While the exemplary embodiment of FIG. 2C shows two such drive rollers 272, the touchless food dispenser 210 can include any number of drive rollers 272 as desired. For example, the packets 260 can be fed between a single drive roller 272 and a non-powered roller that is configured to be rotated by the drive roller 272. In some embodiments, the packets 260 are fed towards the aperture 230 by means other than rollers and belts, such as, for example, a mechanical or spring-loaded arm mechanism, or any other type of device for feeding the packets 260 towards the aperture 230 to be dispensed out of the aperture 230.

[0060] The one or more sensor rollers 274 are generally cylindrical, rotatable rollers. The one or more sensor rollers 274 are connectable to the electric motor 276 by a transmission, such as by gears, a belt and pulley, wheels, or the like. The one or more sensor rollers 274 are configured to be driven such that the one or more sensor rollers 274 have a slower surface speed than the one or more drive rollers 272. In this way, tension is created in the roll 262 of packets 260 between the one or more sensor rollers 274 and the one or more drive rollers 272 such that the perforations 261 can be

expanded. Alternatively, the one or more sensor rollers 274 are not attached to the electric motor 276 but are configured to be rotated by contact with the packets 260.

[0061] The electric motor 276 is an electric machine that converts electrical energy into mechanical energy. For example, the electric motor 276 receives electric power from the power supply 280 and transmits mechanical power to the one or more drive rollers 272 via the transmission. The electric motor 276 can include any type of electric motor, as desired, for providing mechanical power to the one or more drive rollers 272.

[0062] The touchless food dispenser 210 also includes a packet sensor 277 for detecting the presence of a packet 260 as the packet 260 passes the packet sensor 277. For example, the packet sensor 277 is configured to generate a signal (e.g., a packet signal) indicative of the presence of a packet 260. The packet sensor 277 can sense the packets 260, and the controller 504 can determine a number of packets 260 that are being fed towards the aperture 230, perforations in the packets 260 as the packets 260 pass the packet sensor 277, and/or a length of a packet 260 as the packet 260 passes the packet sensor 277. The packet sensor 277 is a photo-electronic device or like device for detecting the presence of packets 260. In some embodiments, the packet sensor 277 detects the presence of a perforation 261 in the packets 260. In such embodiments, the packet sensor 277 includes a light source and a photo-conductive receiver operable to detect light from the light source. The sensor is configured to generate a signal when it receives the light from the light source. For example, the light source is normally blocked by the packets 260 between the light source and the photo-conductive receiver. However, if a perforation 261 is positioned between the light source and the photo-conductive receiver, then light passes through the perforation 261 to the receiver and the packet sensor 277 generates the perforation signal. The packet sensor 277 can include any type of sensor for detecting packets 260 and/or perforations 261 in the packets 260. For example, the packet sensor 277 can be capacitive and use a capacitive coupled the packet sensor 277. The packet sensor 277 can be based on mechanical detection, can be based on Hall effect, or can be based on a change in radio frequency, or any other method to detect individual packets 260 as the packets 260 move past the packet sensor 277.

[0063] The touchless food dispenser 210 also includes a cutting mechanism 278 for cutting or otherwise opening the packets 260 prior to, or in parallel with, a respective packet 260 being dispensed through the aperture 230. The cutting mechanism 278 includes a blade or the like for cutting or otherwise remove an individual packet 260 from the roll 262 such that the individual packet 260 can be removed from the touchless food dispenser 210. For example, a user can remove the dispensed packet 260 by tearing the packet 260 at the perforation 261 on the cutting mechanism 278. In some embodiments, cutting the packet 260 with the cutting mechanism 278 opens the packet 260 such that the user does not need to tear the packet 260 open after removing the packet 260 from the touchless food dispenser 210.

[0064] In some embodiments, the cutting mechanism 278 is a powered cutting mechanism such that the cutting mechanism 278 can automatically cut, tear, or otherwise separate or open a respective packet 260 as the packet 260 is being dispensed through the aperture 230. For example, the cutting mechanism 278 can include an actuator or other

device for moving the blade such that the cutting mechanism 278 automatically cuts the packet 260 open or cuts the packets 260 at the perforation 261 to separate the packets 260 from the roll 262. In this way, the cutting mechanism 278 can receive electric power from the power supply 280 and can be controlled by the controller 504 to perform a cutting action, as detailed further below.

[0065] The touchless food dispenser 210 can also be in communication with a computing device 290, such as, for example, a smartphone, a table, a computer, a laptop, or the like. In some embodiments, the touchless food dispenser 210 can receive user input from the computing device 290. In this way, the user can input commands to the controller 504, to control aspects of the touchless food dispenser 210, as detailed further below. For example, the computing device 290 can display a graphical user interface (e.g., via a mobile application) such that the user can input a selection of a type of food for dispensing from the touchless food dispenser 210, a selection of an amount of the food to dispense, or any other user input can be input to the controller 504 from the computing device 290. In this way, the user can control aspects of the touchless food dispenser 210 without physically touching the touchless food dispenser 210. In some embodiments, the mobile application can store user preferences including the amount of food to dispense. The user preferences can be sent to the touchless food dispenser 210 (e.g., via a numerical code, via a barcode, via a QR code, via wireless communication, or the like) and the touchless food dispenser 210 can automatically dispense the food based on the user preferences.

[0066] FIG. 3 is a schematic, side cutaway view of a touchless food dispenser 310, according to another embodiment. The touchless food dispenser 310 is substantially similar to the touchless food dispenser 210 of FIGS. 2A to 2C. The touchless food dispenser 310, however, includes a stack 362 of packets 360 rather than a roll of packets. The touchless food dispenser 310 includes one or more food storage containers 370 for storing the stack 362 of packets 360. Each food storage container 370 can store packets 360 having a specific type of food, such as, for example, a stack of ketchup packets, a stack of mustard packets, a stack of relish packets, etc. The packets 360 of the stack 362 can be coupled together at one or more perforations or can be separate and individually placed in the stack 362 within a respective food storage container 370.

[0067] The one or more food storage containers 370 can include a feed mechanism 373 for releasing an individual packet 360 from the respective food storage container 370 such that individual packet 360 is directed towards the aperture 230. For example, the packets 360 can be deposited onto the belt 275 and directed towards the aperture 230. The feed mechanism 373 is a mechanical arm or spring-loaded arm that is controlled to be actuated (e.g., by the controller 504) to release an individual packet 360 from the food storage container 370 such that the packet 360 is directed towards the aperture 230 to be dispensed from the aperture 230. The feed mechanism 373 can include any type of mechanism or device for releasing packets 360 from the one or more food storage containers 370.

[0068] FIG. 4 is a schematic, side cutaway view of a touchless food dispenser 410, according to another embodiment. The touchless food dispenser 410 is substantially similar to the touchless food dispenser 210 of FIGS. 2A to 2C. The touchless food dispenser 310, however, includes a

pile 462 of packets 460 rather than a roll of packets or a stack of packets. The touchless food dispenser 410 includes one or more food storage containers 470 for storing the pile 462 of packets 460. Each food storage container 470 can store packets 460 having a specific type of food, such as, for example, a stack of ketchup packets, a stack of mustard packets, a stack of relish packets, etc. The packets 460 of the pile 462 can be coupled together at one or more perforations or can be separate and individually placed in the pile 462 within a respective food storage container 470. In this way, a person can pour or otherwise place the packets 460 into the food storage container 470 in order to fill the food storage container 470 with packets 460.

[0069] The one or more food storage containers 470 can include a feed mechanism 473 for releasing an individual packet 460 from the respective food storage container 470 such that individual packet 460 is directed towards the aperture 230. For example, the packets 460 can be deposited onto the belt 275 and directed towards the aperture 230. The feed mechanism 473 is a mechanical arm or spring-loaded arm that is controlled to be actuated (e.g., by the controller 504) to release an individual packet 460 from the food storage container 470 such that the packet 460 is directed towards the aperture 230 to be dispensed from the aperture 230. The feed mechanism 473 can include any type of mechanism or device for releasing packets 460 from the one or more food storage containers 470.

[0070] FIG. 5 is a block diagram of a touchless food dispenser control system 500, for operation and control of at least portions of the touchless food dispenser 210 (FIGS. 2A to 2C). While the touchless food dispenser 210 is described herein, the touchless food dispenser control system 500 can be used to control the touchless food dispenser 310 of FIG. 3 and/or the touchless food dispenser 410 of FIG. 4, respectively.

[0071] The touchless food dispenser control system 500 includes inputs 502, the controller 504, and outputs 506. The inputs 502 include user input 510 from the display 250 and/or from the computing device 290, one or more user proximity sensor signals 512 from the one or more user proximity sensors 240, one or more dispenser proximity sensor signals 514 from the one or more dispenser proximity sensors 242, and one or more packet sensor signals 516 from the one or more packet sensors 277. The outputs 506 include the electric motor 276, the one or more drive rollers 272, and the cutting mechanism 278. The electric motor 276 output includes control of the electric motor 276 to control operation of the electric motor 276. The drive rollers 272 output includes control of the drive rollers 272 to rotate the drive rollers 272. The cutting mechanism 278 output includes control of the cutting mechanism 278 to cut, slice, or otherwise tear a respective packet 260. The controller 504 receives the inputs 502, implements a method of dispensing food from a touchless food dispenser 210, and controls the outputs 506, as detailed with reference to FIG. 6 below.

[0072] The controller 504 may be one or more standalone controllers. In this embodiment, the controller 504 includes a computing device having one or more processors 505 and a memory 507. Accordingly, the controller 504 can be implemented as the computing device 1000 detailed below with respect to FIG. 10.

