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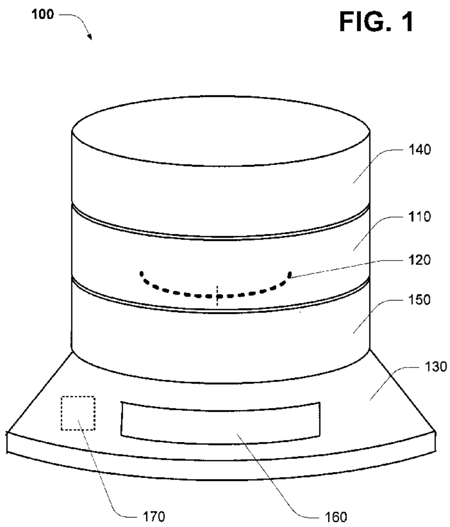
FIG. 1



(57) Abstract: A food processing apparatus has a blade assembly that can be driven at both stirring and processing speeds. The blade assembly rotates in a vessel that may be heated.

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IMPROVED COOKING APPARATUS AND METHOD

FIELD OF THE INVENTION

The present invention relates to cooking appliances and in particular to electrical cooking appliances.

The invention has been developed primarily as a processing and cooking apparatus having a food processing vessel associated with mixing/cutting arms, being a blade assembly, driven by an electric drive module, and having a heating module - and will be described hereafter with reference to this application. However, it will be appreciated that the invention is not limited to this particular field of use.

BACKGROUND OF THE INVENTION

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of the common general knowledge in the field.

Multifunction kitchen appliances are known. An example of a multifunction kitchen appliance is described in PCT publication WO 2003/075727.

It will be appreciated that by providing multiple functions in a single kitchen appliance, convenience in the operation of one or more of these functions and the appliance as a whole can be identified.

There is a need in the art to overcome or ameliorate one of the disadvantages of the prior art or provide a useful alternative.

OBJECT OF THE INVENTION

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

There is an object of the invention in its preferred form to provide a cooking appliance incorporating any one or more of a reverse drive module, a twin motor drive motor module, an automatic ingredient dispenser module, or a cooling (or refrigeration) module.

It is a further object of the invention in a preferred form to provide a reverse drive mechanism for a cooking appliance.

There is a further object of the invention in its preferred form to provide a twin motor module for a cooking appliance.

There is a further object of the invention in a preferred form to provide an automatic ingredient dispenser for a cooking appliance.

There is a further object of the invention in a preferred form to provide a removable cooling module for a cooking appliance.

SUMMARY OF THE INVENTION

According to an aspect of the invention there is provided a cooking apparatus including:

a food processing vessel;

mixing/cutting arms within the vessel;

an electric drive module for driving the arms;

an automatic ingredient dispensing module for selectively dispensing ingredients into the vessel; and

a heating module for heating ingredients within the vessel.

Preferably the cooking apparatus includes a cooling module for cooling ingredients in the vessel. More preferably, the cooling module is removable.

Preferably the cooking apparatus includes a user interface with a graphic display and user inputs for enabling user configuration, selection of parameters and values as well as programming cooking and processing operations.

Preferably, the drive module is a dual drive module. More preferably, the drive module includes a the dual drive coupling that can be received by a dual driven coupling associated with the vessel. More preferably, the drive module includes a plurality of drive motors. The term "drive train" or "power train" is used to refer to the mechanical or electro-mechanical components in a drive module that transmit torque from a motor to a rotating blade, blade assembly or blade drive shaft. This applies to all blade types, such as stirring blades or processing blades.

According to an aspect of the invention there is provided a method of cooking using a cooking apparatus as herein disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is an embodiment cooking apparatus according to the invention;

FIG. 2 is an embodiment cooking apparatus according to the invention, shown with a removable cooling module;

FIG. 3A though FIG. 3B show embodiments of a reverse drive module according to the invention;

FIG. 3A though FIG. 3B show embodiments of a reverse drive module according to the invention;

FIG. 4A though FIG. 4E show embodiments of a reverse drive module according to the invention;

FIG. 5 show an embodiment reverse drive module according to the invention;

FIG. 6 show an embodiment reverse drive module according to the invention;

FIG. 7A though FIG. 7C show embodiments of a reverse drive module according to the invention, showing an the attachment element with an associated reader or sensor;

FIG. 8A though FIG. 8B show embodiments of a reverse drive module according to the invention;