[0073] FIG. 6 is a flow diagram of a method 600 of dispensing food from a touchless food dispenser, according to an embodiment of the present disclosure. Reference is

made to the touchless food dispenser **210** of FIGS. 2A-2C and to the touchless food dispenser control system **500** of FIG. 5 in the description of the method **600** below. The method **600** can also be utilized in controlling the touchless food dispenser **310** of FIG. 3 and the touchless food dispenser **410** of FIG. 4.

[0074] In step **605**, the controller **504** receives user input **510**. For example, the controller **504** receives a selection of a type of food to dispense from the touchless food dispenser **210**, receives an amount of the food to dispense, receives a quantity of packets **260** to dispense, or the like. For example, the controller **504** can receive a selection of a type of condiment (e.g., ketchup, mustard, relish, etc.) to dispense, a type of spice (e.g., salt, pepper, oregano, etc.) to dispense, and/or a type of food (e.g., lettuce, onions, tomatoes, etc.) to dispense. The amount of food to dispense can include an amount by volume (e.g., fluid ounces, milliliters, etc.), an amount by weight (e.g., ounces), or the like. The quantity of packets **260** to dispense can include a number of packets **260** to dispense (e.g., 1 packet, 2 packets, 3 packets, 4 packets, etc.). The controller **504** can receive any type of user input for dispensing the food and/or the packets **260** from the touchless food dispenser **210** without the user having to physically touch the touchless food dispenser **210** to dispense the food or the packets **260**.

[0075] In step **610**, the controller **504** receives one or more proximity sensor signals. For example, the controller **504** receives the one or more user proximity sensor signals **512** from the one or more user proximity sensors **240** that indicate the user is proximate (e.g., standing in front of) the touchless food dispenser **210**. The controller **504** can also receive the one or more dispenser proximity sensor signals **514** from one or more of the dispenser proximity sensors **242** that indicate the user is gesturing in front of the respective aperture **230** of the selected type of food.

[0076] In step **615**, the controller **504** dispenses one or more packets **260** through the aperture **230**. In this way, the roll **262** can be unwound as the packets **260** are dispensed. For example, the controller **504** can dispense the selected quantity of packets **260** to dispense. To determine the quantity of packets **260** that have been dispensed, the controller **504** receives the packet sensor signals **516** from the one or more packet sensors **277**. The controller **504** can determine a number of packets **260** that are sensed by the packet sensor **277**. For example, the controller **504** can determine the number of packets **260** based on the number of perforations **261** that have passed the packet sensors **277**, based on the length of a packet **260** as the packet **260** passes the packet sensors **277**, or based on any other means for determining a number of packets **260** that have passed the packet sensors **277**.

[0077] Accordingly, the controller **504** can determine a quantity of packets **260** that have been dispensed based on the number of packets **260** sensed by the packet sensors **277**. In this way, the controller **504** can determine when to stop dispensing the packets **260** from the touchless food dispenser **210**. For example, the controller **504** can automatically stop dispensing packets **260** from the touchless food dispenser **210** when the selected quantity of packets **260** has been dispensed.

[0078] To dispense the one or more packets **260**, in step **620**, the controller **504** controls the electric motor **276** to turn on the electric motor. In step **625**, the controller **504** controls the drive rollers **272** to rotate the drive rollers **272**.

Rotation of the drive rollers **272** causes the packets **260** to cycle between the drive rollers **272**. For example, as the drive rollers **272** rotate, the drive rollers **272** pull the packets **260** towards and out of the aperture **230** such that the roll **262** unwinds. In step **630**, the controller **504** controls the cutting mechanism **278** to cut or otherwise tear a respective packet **260** to open the respective packet **260** prior to the packet **260** being dispensed from the aperture **230**. In this way, the controller **504** can automatically open the packets **260** as the packets **260** are being dispensed.

[0079] In some embodiments, the controller **504** can dispense one packet **260** at a time such that each packet **260** is individually cut and removed from the roll **262** as the packet **260** is dispensed from the touchless food dispenser **210**. In some embodiments, the controller **504** can dispense multiple packets **260** at a time. For example, the controller **504** can dispense five packets **260** at a time and cut only the fifth packet **260** to remove the packets **260** from the roll **262**. In some embodiments, the controller **504** can dispense the selected quantity of packets **260** at one time. For example, if the selected quantity of packets **260** is eight packets **260**, the controller **504** can control the touchless food dispenser **210** to dispense eight packets **260** and to cut the eighth packet **260** to remove the eight packets **260** from the roll **262**.

[0080] In some embodiments, the controller **504** can control the drive rollers **272**, as detailed above, to squeeze or otherwise force the food out of the packets **260** to dispense the food out of the aperture **230** rather than dispensing the packets **260** themselves out of the aperture **230**. For example, the cutting mechanism **278** can cut a front end of the packets **260** (e.g., an end facing the aperture **230** when the packet **260** is within the touchless food dispenser **210**) and the food is squeezed out of the packets **260** and through the aperture **230** as the packets **260** pass through the drive rollers **272**. In some embodiments, the roll **262** can comprise a single, continuous packet **260** such that there are no perforations. In such embodiments, the packet **260** can be opened (e.g., manually by an operator or automatically by the cutting mechanism **278**) and the food can be dispensed from the packet **260** as the packet **260** passes through the drive rollers **272**.

[0081] In some embodiments, the controller **504** can receive a user input of a selection of an amount of food to dispense. The controller **504** can dispense the amount of food, can determine an amount of food that has been dispensed, and can automatically stop dispensing when the selection of the amount of food has been dispensed. In some embodiments, the controller **504** can be programmed to dispense a predetermined amount of the food or a predetermined quantity of packets **260** every time a user gestures in front of a respective dispenser proximity sensor **242**. For example, an operator of the touchless food dispenser **210** can set the predetermined amount of food (e.g., 1 ounce, 2 ounces, 3 ounces, etc.) or the predetermined quantity of packets **260** (e.g., 1 packet, 2 packets, 3 packets, etc.) to dispense. In such embodiments, the controller **504** need not receive a user input selection of the amount of food or a user input selection of the quantity of packets **260** from a user that desires to dispense the food or the packets **260**.

[0082] In some embodiments, the controller **504** can control the feed mechanism **373** (FIG. 3) and/or the feed mechanism **473** (FIG. 4) to release the packets from the food

storage containers and towards the aperture 230 to dispense the packets out of the aperture 230, as detailed above.

[0083] FIGS. 7A and 7B illustrate various views of a touchless food dispenser 710, according to another embodiment. FIG. 7A illustrates a schematic, front perspective view of the touchless food dispenser 710, and FIG. 7B illustrates a schematic, front cutaway view of the touchless food dispenser 710 with a front portion of the touchless food dispenser 710 removed such that an inner portion 711 of the touchless food dispenser 710 is shown. The touchless food dispenser 710 can be utilized as the touchless food dispenser 10, shown and described with respect to FIG. 1. The arrangement of the components of the touchless food dispenser 710 shown in FIGS. 7A to 7B are exemplary only, and the components may be arranged in any configuration, as desired, without deviating from the present disclosure.

[0084] Referring to FIG. 7A, the touchless food dispenser 710 includes a casing 712 that defines a front side 714, a rear side 716, a left side 718, a right side 720, a bottom side 722, and a top side 724, per the orientation of the touchless food dispenser 710 shown in FIG. 7A. While the exemplary embodiment shows the casing 712 having a generally rectangular configuration, the casing 712 of the touchless food dispenser 710 can have any configuration, shape, and/or size, as desired. The touchless food dispenser 710 can store one or more types of food within the casing 712 for being dispensed from the touchless food dispenser 710, as detailed further below. For example, the touchless food dispenser 710 can store condiments, spices, chopped foods (e.g., onions, lettuce, tomatoes, etc.), or the like for being dispensed from the touchless food dispenser 710 into a receptacle 760 (e.g., a condiment cup), onto a food item (e.g., onto a hamburger), or otherwise dispensed out of the touchless food dispenser 710.

[0085] The touchless food dispenser 710 includes one or more dispensing mechanisms, such as one or more removable nozzles 730 for dispensing one or more types of food 758 from the touchless food dispenser 710. The one or more removable nozzles 730 can include apertures or the like for dispensing the food 758 from the touchless food dispenser 710. In the exemplary embodiment, the one or more removable nozzles 730 include three such removable nozzles 730 including as a first removable nozzle 730a, a second removable nozzle 730b, and a third removable nozzle 730c. The one or more removable nozzles 730 may include any number of removable nozzles 730 for dispensing any number of types of food 758, as desired, and may be sized and shaped for dispensing various types of food from the touchless food dispenser 710. The touchless food dispenser 710 includes a dispensing area 732 in which the one or more removable nozzles 730 are oriented to dispense the food 758 food from the touchless food dispenser 710.

[0086] Each of the removable nozzles 730 includes one or more clasps 731. For example, the one or more clasps 731 can be pinch clasps that can be pinched and inserted into a corresponding aperture 729 (FIG. 7B) or the like on the touchless food dispenser 710 and can expand within the aperture 729 (FIG. 7B) to secure the removable nozzles 730 to the touchless food dispenser 710. The removable nozzles 730 can be single-use nozzles such that the removable nozzles 730 are replaced after each use of the removable nozzle 730 (e.g., after each time food is dispensed through the removable nozzle 730), as detailed further below. Thus, the removable nozzles 730 can be removed from the touch-

less food dispenser 710 and replaced with new removable nozzles 730. In some embodiments, the removable nozzles 730 can include threads that can be threaded into corresponding threads in the apertures 729 (FIG. 7B). The removable nozzles 730 can include any apparatus for allowing the removable nozzles 730 to be removed from the touchless food dispenser 710.

[0087] The touchless food dispenser 710 also includes one or more user proximity sensors 740 and one or more dispenser proximity sensors 742. The one or more user proximity sensors 740 are positioned and oriented to detect a user in front of, or otherwise near or proximate, the touchless food dispenser 710, as detailed above with respect to the user proximity sensors 40 of FIG. 1. The one or more dispenser proximity sensors 742 are positioned and oriented to detect an object, such as a receptacle for receiving the dispensed food, a food item, a user's hand, etc., in front of, or below, a respective removable nozzle 730, as detailed above with respect to the dispenser proximity sensors 42 of FIG. 1. The one or more dispenser proximity sensors 742 include a proximity sensor associated with each of the one or more removable nozzles 730. For example, the one or more dispenser proximity sensors 742 include one or more first dispenser proximity sensors 742a associated with the first removable nozzle 730a, one or more second dispenser proximity sensors 742b associated with the second removable nozzle 730b, and one or more third dispenser proximity sensors 742c associated with the third removable nozzle 730c.

[0088] In some embodiments, the touchless food dispenser 710 includes a display 750. The display 750 can display the various types of food that are available in the touchless food dispenser 710 for dispensing, can display a selected type of food for dispensing from the touchless food dispenser 710, can display an amount of food being dispensed, and/or can display advertisements, pictures, video or text, as detailed above with respect to the display 50 of FIG. 1.

[0089] FIG. 7B shows the front side 714 of the inner portion 711 of the touchless food dispenser 710. The dispenser proximity sensors 742 (FIG. 7A) are removed from FIG. 7B for clarity. As shown in FIG. 7B, the touchless food dispenser 710 includes one or more apertures 729 (shown schematically by dashed lines in FIG. 7B) for receiving the removable nozzles 730. For example, the one or more apertures include a first aperture 729a for receiving the first removable nozzle 730a, a second aperture 729b for receiving the second removable nozzle 730b, and a third aperture 729c for receiving the third removable nozzle 730c. The one or more apertures 729 may include any number of apertures for receiving any number of removable nozzles 730.

[0090] As shown in FIG. 7B, the touchless food dispenser 710 includes one or more food storage containers 770 for storing one or more types of food. In the exemplary embodiment, the one or more food storage containers 770 include a first food storage container 770a that stores a first type of food (e.g., ketchup), a second food storage container 770b that stores a second type of food (e.g., mustard), and a third food storage container 770c that stores a third type of food (e.g., relish). The food storage containers 770 may include any number of food storage containers with any number of different types of food, and can store any amount of food therein. In some embodiments, the touchless food dispenser 710 includes a single food storage container 770 that stores various types of food. The food may be stored directly

within the food storage containers 770. In some embodiments, the food is stored in one or more food-containing bags 772 that are inserted into the one or more food storage containers 770. For example, the one or more food-containing bags 772 include a first food-containing bag 772a within the first food storage container 770a, a second food-containing bag 772b within the second food storage container 770b, and a third food-containing bag 772c within the third food storage container 770c. Each food-containing bag 772 may store a different type of food. The food-containing bags 772 may include any number of food-containing bags for containing any number of different types of food.

[0091] Each food storage container 770 may include a door or the like for providing access to the food storage container 770. In this way, an operator of the touchless food dispenser 710 can insert the food-containing bags 772 into the food storage containers 770. In some embodiments, the touchless food dispenser 710 includes a single door that opens all of the food storage containers 770 at once. In some embodiments, each food storage container 770 includes a separate door such that each food storage container 770 can be opened individually. Thus, the food-containing bags 772 can be removed and replaced with new food-containing bags 772 when the food-containing bags 772 are empty or nearly empty (e.g., after all or nearly all of the food 758 of a food-containing bag 772 has been dispensed). In some embodiments, the operator can refill the food storage containers 770 directly, for example, by pouring additional food from the food-containing bags 772 into the food storage container 770, rather than replacing an entire food-containing bag 772 with a new food-containing bag 772. In some embodiments, rather than food-containing bags 772, the food storage containers 770 can include vats, reservoirs, or the like for storing food therein.

[0092] The touchless food dispenser 710 also includes one or more tubes 774 that provide fluid communication between the one or more food-containing bags 772 and the one or more removable nozzles 730. In this way, the food can be dispensed from a respective food-containing bag 772 through a respective removable nozzle 730 and out of the touchless food dispenser 710, as detailed further below. In the exemplary embodiment, the one or more tubes 774 include a first tube 774a between the first food-containing bag 772a and the first removable nozzle 730a, a second tube 774b between the second food-containing bag 772b and the second removable nozzle 730b, and a third tube 774c between the third food-containing bag 772c and the third removable nozzle 730c. The one or more tubes 774 can include any number of tubes 774 for providing fluid communication between the food-containing bags 772 and the removable nozzles 730. The one or more tubes 774 can include flexible tubes, such as rubber tubes or the like, to carry food from the food-containing bags 772 to the removable nozzles 730.

[0093] The touchless food dispenser 710 also includes a power supply 280, one or more pumps 781, a refrigeration device 782, and a controller 804. The power supply 280 provides electric power to the various electronic components of the touchless food dispenser 710. The power supply 280 can include, for example, a power cord that plugs into a corresponding power outlet, one or more batteries, or any other type of power supply. The one or more pumps 781 can include any type of pump for pushing or otherwise moving the food from the food-containing bags 772 through the

removable nozzles 730. For example, the one or more pumps 781 are coupled to the food-containing bags 772 via tubing (e.g., the tubes 774) or the like. In the exemplary embodiment, the one or more pumps 781 include a first pump 781a associated with the first food-containing bag 772a, a second pump 781b associated with the second food-containing bag 772b, and a third pump 781c associated with the third food-containing bag 772c. The one or more pumps 781 can include any number of different pumps for pumping the food from the food-containing bags 772 through the removable nozzles 730 to dispense food from the touchless food dispenser 710.

[0094] The refrigeration device 782 can control the climate (e.g., the temperature) within the touchless food dispenser 710 such as to control the temperature of the food that is stored within the touchless food dispenser 710. In some embodiments, the touchless food dispenser includes a heating device to heat aspects of the touchless food dispenser 710. In exemplary embodiments, the heating and/or refrigeration devices may heat or cool the touchless food dispenser 710 to a specified temperature or within a specified temperature range to heat or to cool the food stored within the touchless food dispenser 710. The controller 804 can control aspects of the touchless food dispenser 710 to automatically dispense a portion of the food, as detailed further below.

[0095] The touchless food dispenser 710 can also be in communication with a computing device 790, such as, for example, a smartphone, a tablet, a computer, a laptop, or the like. In some embodiments, the touchless food dispenser 710 can receive user input from the computing device 790. In this way, the user can input commands to the controller 804, to control aspects of the touchless food dispenser 710, as detailed further below. For example, the computing device 790 can display a graphical user interface (e.g., via a mobile application or the like) such that the user can input a selection of a type of food for dispensing from the touchless food dispenser 710, a selection of an amount of the food to dispense, or any other user input can be input to the controller 804 from the computing device 790. In this way, the user can control aspects of the touchless food dispenser 710 without physically touching the touchless food dispenser 710. In some embodiments, the mobile application can store user preferences including the amount of food to dispense. The user preferences can be sent to the touchless food dispenser 710 (e.g., via a numerical code, via a barcode, via a QR code, via wireless communication, or the like) and the touchless food dispenser 710 can automatically dispense the food based on the user preferences.

[0096] In some embodiments, the removable nozzles 730 define a receptacle into which the food is dispensed. In this way, a portion of food can be dispensed into a respective removable nozzle 730 and the user can remove the removable nozzle 730 to take the dispensed food from the touchless food dispenser 710. In some embodiments, the removable nozzles 730 can be automatically removed and replaced. For example, the touchless food dispenser 710 can store a plurality of removable nozzles 730 associated with each of the different food storage containers 770. The controller 804 can control the touchless food dispenser 710 to dispense the food and to remove the removable nozzle 730 from the aperture 729 after the food has been dispensed. A different (e.g., a new) removable nozzle 730 can then be inserted into the aperture 729 (e.g., the different removable

nozzle 730 can drop down or otherwise be inserted into the aperture 729), as detailed further below.

[0097] FIG. 7C is a schematic, front cutaway view of the touchless food dispenser 710, according to the present disclosure. The view of FIG. 7C shows one or more nozzle containers 733, and the food storage containers 770 are not shown in this view for clarity. The one or more nozzle containers 733 can be in front of, behind, or in line with, the one or more food storage containers 770. The one or more nozzle containers 733 store the removable nozzles 730 therein. For example, the one or more nozzle containers 733 include a first nozzle container 733a for storing a plurality of first removable nozzles 730a, a second nozzle container 733b for storing a plurality of second removable nozzles 730b, and a third nozzle container 733c for storing a plurality of third removable nozzles 730c. The one or more nozzle containers 733 can include any number of nozzle containers 733 for containing any number of different removable nozzles 730.

[0098] The touchless food dispenser 710 also includes one or more nozzle replacement mechanisms 734 for replacing the removable nozzles 730 after a respective removable nozzle 730 has been used. The one or more nozzle replacement mechanisms 734 include an electro-mechanical device that is controlled by the controller 804 (FIGS. 7B and 8). The one or more nozzle replacement mechanisms 734 can be controlled to remove a respective removable nozzle 730 after food has been dispensed through or into the removable nozzle 730. For example, the one or more nozzle replacement mechanisms 734 can open the clasps 731 such that the removable nozzle 730 drops or is otherwise placed into a disposal container 735. In this way, used removable nozzles 730 can be disposed in the disposal container 735 and a person (e.g., an employee or owner of the touchless food dispenser 710) can remove the disposal container 735 to dispose the used removable nozzles 730. In some embodiments, the one or more nozzle replacement mechanisms 734 can unscrew the removable nozzle 730 from the threaded connection to remove the removable nozzle 730 from the aperture 729. In embodiments in which the food is dispensed into the removable nozzle 730, the one or more nozzle replacement mechanisms 734 can remove the removable nozzle 730 from the aperture 729 such that the user can take the removable nozzle 730 from the touchless food dispenser 710.