FIG. 9A though FIG. 9C show embodiments of a reverse drive module according to the invention;

FIG. 10A though FIG. 10B show an embodiment a dual drive module according to the invention;

FIG. 11A though FIG. 11B show an embodiment dual drive module according to the invention;

FIG. 12A to FIG. 12D show an embodiment automatic dispensing module according to the invention;

FIG. 13 show an embodiment automatic dispensing module according to the invention;

FIG. 14A to FIG. 14D show an embodiment dispensing platter of the automatic dispensing module according to FIG. 13;

FIG. 15A to FIG. 15E show the operation of the automatic dispensing module according to FIG. 13;

FIG. 16A through FIG. 16C shows a an embodiment flow chart for methods of operating a cooking apparatus;

FIG. 17A through FIG. 17C show embodiment kitchen appliances according to the invention;

FIG. 18A through FIG. 18N show an embodiment user interface according to the invention; and

FIG. 19 shows an embodiment method of a cooking process comprising a plurality of steps.

FIG. 20 is a partially cross sectioned drawing of a drive module and power train for a cooking apparatus, utilising two different motors.

FIG. 21 is a partially cross sectioned drawing of a drive module and power train for a cooking apparatus, utilising two different motors.

PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. 1, an embodiment of an electrical cooking apparatus 100 can include:

a food processing vessel 110;

mixing/cutting arms (of a blade assembly) within the vessel 120;

an electric drive module 130 for driving the arms;

an automatic ingredient dispensing module 140 for selectively dispensing ingredients into the vessel;

a heating module 150 for heating ingredients within the vessel; and

a user interface 160 for enabling user configuration as controlled by a processor module 170.

Referring to FIG. 2, an embodiment cooking apparatus 100 can further include a cooling module 180 for cooling ingredients in the vessel. The cooling module can be fixed or removable.

It will be appreciated that the drive train or module can be a dual drive module, such as those disclosed herein.

It will be appreciated that embodiment methods of cooking using the cooking apparatus are disclosed therein. Various embodiments and examples show that when a blade arrangement can be driven effectively over a wide range of speeds, that the cooking apparatus can perform both low speed stirring and high speed processing. Some embodiment can rotate the blades in both directions so as to stir foods with the blunt or back edge of the blades. Other embodiments stir so slowly that the direction of rotation need not be reversed, the blades need not be reversed, the blades being ineffective for cutting foods at stirring speeds. Stirring speeds are most useful when the cooking apparatus has a heating element and stirring is required to prevent sticking and overcooking.

FIG. 3A through FIG. 9C show embodiments of a reverse drive module for use in a cooking apparatus.

It will be appreciated that a one-way bearing can enable multiple couplings to be used where a motor, drive train, or driven gearbox, allows an axle, driven shaft or spindle to be rotated in both directions. In one (first) direction a one-way bearing spins freely, while in the other (second) direction the one-way bearing locks and thus transmits torque.

FIG. 3A and FIG. 3B show a one-way clutch bearing in use for creating a primary drive assembly configuration and a secondary drive configuration. The primary drive configuration works when the bearing is engaged or locked, wherein both the primary drive coupling and secondary drive coupling move in the same direction. The secondary drive configuration is engaged when the spindle is reversed, such that the bearing is free-spinning in its disengaged configuration.

While in this secondary drive configuration the primary drive may still move, but it is not under any load. Accordingly, a 'brake' element or module can be used to prevent free-spinning of the primary drive coupling, and corresponding mixing or cutting arms attached thereto. By applying an external resistive force against a flywheel, which is statically coupled to a primary drive coupling, the primary drive can be restrained (including any coupled mixing blades) while the secondary drive module (and associated secondary drive coupling) can be allowed to operate.

FIG. 3A shown an embodiment device 1000 which includes a food (mixing, processing or cooking) vessel or reservoir 1010 operatively associated with blending/mixing arm (or blade) elements 1012. The arm elements or blade assembly being rotatably coupled to the vessel through a dual driven coupling module 1014.

In this embodiment, the dual driven coupling 1014 comprises an outer shaft or sleeve assembly 1016 that is directly coupled to the blender/mixer arms element 1012 (for example using screws 1017). The outer shaft/sleeve assembly can be rotatably coupled to the food vessel 1010 by one or more bearings 1018. An attachment drive coupling 1020 is driven by: an inner shaft 1022, located within the outer sleeve assembly 1016); and secondary driven coupling 1024. The inner shaft is rotatably coupled to the outer sleeve by bearings 1026.