[0099] The one or more nozzle replacement mechanisms 734 can be controlled to insert a different removable nozzle 730 from the stack of removable nozzles 730 in a respective nozzle container 733. In this way, the one or more nozzle replacement mechanisms 734 can automatically remove a used removable nozzle 730 and replace the used removable nozzle 730 with a different removable nozzle 730. For example, the touchless food dispenser 710 includes a first state in which the food is dispensed through a first removable nozzle 730 in the first aperture 729a, and a second state in which the food is dispensed through a different or second removable nozzle 730 that has been inserted into the first aperture 729a after the first removable nozzle 730 has been removed by the one or more nozzle replacement mechanisms 734. The one or more nozzle replacement mechanisms 734 can include a first nozzle replacement mechanism 734a associated with the plurality of first removable nozzles 730a, a second nozzle replacement mechanism 734b associated with the plurality of second removable nozzles 730b, and a

third nozzle replacement mechanism 734c associated with the plurality of third removable nozzles 730c. The one or more nozzle replacement mechanisms 734 can include any number of nozzle replacement mechanisms 734 for removing and replacing the removable nozzles 730.

[0100] FIG. 8 is a block diagram of a touchless food dispenser control system 800, for operation and control of at least portions of the touchless food dispenser 710 (FIGS. 7A to 7C). The touchless food dispenser control system 800 includes inputs 802, the controller 804, and outputs 806. The inputs 802 include user input 810 from the display 750 and/or from the computing device 790, one or more user proximity sensor signals 812 from the one or more user proximity sensors 740, and one or more dispenser proximity sensor signals 814 from the one or more dispenser proximity sensors 742. The outputs 806 include the one or more pumps 781 and the one or more removable nozzles 730. The pumps 781 output includes control of the one or more pumps 781 to control operation of the one or more pumps 781. The nozzle replacement mechanism 734 output includes control of the one or more nozzle replacement mechanisms 734 to remove and/or replace the removable nozzles 730. The controller 804 receives the inputs 802, implements a method of dispensing food from a touchless food dispenser 710, and controls the outputs 806, as detailed with reference to FIG. 9 below.

[0101] The controller 804 may be one or more standalone controllers. In this embodiment, the controller 804 includes a computing device having one or more processors 805 and a memory 807. Accordingly, the controller 804 can be implemented as the computing device 1000 detailed below with respect to FIG. 10.

[0102] FIG. 9 is a flow diagram of a method 900 of dispensing food from a touchless food dispenser, according to another embodiment of the present disclosure. Reference is made to the touchless food dispenser 710 of FIGS. 7A to 7C and to the touchless food dispenser control system 800 of FIG. 8 in the description of the method 900 below.

[0103] In step 905, the method 900 includes receiving user input 810. For example, the controller 804 receives user input 810. The controller 804 can receive a selection of a type of food 758 to dispense from the touchless food dispenser 710, can receive an amount of the food 758 to dispense, or the like. For example, the controller 804 can receive a selection of a type of condiment (e.g., ketchup, mustard, relish, etc.) to dispense, a type of spice (e.g., salt, pepper, oregano, etc.) to dispense, and/or a type of food (e.g., lettuce, onions, tomatoes, etc.) to dispense. The amount of food 758 to dispense can include an amount by volume (e.g., fluid ounces, milliliters, etc.), an amount by weight (e.g., ounces), or the like. The controller 804 can receive any type of user input for dispensing the food 758 from the touchless food dispenser 710 without the user having to physically touch the touchless food dispenser 710 to dispense the food 758.

[0104] In step 910, the method 900 includes receiving one or more proximity sensor signals. For example, the controller 804 receives the one or more user proximity sensor signals 812 from the one or more user proximity sensors 740 that indicate the user is proximate (e.g., standing in front of) the touchless food dispenser 710. The controller 804 can also receive the one or more dispenser proximity sensor signals 814 from one or more of the dispenser proximity

sensors **742** that indicate the user is gesturing in front of, or below, a respective removable nozzle **730** of the selected type of food **758**.

[0105] In step **915**, the method **900** includes dispensing the food **758** through the removable nozzle **730**. For example, the controller **804** dispenses the food **758** through the removable nozzle **730**. For example, the controller **804** can dispense the selected amount of food **758**. To dispense the food **758**, the controller **804** can control one or more of the pumps **781** to pump the food **758** from the food-containing bag **772**, through the tube **774**, and through the removable nozzle **730**. In this way, the food **758** is dispensed into a receptacle **760**, onto a food item, or otherwise dispensed from the touchless food dispenser **710**. In some embodiments, when the removable nozzles **730** define receptacles, the food **758** can be dispensed into the removable nozzles **730**. In this way, the controller **804** can dispense a predetermined amount of food into the removable nozzle **730** and the user can remove the removable nozzle **730** with the food **758** therein from the touchless food dispenser **710**. For example, the controller **804** can dispense an amount of food **758** corresponding to a volume of the removable nozzle **730**.

[0106] The controller **804** can also determine an amount of food **758** that has been dispensed. For example, the controller **804** can determine the amount of food **758** that has been dispensed based on the pumping action of the pumps **781**, based on a sensor that senses the food **758** passing through the tubes **774** or through the removable nozzle **730**, based on a weight of the food **758** in the food-containing bag **772**, and/or by any other means for determining an amount of the food **758** that has been dispensed. In this way, the controller **804** can determine when to stop dispensing the food **758** from the touchless food dispenser **710**. For example, the controller **804** can automatically stop dispensing the food **758** from the touchless food dispenser **710** when the selected amount of food **758** has been dispensed.

[0107] In some embodiments, the controller **804** can be programmed to dispense a predetermined amount of the food **758** every time a user gestures in front of, or below, a respective dispenser proximity sensor **742**. For example, an operator of the touchless food dispenser **710** can set the predetermined amount of food (e.g., 1 fluid ounce, 2 fluid ounces, 3 fluid ounces, etc.) to dispense. In such embodiments, the controller **804** need not receive a user input selection of the amount of food **758** from a user that desires to dispense the food **758** from the touchless food dispenser **710**.

[0108] After the food **758** has been dispensed, in step **920**, the method **900** includes removing the removable nozzle **730**. For example, the user can remove the removable nozzle **730** and/or the operator can remove the removable nozzle **730** from the aperture **729**. In some embodiments, the controller **804** can control the touchless food dispenser **710** to automatically remove the removable nozzle **730**. For example, the controller **804** can control an actuator or like device, such as the one or more nozzle replacement mechanisms **734**, such that the removable nozzle **730** is removed from the aperture **729**. In some embodiments, the user or the operator can dispose of the removable nozzle **730**. In some embodiments, the removable nozzle **730** can be disposed of in the disposal container **735** within the touchless food dispenser **710**. For example, when the controller **804** controls the one or more nozzle replacement mechanisms **734** to

remove the removable nozzle **730** from the aperture **729**, the removable nozzle **730** can fall into, or otherwise be placed into, the disposal container **735**.

[0109] In step **925**, the method **900** includes inserting a different removable nozzle **730** into the touchless food dispenser **710**. For example, the controller **804** can control the one or more nozzle replacement mechanisms **734** to insert a different removable nozzle **730** into the aperture **729** from the nozzle container **733**. In some embodiments, the operator or the user can insert the different removable nozzle **730** in the aperture **729**. In some embodiments, additional removable nozzles **730** can be stored within the touchless food dispenser **710** (e.g., in the one or more nozzle containers **733**) such that the different removable nozzle **730** can automatically drop down into the aperture **729** to take the place of the removed removable nozzle **730**, as detailed above. Thus, the touchless food dispenser **710** includes single-use removable nozzles **730** that can be removed and replaced after every use (e.g., every time food **758** is dispensed through, or into, a respective removable nozzle **730**).

[0110] With reference to FIG. **10**, an exemplary system includes a general-purpose computing device **1000**, including a processing unit (CPU or processor) **1020** and a system bus **1010** that couples various system components including a memory **1030** such as read-only memory (ROM) **1040** and random-access memory (RAM) **1050** to the processor **1020**. The computing device **1000** can include a cache of high-speed memory connected directly with, in close proximity to, or integrated as part of the processor **1020**. The computing device **1000** copies data from the memory **1030** and/or the storage device **1060** to the cache for quick access by the processor **1020**. In this way, the cache provides a performance boost that avoids processor **1020** delays while waiting for data. These and other modules can control or be configured to control the processor **1020** to perform various actions. Other memory **1030** may be available for use as well. The memory **1030** can include multiple different types of memory with different performance characteristics. It can be appreciated that the disclosure may operate on a computing device **1000** with more than one processor **1020** or on a group or cluster of computing devices networked together to provide greater processing capability. The processor **1020** can include any general-purpose processor and a hardware module or software module, such as module **1** **1062**, module **2** **1064**, and module **3** **1066** stored in storage device **1060**, configured to control the processor **1020** as well as a special-purpose processor where software instructions are incorporated into the actual processor design. The processor **1020** may essentially be a completely self-contained computing system, containing multiple cores or processors, a bus, memory controller, cache, etc. A multi-core processor may be symmetric or asymmetric.