In this embodiment, by way of example only, the primary driven coupling 1032 is in the form of a female coupling configured within the outer sleeve assembly 1016, and the secondary driven coupling 1034 is a male coupling fixed to the end of the inner shaft 1022. It would be appreciated that a plurality of seals (for example V seals) can be used to restrict ingress to the driven coupling and bearings.

It will be appreciated that a drive module 1040 can be operatively associated with the driven couplings 1014. The drive module 1040 can include a primary drive coupling 1042 and a secondary drive coupling 1044.

In this example, by way of example only, a secondary (female) drive coupling 1044 can be received within the outer sleeve 1016 for engaging the secondary driven coupling 1034. As the secondary drive coupling is inserted in the outer sleeve, a primary drive coupling 1042 engages the primary driven coupling 1032.

In this example embodiment, one-way bearings 1046 enable both independent and dependent rotation of the primary and secondary drive couplings, with respect to a motor based housing 1048. By way of example, the primary (outer) drive coupling 1044 is rotatably coupled to the housing 1048 via bearings 1050. The secondary (inner) drive coupling can be independently or dependently driven with respect to the primary drive coupling 1044 through operation of one-way bearings 1046. The drive coupling can include a flywheel assembly 1052 which can be associated with rotation of the primary drive coupling.

A brake assembly 1054 can be used to restrict rotation of the flywheel 1052. For example, a solenoid 1056 can operate to move a brake pad element 1058 into abutting engagement with the flywheel 1052.

It will be appreciated that the cooking appliance can heat, blend, process ingredients within the food vessel using high speed blades. However, this can and usually will result in the food being broken down into a relatively fine consistency. It would be beneficial to enable an attachment (for example a food processor disc for grating or slicing ingredients) having a relatively high rotational speed to process the ingredients entering into the vessel, while the blending/stirring arms remain stationary (or rotate at a relative low rotation speed). Thus the term “high speed” refers to motor or blade speeds that result in the break down or processing foods in the context of routine cooking. “Low speed” refers to blade or motor speeds that achieve stirring without significant food break down or change in the food.

In this embodiment a drive shaft (spindle or axle) 1060 is directly coupled to the secondary drive coupling, and indirectly coupled to the primary drive coupling through the one-way bearings 1046. It would be appreciated that the drive shaft 1060 can be driven by a motor or gear assembly or belt assembly. It would be further appreciated that the drive shaft can be driven by a dual-motor drive module.

FIG. 3B shows the drive couplings 1040 engaged with driven couplings 1014. An attachment element (processing module) 1070 is coupled to the attachment drive coupling 1020. It would be appreciated that the attachment element 1070 can be operated in conjunction or independently with the blade/arms element 1012, depending on the driven direction of the drive shaft 1060.

It will be appreciated that alternate brake assemblies can be used to resist rotation of the primary drive coupling. Example brake assembly modules are shown in FIG. 4A to FIG. 4D.

Referring to FIG. 4 A, an embodiment brake assembly 1100 can incorporate a ratchet mechanism between a brake element 1102 and the flywheel 1052. The brake element can be biased into ratcheting engagement with the flywheel using a spring 1104. It will be appreciated that, when the driveshaft 1060 is rotated such the secondary drive coupling rotates freely within the primary drive coupling, the brake assembly acts to restrict rotation of the primary drive coupling through resisting rotation of the flywheel.

Referring to FIG. 4B, an embodiment brake assembly 1110 includes a friction plate 1112 that travels vertically to engage the base of the flywheel, without allowing rotation of the friction plate. The friction plate is driven vertically upward by the rotation of the driveshaft 1060 in a direction wherein the secondary drive coupling rotates freely within the primary drive coupling. This rotation of the driveshaft 1060 causes a radially extending pin 1114 (fixed to the driveshaft) to slide within an inclined slot 1116 formed in a slave block 1118 (slidably located about the drive shaft) - such that the pin moves down the incline slot 1116 - causing the slave block 1118 to rise, and thereby move the friction plate upwardly into abutting contact with the flywheel 1052. It would be appreciated that the slave block 1118 continues to rotate beneath the friction plate. By rotating the driveshaft in the opposite direction, the pin 1116 slides up the inclined slot, thereby allowing the slave block 1118 to lower and disengage the friction plate. It will be appreciated in this orientation that while rotating the driveshaft in this configuration, the one-way bearings are engaged to cause simultaneous rotation of both the primary drive coupling and secondary drive coupling.