[0111] The system bus **1010** may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. A basic input/output (BIOS) stored in ROM **1040** or the like, may provide the basic routine that helps to transfer information between elements within the computing device **1000**, such as during start-up. The computing device **1000** further includes storage devices **1060** such as a hard disk drive, a magnetic disk drive, an optical disk drive, tape drive or the like. The storage device **1060** can include software modules **1062**, **1064**, **1066** for

controlling the processor **1020**. Other hardware or software modules are contemplated. The storage device **1060** is connected to the system bus **1010** by a drive interface. The drives and the associated computer-readable storage media provide nonvolatile storage of computer-readable instructions, data structures, program modules and other data for the computing device **1000**. In one aspect, a hardware module that performs a particular function includes the software component stored in a tangible computer-readable storage medium in connection with the necessary hardware components, such as the processor **1020**, system bus **1010**, output device **1070**, and so forth, to carry out the function. In another aspect, the system can use a processor and computer-readable storage medium to store instructions which, when executed by a processor (e.g., one or more processors), cause the processor to perform a method or other specific actions. The basic components and appropriate variations are contemplated depending on the type of device, such as whether the computing device **1000** is a small, handheld computing device, a desktop computer, or a computer server.

[0112] Although the exemplary embodiment described herein employs the storage device **1060**, other types of computer-readable media which can store data that are accessible by a computer, such as magnetic cassettes, flash memory cards, digital versatile disks, cartridges, random-access memories (RAMs) **1050**, and read-only memory (ROM) **1040**, may also be used in the exemplary operating environment. Tangible computer-readable storage media, computer-readable storage devices, or computer-readable memory devices, expressly exclude media such as transitory waves, energy, carrier signals, electromagnetic waves, and signals per se.

[0113] To enable user interaction with the computing device **1000**, an input device **1090** represents any number of input mechanisms, such as a microphone for speech, a touch-sensitive screen for gesture or graphical input, keyboard, mouse, motion input, speech and so forth. An output device **1070** can also be one or more of a number of output mechanisms known to those of skill in the art, such as, for example, a display. In some instances, multimodal systems enable a user to provide multiple types of input to communicate with the computing device **1000**. The communications interface **1080** generally governs and manages the user input and system output. There is no restriction on operating on any particular hardware arrangement and therefore the basic features here may easily be substituted for improved hardware or firmware arrangements as they are developed.

[0114] The technology discussed herein refers to computer-based systems and actions taken by, and information sent to and from, computer-based systems. One of ordinary skill in the art will recognize that the inherent flexibility of computer-based systems allows for a great variety of possible configurations, combinations, and divisions of tasks and functionality between and among components. For instance, processes discussed herein can be implemented using a single computing device or multiple computing devices working in combination. Databases, memory, instructions, and applications can be implemented on a single system or distributed across multiple systems. Distributed components can operate sequentially or in parallel.

[0115] Further aspects of the present disclosure are provided by the subject matter of the following clauses.

[0116] According to an aspect of the present disclosure, a touchless food includes one or more types of food stored therein and one or more dispensing mechanisms, wherein the food is caused to be dispensed through the one or more dispensing mechanisms without a user physically touching the touchless food dispenser.

[0117] The touchless food dispenser of the preceding clause, wherein the touchless food dispenser receives a selected amount of food to dispense and dispenses the selected amount of food.

[0118] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser dispenses a predetermined amount of food.

[0119] The touchless food dispenser of any preceding clause, further comprising one or more user proximity sensors to detect a user in proximity of the touchless food dispenser.

[0120] The touchless food dispenser of any preceding clause, further comprising one or more dispenser proximity sensors to detect a gesture of the user that controls the food being dispensed through the one or more dispensing mechanisms.

[0121] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser dispenses the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

[0122] The touchless food dispenser of any preceding clause, further comprising a display for displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0123] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser receives a selection of an amount of food to dispense from a computing device.

[0124] The touchless food dispenser of any preceding clause, wherein the one or more dispensing mechanisms include one or more apertures.

[0125] The touchless food dispenser of any preceding clause, wherein the food is stored in one or more packets within the touchless food dispenser, and the one or more packets are dispensed through the one or more apertures.

[0126] The touchless food dispenser of any preceding clause, wherein the one or more packets are bundled in a roll that is stored within the touchless food dispenser.

[0127] The touchless food dispenser of any preceding clause, further comprising a cutting mechanism that removes the one or more packets from the roll to dispense the one or more packets from the touchless food dispenser.

[0128] The touchless food dispenser of any preceding clause, wherein the cutting mechanism automatically opens the one or more packets as the one or more packets are being dispensed from the touchless food dispenser.

[0129] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser receives a selected quantity of packets to dispense and dispenses the selected quantity of packets.

[0130] The touchless food dispenser of any preceding clause, further comprising one or more food storage containers, wherein the food is stored within the food storage containers.

[0131] The touchless food dispenser of any preceding clause, further comprising one or more pumps that pump the food from the one or more food storage containers to dispense the food.

[0132] The touchless food dispenser of any preceding clause, further comprising one or more removable nozzles.

[0133] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are single-use removable nozzles that are removed and replaced with a different removable nozzle after each use of a respective removable nozzle.

[0134] The touchless food dispenser of any preceding clause, wherein the food is dispensed through the one or more removable nozzles.

[0135] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are receptacles that receive the food therein.

[0136] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser stores additional removable nozzles therein to replace the removed removable nozzle.

[0137] The touchless food dispenser of any preceding clause, further comprising a power supply that supplies power to the touchless food dispenser.

[0138] The touchless food dispenser of any preceding clause, further comprising a controller that controls the touchless food dispenser to dispense the food.

[0139] The touchless food dispenser of any preceding clause, further comprising a refrigeration device to control a temperature of the food within the touchless food dispenser.

[0140] According to an aspect of the present disclosure, a method of dispensing food from a touchless food dispenser includes receiving a selected type of food to dispense from a touchless food dispenser and dispensing the selected type of food through one or more dispensing mechanisms from the touchless food dispenser without a user physically touching the touchless food dispenser to cause the food to be dispensed.

[0141] The method of the preceding clause, further comprising receiving a selected amount of food to dispense and dispensing the selected amount of food.

[0142] The method of any preceding clause, further comprising dispensing a predetermined amount of food.

[0143] The method of any preceding clause, further comprising detecting the user is in proximity to the touchless food dispenser.

[0144] The method of any preceding clause, wherein receiving the selected type of food to dispense includes detecting a gesture of the user that controls the food being dispensed through the one or more dispensing mechanisms.

[0145] The method of any preceding clause, further comprising dispensing the food as long as the gesture of the user is detected.

[0146] The method of any preceding clause, further comprising displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0147] The method of any preceding clause, further comprising receiving, from a computing device, a selection of an amount of food to dispense.

[0148] The method of any preceding clause, wherein the one or more dispensing mechanisms include one or more apertures.

[0149] The method of any preceding clause, wherein the food is stored in packets within the touchless food dispenser, and the method further comprises dispensing the one or more packets through the one or more apertures.

[0150] The method of any preceding clause, wherein the one or more packets are bundled in a roll that is stored within the touchless food dispenser.

[0151] The method of any preceding clause, further comprising removing the one or more packets from the roll to dispense the one or more packets from the touchless food dispenser.

[0152] The method of any preceding clause, further comprising automatically opening the one or more packets as the one or more packets are being dispensed from the touchless food dispenser.

[0153] The method of any preceding clause, further comprising receiving a selected quantity of packets to dispense and dispensing the selected quantity of packets.

[0154] The method of any preceding clause, further comprising storing the food within one or more food storage containers.

[0155] The method of any preceding clause, further comprising pumping the food from the one or more food storage containers to dispense the food.

[0156] The method of any preceding clause, wherein the touchless food dispenser includes one or more removable nozzles.

[0157] The method of any preceding clause, further comprising removing and replacing a respective removable nozzle with a different removable nozzle after each use of the respective removable nozzle.

[0158] The method of any preceding clause, further comprising dispensing the food through the one or more removable nozzles.

[0159] The method of any preceding clause, wherein the one or more removable nozzles define a receptacle, and the method further comprises dispensing the food into the one or more removable nozzles.

[0160] The method of any preceding clause, further comprising storing additional removable nozzles within the touchless food dispenser to replace the removed removable nozzle.

[0161] The method of any preceding clause, further comprising supplying electric power to the touchless food dispenser through a power supply.

[0162] The method of any preceding clause, further comprising controlling the touchless food dispenser with a controller to dispense the food.

[0163] The method of any preceding clause, further comprising controlling a temperature of the food within the touchless food dispenser with a refrigeration device.

[0164] According to an aspect of the present disclosure, a touchless food dispenser includes one or more packets of food stored therein and one or more apertures, wherein the touchless food dispenser is configured to dispense the food through the one or more apertures.

[0165] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to receive a selected amount of food to dispense and dispense the selected amount of food.

[0166] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense a predetermined amount of food.

[0167] The touchless food dispenser of any preceding clause, further comprising one or more dispenser proximity sensors that are configured to detect a gesture of the user that controls the food being dispensed through the one or more apertures.

[0168] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

[0169] The touchless food dispenser of any preceding clause, further comprising a display for displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0170] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to receive a selection of an amount of food to dispense from a computing device.

[0171] The touchless food dispenser of any preceding clause, wherein the one or more packets are coupled together in a bundle and stored within the touchless food dispenser.

[0172] The touchless food dispenser of any preceding clause, further comprising a cutting mechanism that is configured to remove the one or more packets from the bundle to dispense the one or more packets from the touchless food dispenser.

[0173] The touchless food dispenser of any preceding clause, wherein the one or more packets are bundled together in a stack within the touchless food dispenser.

[0174] The touchless food dispenser of any preceding clause, wherein the one or more packets are bundled together in a roll within the touchless food dispenser.

[0175] The touchless food dispenser of any preceding clause, further comprising a cutting mechanism that is configured to remove the one or more packets from the roll to dispense the one or more packets from the touchless food dispenser.

[0176] The touchless food dispenser of any preceding clause, further comprising a cutting mechanism that is configured to automatically open the one or more packets as the one or more packets are being dispensed from the touchless food dispenser.

[0177] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to receive a selected quantity of packets to dispense and dispenses the selected quantity of packets.

[0178] The touchless food dispenser of any preceding clause, wherein the one or more packets are coupled together and each packet includes one or more perforations.

[0179] The touchless food dispenser of any preceding clause, further comprises a packet sensor that is configured to detect the one or more packets as the one or more packets are being dispensed.

[0180] The touchless food dispenser of any preceding clause, further comprising one or more drive rollers, the touchless food dispenser configured to feed the one or more packets through the one or more drive rollers to dispense the one or more packets through the one or more apertures.

[0181] The touchless food dispenser of any preceding clause, the one or more drive rollers configured to force the food out of the one or more packets to dispense the food out of the one or more apertures and from the touchless food dispenser.

[0182] The touchless food dispenser of any preceding clause, further comprising an electric motor that is configured to provide mechanical power to the one or more drive rollers for rotating the one or more drive rollers.

[0183] The touchless food dispenser of any preceding clause, further comprising a power supply that is configured to supply power to the touchless food dispenser.

[0184] The touchless food dispenser of any preceding clause, further comprising a controller that is configured to control the touchless food dispenser to dispense the food.

[0185] The touchless food dispenser of any preceding clause, further comprising a refrigeration device that is configured to control a temperature of the food within the touchless food dispenser.

[0186] The touchless food dispenser of any preceding clause, wherein each of the one or more packets of food containing a single-serving of the food.

[0187] The touchless food dispenser of any preceding clause, wherein the one or more packets of food each contain less than 1 oz of food.

[0188] The touchless food dispenser of any preceding clause, wherein the one or more packets of food each contain less than 0.5 oz of food.

[0189] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense the food through the one or more apertures without a user physically touching the touchless food dispenser.

[0190] The touchless food dispenser of any preceding clause, further comprising a casing, wherein the one or more packets of food are stored within the casing, and the touchless food dispenser is configured to dispense the food out of the casing through the one or more apertures.

[0191] The touchless food dispenser of any preceding clause, further comprising one or more removable nozzles inserted in the one or more apertures, wherein the touchless food dispenser is configured to dispense the food from the touchless food dispenser through the one or more nozzles.

[0192] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense the one or more packets of food from the touchless food dispenser through the one or more apertures.

[0193] The touchless food dispenser of any preceding clause, wherein the one or more packets of food are stored within one or more food storage containers in the touchless food dispenser.

[0194] The touchless food dispenser of any preceding clause, further comprising a feed mechanism that is configured to release a packet of the one or more packets of food from the one or more food storage containers.

[0195] According to an aspect of the present disclosure, a method of dispensing food from a touchless food dispenser includes receiving a selected type of food to dispense from a touchless food dispenser, the touchless food dispenser storing one or more packets of food therein and dispensing the selected type of food through one or more apertures from the touchless food dispenser.

[0196] The method of any preceding clause, further comprising receiving a selected amount of food to dispense and dispensing the selected amount of food.

[0197] The method of any preceding clause, further comprising dispensing a predetermined amount of food.

[0198] The method of any preceding clause, further comprising detecting a gesture of the user that controls the food being dispensed through the one or more dispensing mechanisms.

[0199] The method of any preceding clause, further comprising dispensing the food as long as the gesture of the user is detected.

[0200] The method of any preceding clause, further comprising displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0201] The method of any preceding clause, further comprising receiving, from a computing device, a selection of an amount of food to dispense.

[0202] The method of any preceding clause, further comprising coupling the one or more packets together in a bundle and storing the coupled one or more packets within the touchless food dispenser.

[0203] The method of any preceding clause, further comprising removing the one or more packets from the bundle with a cutting mechanism to dispense the one or more packets from the touchless food dispenser.

[0204] The method of any preceding clause, further comprising storing the one or more packets in a stack within the touchless food dispenser.

[0205] The method of any preceding clause, further comprising storing the one or more packets in a roll within the touchless food dispenser.

[0206] The method of any preceding clause, further comprising removing the one or more packets from the roll to dispense the one or more packets from the touchless food dispenser.

[0207] The method of any preceding clause, further comprising automatically opening the one or more packets as the one or more packets are being dispensed from the touchless food dispenser.

[0208] The method of any preceding clause, further comprising receiving a selected quantity of packets to dispense and dispensing the selected quantity of packets.

[0209] The method of any preceding clause, further comprising detecting the one or more packets as the one or more packets are being dispensed.

[0210] The method of any preceding clause, further comprising feeding the one or more packets through one or more drive rollers to dispense the one or more packets through the one or more apertures.

[0211] The method of any preceding clause, further comprising forcing the food out of the one or more packets with the one or more drive rollers to dispense the food from the touchless food dispenser.

[0212] The method of any preceding clause, further comprising providing mechanical power to the one or more drive rollers to rotate the one or more drive rollers.

[0213] The method of any preceding clause, further comprising supplying power to the touchless food dispenser from a power supply.

[0214] The method of any preceding clause, further comprising controlling, by a controller, the touchless food dispenser to dispense the food.

[0215] The method of any preceding clause, further comprising controlling a temperature of the food within the touchless food dispenser with a refrigeration device.

[0216] The method of any preceding clause, wherein the one or more packets of food contain a single-serving of the food.

[0217] The method of any preceding clause, wherein the one or more packets of food each contain less than 1 oz of food.

[0218] The method of any preceding clause, wherein the one or more packets of food each contain less than 0.5 oz of food.

[0219] The method of any preceding clause, further comprising dispensing the food through the one or more apertures without a user physically touching the touchless food dispenser.

[0220] The method of any preceding clause, wherein the touchless food dispenser includes a casing, wherein the one or more packets of food are stored within the casing, and the method further comprises dispensing the food out of the casing through the one or more apertures.

[0221] The method of any preceding clause, wherein the touchless food dispenser includes one or more removable nozzles inserted in the one or more apertures, the method further comprising dispensing the food from the touchless food dispenser through the one or more nozzles.

[0222] The method of any preceding clause, further comprising dispensing the one or more packets of food from the touchless food dispenser through the one or more apertures.

[0223] The method of any preceding clause, wherein the one or more packets of food are stored within one or more food storage containers in the touchless food dispenser.

[0224] The method of any preceding clause, wherein the touchless food dispenser includes a feed mechanism, the method further comprising releasing a packet of the one or more packets of food from the one or more food storage containers.

[0225] According to an aspect of the present disclosure, a touchless food dispenser control system includes a touchless food dispenser comprising one or more packets of food stored therein and one or more apertures and a controller. The controller is configured to control the touchless food dispenser to dispense the food through the one or more apertures.

[0226] The touchless food dispenser control system of the preceding clause, wherein the controller is configured to receive a selected amount of food to dispense and to dispense the selected amount of food.

[0227] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to control the touchless food dispenser to dispense a predetermined amount of food.

[0228] The touchless food dispenser control system of any preceding clause, further comprising one or more dispenser proximity sensors configured to detect a gesture of the user, wherein the controller is further configured to receive one or more dispenser proximity sensor signals from the one or more dispenser proximity sensors and control the touchless food dispenser to dispense the food through the one or more apertures when receiving the one or more dispenser proximity sensor signals.

[0229] The touchless food dispenser control system of any preceding clause, wherein the controller is further configured to control the touchless food dispenser to dispense the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

[0230] The touchless food dispenser control system of any preceding clause, further comprising a display, wherein the controller is configured to display, on the display, pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0231] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to receive a selection of an amount of food to dispense from a computing device.

[0232] The touchless food dispenser control system of any preceding clause, wherein the one or more packets are coupled together in a bundle and stored within the touchless food dispenser.

[0233] The touchless food dispenser control system of any preceding clause, further comprising a cutting mechanism, the controller is further configured to control the cutting mechanism to remove the one or more packets from the bundle to dispense the one or more packets from the touchless food dispenser.

[0234] The touchless food dispenser control system of any preceding clause, wherein the one or more packets are bundled together in a stack within the touchless food dispenser.

[0235] The touchless food dispenser control system of any preceding clause, wherein the one or more packets are bundled in a roll that is stored within the touchless food dispenser.

[0236] The touchless food dispenser control system of any preceding clause, further comprising a cutting mechanism, wherein the controller is configured to control the cutting mechanism to remove the one or more packets from the roll to dispense the one or more packets from the touchless food dispenser.

[0237] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to control the cutting mechanism to automatically open the one or more packets as the one or more packets are being dispensed from the touchless food dispenser.

[0238] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to receive a selected quantity of packets to dispense and control the touchless food dispenser to dispense the selected quantity of packets.

[0239] The touchless food dispenser control system of any preceding clause, wherein the one or more packets are coupled together and each packet includes one or more perforations.

[0240] The touchless food dispenser control system of any preceding clause, further comprising a packet sensor that is configured to detect the one or more packets as the one or more packets are being dispensed, wherein the controller is configured to receive one or more packet signals from the packet sensor that indicates the detected one or more packets.

[0241] The touchless food dispenser control system of any preceding clause, further comprising one or more drive rollers, wherein the controller is configured to control the one or more drive rollers to feed the one or more packets through the one or more drive rollers to dispense the one or more packets through the one or more apertures.

[0242] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to control the one or more drive rollers to force the food out of the one or more packets to dispense the food out of the one or more apertures and from the touchless food dispenser.

[0243] The touchless food dispenser control system of any preceding clause, further comprising an electric motor that is configured to provide mechanical power to the one or more drive rollers for rotating the one or more drive rollers, wherein the controller is configured to control the electric motor to rotate the one or more drive rollers.

[0244] The touchless food dispenser control system of any preceding clause, further comprising a power supply,

wherein the controller is configured to supply power from the power supply to the touchless food dispenser.

[0245] The touchless food dispenser control system of any preceding clause, further comprising a refrigeration device, wherein the controller is configured to control a temperature of the food within the touchless food dispenser with the refrigeration device.

[0246] The touchless food dispenser control system of any preceding clause, wherein each of the one or more packets of food contain a single-serving of the food.

[0247] The touchless food dispenser control system of any preceding clause, wherein the one or more packets of food each contain less than 1 oz of food.

[0248] The touchless food dispenser control system of any preceding clause, wherein the one or more packets of food each contain less than 0.5 oz of food.

[0249] The touchless food dispenser control system of any preceding clause, wherein the controller controls the touchless food dispenser to dispense the food through the one or more apertures without a user physically touching the touchless food dispenser.

[0250] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes a casing, wherein the one or more packets of food are stored within the casing, and the controller controls the touchless food dispenser to dispense the food out of the casing through the one or more apertures.

[0251] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes one or more removable nozzles inserted in the one or more apertures, and the controller further controls the touchless food dispenser to dispense the food from the touchless food dispenser through the one or more nozzles.

[0252] The touchless food dispenser control system of any preceding clause, wherein the controller controls the touchless food dispenser to dispense the one or more packets of food from the touchless food dispenser through the one or more apertures.

[0253] The touchless food dispenser control system of any preceding clause, wherein the one or more packets of food are stored within one or more food storage containers in the touchless food dispenser.

[0254] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes a feed mechanism, and the controller controls the feed mechanism to release a packet of the one or more packets of food from the one or more food storage containers.

[0255] According to an aspect of the present disclosure, a touchless food dispenser includes one or more types of food stored therein and one or more removable nozzles, wherein the touchless food dispenser is configured to dispense the food through the one or more removable nozzles, and one or more nozzle replacement mechanisms that are configured to remove the one or more removable nozzles and replace the one or more removable nozzles with a different removable nozzle.

[0256] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to receive a selected amount of food to dispense and dispense the selected amount of food.

[0257] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense a predetermined amount of food.

[0258] The touchless food dispenser of any preceding clause, further comprising one or more dispenser proximity sensors that are configured to detect a gesture of the user that controls the food being dispensed through the one or more removable nozzles.

[0259] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser that is configured to dispense the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

[0260] The touchless food dispenser of any preceding clause, further comprising a display for displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0261] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to receive a selection of an amount of food to dispense from a computing device.

[0262] The touchless food dispenser of any preceding clause, further comprising one or more food storage containers, wherein the food is stored within the food storage containers.

[0263] The touchless food dispenser of any preceding clause, further comprising one or more pumps that are configured to pump the food from the one or more food storage containers to dispense the food.

[0264] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are single-use removable nozzles, and the one or more nozzle replacement mechanisms are configured to remove and replace the single-use removable nozzles with a different single-use removable nozzle after each use of a respective single-use removable nozzle.

[0265] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are receptacles that receive the food therein.

[0266] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser stores additional removable nozzles therein to replace the removed removable nozzle.

[0267] The touchless food dispenser of any preceding clause, wherein the additional removable nozzles are stored in one or more nozzle containers.

[0268] The touchless food dispenser of any preceding clause, further comprising a disposal container, wherein the one or more nozzle replacement mechanisms are configured to remove the one or more removable nozzles into the disposal container.

[0269] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are secured in one or more apertures within the touchless food dispenser.

[0270] The touchless food dispenser of any preceding clause, further comprising one or more clasps, wherein the one or more removable nozzles are secured to the touchless food dispenser by the one or more clasps.

[0271] The touchless food dispenser of any preceding clause, wherein the one or more removable nozzles are secured to the touchless food dispenser by a threaded connection

[0272] The touchless food dispenser of any preceding clause, further comprising a power supply that is configured to supply power to the touchless food dispenser.

[0273] The touchless food dispenser of any preceding clause, further comprising a controller that is configured to control the touchless food dispenser to dispense the food.

[0274] The touchless food dispenser of any preceding clause, further comprising a refrigeration device that is configured to control a temperature of the food within the touchless food dispenser.

[0275] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser is configured to dispense the food through the one or more removable nozzles without a user physically touching the touchless food dispenser.

[0276] The touchless food dispenser of any preceding clause, further comprising a casing, wherein the one or more types of food are stored within the casing, and the touchless food dispenser is configured to dispense the food out of the casing through the one or more removable nozzles.

[0277] The touchless food dispenser of any preceding clause, further comprising one or more packets that contain the one or more types of food therein.

[0278] The touchless food dispenser of any preceding clause, wherein the touchless food dispenser includes a first state in which a removable nozzle of the one or more removable nozzles is configured to dispense the one or more types of food therethrough, and a second state in which the different removable nozzle is configured to dispense the one or more types of food therethrough.

[0279] The touchless food dispenser of any preceding clause, wherein the one or more types of food are stored in one or more food-containing bags within the touchless food dispenser.

[0280] The touchless food dispenser of any preceding clause, wherein the one or more food-containing bags are stored within one or more food storage containers.

[0281] The touchless food dispenser of any preceding clause, further comprising a dispensing area, wherein the one or more removable nozzles are oriented to dispense the food into the dispensing area.

[0282] The touchless food dispenser of any preceding clause, further comprising one or more user proximity sensors that are configured to detect a user in proximity to the touchless food dispenser.

[0283] The touchless food dispenser of any preceding clause, further comprising one or more stacks of additional removable nozzles stored within the touchless food dispenser.

[0284] The touchless food dispenser of any preceding clause, further comprising one or more tubes that are configured to provide the one or more types of food to the one or more removable nozzles to dispense the food through the one or more removable nozzles.

[0285] According to an aspect of the present disclosure, a method of dispensing food from a touchless food dispenser includes receiving a selected type of food to dispense from a touchless food dispenser, the touchless food dispenser storing one or more types of food therein, dispensing the selected type of food through one or more removable nozzles from the touchless food dispenser with, and removing, with one or more nozzle replacement mechanisms, the one or more removable nozzles and replacing, with the one or more nozzle replacement mechanisms, the one or more removable nozzles with a different removable nozzle.

[0286] The method of any preceding clause, further comprising receiving a selected amount of food to dispense and dispensing the selected amount of food.

[0287] The method of any preceding clause, further comprising dispensing a predetermined amount of food.

[0288] The method of any preceding clause, further comprising detecting a gesture of the user that controls the food being dispensed through the one or more dispensing mechanisms.

[0289] The method of any preceding clause, further comprising dispensing the food as long as the gesture of the user is detected.

[0290] The method of any preceding clause, further comprising displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0291] The method of any preceding clause, further comprising receiving, from a computing device, a selection of an amount of food to dispense.

[0292] The method of any preceding clause, further comprising storing the food within one or more food storage containers.

[0293] The method of any preceding clause, further comprising pumping the food from the one or more food storage containers to dispense the food.

[0294] The method of any preceding clause, further comprising removing and replacing, with the one or more nozzle replacement mechanisms, a respective removable nozzle with a different removable nozzle after each use of the respective removable nozzle.

[0295] The method of any preceding clause, further comprising storing the additional removable nozzles in one or more nozzle containers.

[0296] The method of any preceding clause, further comprising a disposal container, the method further comprising removing, with the one or more nozzle replacement mechanisms, the one or more removable nozzles into the disposal container.

[0297] The method of any preceding clause, wherein the one or more removable nozzles are secured in one or more apertures within the touchless food dispenser.

[0298] The method of any preceding clause, wherein the one or more removable nozzles are secured to the touchless food dispenser by one or more clasps.

[0299] The method of any preceding clause, wherein the one or more removable nozzles are secured to the touchless food dispenser by a threaded connection

[0300] The method of any preceding clause, wherein the one or more removable nozzles define receptacles that receive the food therein.

[0301] The method of any preceding clause, further comprising storing additional removable nozzles within the touchless food dispenser to replace the removed removable nozzle.

[0302] The method of any preceding clause, further comprising supplying power to the touchless food dispenser from a power supply.

[0303] The method of any preceding clause, further comprising controlling, by a controller, the touchless food dispenser to dispense the food.

[0304] The method of any preceding clause, further comprising controlling a temperature of the food within the touchless food dispenser with a refrigeration device.

[0305] The method of any preceding clause, further comprising dispensing the food through the one or more removable nozzles without a user physically touching the touchless food dispenser.

[0306] The method of any preceding clause, wherein the touchless food dispenser includes a casing, wherein the one or more types of food are stored within the casing, and the method further comprises dispensing the food out of the casing through the one or more removable nozzles.

[0307] The method of any preceding clause, wherein the touchless food dispenser includes one or more packets that contain the one or more types of food therein.

[0308] The method of any preceding clause, wherein the touchless food dispenser includes a first state in which a removable nozzle of the one or more removable nozzles is configured to dispense the one or more types of food therethrough, and a second state in which the different removable nozzle is configured to dispense the one or more types of food therethrough.

[0309] The method of any preceding clause, wherein the one or more types of food are stored in one or more food-containing bags within the touchless food dispenser.

[0310] The method of any preceding clause, wherein the one or more food-containing bags are stored within one or more food storage containers.

[0311] The method of any preceding clause, wherein the touchless food dispenser includes a dispensing area, wherein the one or more removable nozzles are oriented to dispense the food into the dispensing area.

[0312] The method of any preceding clause, wherein the touchless food dispenser includes one or more user proximity sensors that are configured to detect a user in proximity to the touchless food dispenser.

[0313] The method of any preceding clause, wherein the touchless food dispenser includes one or more stacks of additional removable nozzles stored within the touchless food dispenser.

[0314] The method of any preceding clause, wherein the touchless food dispenser includes one or more tubes that are configured to provide the one or more types of food to the one or more removable nozzles to dispense the food through the one or more removable nozzles.

[0315] According to an aspect of the present disclosure, a touchless food dispenser control system includes a touchless food dispenser comprising one or more types of food stored therein and one or more removable nozzles and a controller configured to control the touchless food dispenser to dispense the food through the one or more removable nozzles, and to remove, with one or more nozzle replacement mechanisms, the one or more removable nozzles and replace, with the one or more nozzle replacement mechanisms, the one or more removable nozzles with a different removable nozzle.

[0316] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to receive a selected amount of food to dispense and to control the touchless food dispenser to dispense the selected amount of food.

[0317] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to control the touchless food dispenser to dispense a predetermined amount of food.

[0318] The touchless food dispenser control system of any preceding clause, further comprising one or more dispenser proximity sensors that are configured to detect a gesture of

the user, wherein the controller is further configured to receive one or more dispenser proximity sensor signals from the one or more dispenser proximity sensors and control the food being dispensed through the one or more removable nozzles when receiving the one or more dispenser proximity sensor signals.

[0319] The touchless food dispenser control system of any preceding clause, wherein the controller is further configured to control the touchless food dispenser to dispense the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

[0320] The touchless food dispenser control system of any preceding clause, further comprising a display, wherein the controller is configured to display, on the display, pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

[0321] The touchless food dispenser control system of any preceding clause, wherein the controller is configured to receive a selection of an amount of food to dispense from a computing device.

[0322] The touchless food dispenser control system of any preceding clause, further comprising one or more food storage containers, wherein the food is stored within the food storage containers.

[0323] The touchless food dispenser control system of any preceding clause, further comprising one or more pumps, wherein the controller is configured to control the one or more pumps to pump the food from the one or more food storage containers to dispense the food.

[0324] The touchless food dispenser control system of any preceding clause, wherein the one or more removable nozzles are single-use removable nozzles, and the controller is configured to control the one or more nozzle replacement mechanisms remove and replace the single-use removable nozzles with a new single-use removable nozzle after each use of a respective single-use removable nozzle.

[0325] The touchless food dispenser control system of any preceding clause, wherein the one or more removable nozzles define receptacles, wherein the controller is configured to control the touchless food dispenser to dispense the food into the one or more removable nozzles.

[0326] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser stores additional removable nozzles therein, wherein the controller is configured to control the touchless food dispenser to replace the removed removable nozzle with an additional removable nozzle.

[0327] The touchless food dispenser control system of any preceding clause, wherein the additional removable nozzles are stored in one or more nozzle containers.

[0328] The touchless food dispenser control system of any preceding clause, further comprising a disposal container, wherein the controller controls the one or more nozzle replacement mechanisms to remove the one or more removable nozzles into the disposal container.

[0329] The touchless food dispenser control system of any preceding clause, wherein the one or more removable nozzles are secured in one or more apertures within the touchless food dispenser.

[0330] The touchless food dispenser control system of any preceding clause, wherein the one or more removable nozzles are secured to the touchless food dispenser by one or more clasps.

[0331] The touchless food dispenser control system of any preceding clause, wherein the one or more removable nozzles are secured to the touchless food dispenser by a threaded connection

[0332] The touchless food dispenser control system of any preceding clause, further comprising a power supply that is configured to supply power from the power supply to the touchless food dispenser.

[0333] The touchless food dispenser control system of any preceding clause, further comprising a refrigeration device, wherein the controller is configured to control a temperature of the food within the touchless food dispenser with the refrigeration device.

[0334] The touchless food dispenser control system of any preceding clause, wherein the controller controls the touchless food dispenser to dispense the food through the one or more removable nozzles without a user physically touching the touchless food dispenser.

[0335] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes a casing, wherein the one or more types of food are stored within the casing, and the controller controls the touchless food dispenser to dispense the food out of the casing through the one or more removable nozzles.

[0336] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes one or more packets that contain the one or more types of food therein.

[0337] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes a first state in which a removable nozzle of the one or more removable nozzles is configured to dispense the one or more types of food therethrough, and a second state in which the different removable nozzle is configured to dispense the one or more types of food therethrough.

[0338] The touchless food dispenser control system of any preceding clause, wherein the one or more types of food are stored in one or more food-containing bags within the touchless food dispenser.

[0339] The touchless food dispenser control system of any preceding clause, wherein the one or more food-containing bags are stored within one or more food storage containers.

[0340] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes a dispensing area, wherein the one or more removable nozzles are oriented to dispense the food into the dispensing area.

[0341] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes one or more user proximity sensors that are configured to detect a user in proximity to the touchless food dispenser.

[0342] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes one or more stacks of additional removable nozzles stored within the touchless food dispenser.

[0343] The touchless food dispenser control system of any preceding clause, wherein the touchless food dispenser includes one or more tubes that are configured to provide the one or more types of food to the one or more removable nozzles to dispense the food through the one or more removable nozzles.

[0344] Although the foregoing description is directed to the preferred embodiments, it is noted that other variations

and modifications will be apparent to those skilled in the art and may be made without departing from the spirit or scope of the disclosure. Moreover, features described in connection with one embodiment may be used in conjunction with other embodiments, even if not explicitly stated above.

1. A touchless food dispenser comprising:
one or more packets of food stored therein;
one or more apertures, wherein the touchless food dispenser is configured to dispense the food out of the touchless food dispenser through the one or more apertures;
one or more drive rollers, the touchless food dispenser configured to feed the one or more packets of food through the one or more drive rollers to dispense the one or more packets of food through the one or more apertures; and
a cutting mechanism disposed between the one or more drive rollers and the one or more apertures, wherein the cutting mechanism is configured to cut the one or more packets of food as the one or more packets of food are fed through the one or more drive rollers towards the one or more apertures.
2. The touchless food dispenser of claim 1, wherein the cutting mechanism includes a blade for cutting the one or more packets of food.
3. The touchless food dispenser of claim 2, wherein the cutting mechanism includes an actuator configured to move the blade to cut the one or more packets of food.
4. The touchless food dispenser of claim 1, wherein the one or more packets of food are coupled together, and the cutting mechanism removes an individual packet of food from the one or more packets of food to dispense the individual packet of food from the touchless food dispenser.
5. The touchless food dispenser of claim 1, wherein the cutting mechanism cuts the one or more packets of food to open the one or more packets of food.
6. The touchless food dispenser of claim 5, wherein the cutting mechanism cuts a front end of the one or more packets of food.
7. The touchless food dispenser of claim 1, wherein the one or more drive rollers are configured to force the food out of the one or more packets of food to dispense the food out of the one or more apertures and from the touchless food dispenser.
8. The touchless food dispenser of claim 1, further comprising an electric motor that is configured to provide mechanical power to the one or more drive rollers for rotating the one or more drive rollers.
9. The touchless food dispenser of claim 1, wherein the touchless food dispenser is configured to receive a selected amount of food to dispense and dispense the selected amount of food.
10. The touchless food dispenser of claim 1, wherein the touchless food dispenser is configured to dispense a predetermined amount of food through the one or more apertures.

11. The touchless food dispenser of claim 1, further comprising one or more dispenser proximity sensors that are configured to detect a gesture of a user that controls the food being dispensed through the one or more apertures.

12. The touchless food dispenser of claim 11, wherein the touchless food dispenser is configured to dispense the food as long as the one or more dispenser proximity sensors detect the gesture of the user.

13. The touchless food dispenser of claim 1, further comprising a display for displaying pictures, video, or text with information of a selected type food for dispensing or an amount of food being dispensed.

14. The touchless food dispenser of claim 1, wherein the touchless food dispenser is configured to receive a selection of an amount of food to dispense from a computing device.

15. The touchless food dispenser of claim 1, further comprising a power supply that is configured to supply power to the touchless food dispenser.

16. The touchless food dispenser of claim 1, further comprising a controller that is configured to control the touchless food dispenser to dispense the food.

17. The touchless food dispenser of claim 16, wherein the controller controls the cutting mechanism to cut the one or more packets of food.

18. The touchless food dispenser of claim 1, further comprising a refrigeration device that is configured to control a temperature of the food within the touchless food dispenser.

19. A touchless food dispenser comprising:

one or more packets of food stored therein;

one or more apertures, wherein the touchless food dispenser is configured to dispense the food out of the touchless food dispenser through the one or more apertures;

one or more drive rollers, the touchless food dispenser configured to feed the one or more packets of food through the one or more drive rollers to dispense the one or more packets of food through the one or more apertures;

a cutting mechanism including a blade and an actuator disposed between the one or more drive rollers and the one or more apertures; and

a controller configured to control the actuator to move the blade to cut the one or more packets of food as the one or more packets of food are fed through the one or more drive rollers towards the one or more apertures.

20. The touchless food dispenser of claim 1, wherein the one or more packets of food are coupled together, and the cutting mechanism removes an individual packet of food from the one or more packets of food to dispense the individual packet of food from the touchless food dispenser.

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