Referring to FIG. 4C, an embodiment brake assembly 1120 can include a mechanical brake or clamp. In this embodiment the flywheel 1121, includes a plurality of circumferential detents 1122 for receiving a brake pin 1124. The brake pin engages with one detent of the flywheel, to resist rotation of the flywheel and primary coupling. An actuator 1126 can control engagement/disengagement of the brake pin with the detent of the flywheel.

Referring to FIG. 4D, an embodiment brake assembly 1130 can include an electro-magnetically controlled brake. In this embodiment, a brake pad or pin 1132 is either biased into a free spinning or braked configuration, such that activation of the electro-magnetic control element 1134 moves the brake pin 1132 into the braked or free spinning configuration respectively. The brake pin can be biased into one of the configurations by a spring 1136.

Referring to FIG. 4E, an embodiment brake assembly 1140 can include the flywheel having a radially increasing depression 1142 - that is adapted to engage a locking pin 1144 for resisting rotation of the flywheel in a first direction 1146. It will be appreciated that rotation of the driveshaft and flywheel in the opposite direction will cause the locking pin to ride out of the depression 1142. A control element 1148 can be used to bias the locking pin 1144 into or out of locking engagement with the flywheel.

It will be appreciated that a blade lock assembly can be configured within the jug or driven couplings. In this embodiment there is then no need to incorporate a brake assembly acting on the flywheel component.

Referring to FIG. 5, an embodiment blade lock assembly 1150, can include a blade lock element 1152 that engages the vessel to restrict the blades from rotating freely. A further bearing 1154 can be included to allow free rotation of the attachment coupling.

Referring to FIG. 6, an embodiment locking assembly 1160 can be incorporated with the attachment device 1162. In this embodiment, placing the attachment element 1162 over the attachment coupling 1164, brings location tab elements 1166 into engagement with locating recesses 1168 within the vessel. It would be appreciated that the engagement of the attachment element 1162 within the vessel restricts rotation of the blades/arms.

It would be appreciated that it would be beneficial to be able to indentify the attachment element, particularly depending on the brake assembly mechanism used. Identification of the attachment element can be made through a wireless communication.

Referring to FIG. 7A, the attachment element 1210 can include a near field communication (NFC) or radio frequency identification (RFID) element 1212, which can cooperate with a reader/sensor 1214 located within the cooking apparatus. The reader/sender can be coupled to a processor module 1216 for enabling identification of the attachment element. It would be appreciated that the vessel could also include a hall-effect sensor or interlock switch for confirming coupling of the attachment element to the attachment coupling. This would be beneficial in limiting operation of the motor or limiting motor speed when the attachment element is located proximal to the sensor element 1214.

By way of example only, FIG. 7B and FIG. 7C show use of a further wireless communication element (for example: NFC, RFID or hall effect) 1222 in the attachment element 1210, such that a second reader/sensor device 1224 can appropriately detect and identify the element 1222 - conveying the identification data to a processor module 1216. The processor may use the identification data to alter operational parameters of the appliance. Operational parameters include blade or accessory speed, or maximum speed, cooking times or temperatures or other modifiable functions of the appliance.

FIG. 7B shows the identification element or sensor or detector 1222 and corresponding sensor/reader 1224 being located about a periphery of the vessel.

FIG. 7C shows the identification element 1222 and corresponding detection/reader element 1224 being located more centrally about a vessel lid.

It will also be appreciated that the accessory can include a chopping blade 1230 located below a food chute 1232. The food chute 1232 having a cooperating pusher 1234 that slidably engages within the chute.

It would be appreciated that a cooking vessel can preferably present a relatively large cooking volume, and more preferably present a relatively large base cooking surface. However, by providing a wide base to the cooking vessel, the mixing arms/blades are required to be correspondingly large to reach the extremities of the cooking surface for enabling appropriate stirring during cooking. This increased diameter/radius can place additional load on the driving motor at high speed (for example during blending). Accordingly, the device can include differential gearing for driving the primary drive coupling at a different (typically lower) speed than the secondary drive coupling.

Referring to FIG. 8A through FIG. 8D, by way of example only, a primary drive coupling 1302 can be driven by a sleeve drive element 1303, and the secondary drive coupling 1304 driven by a shaft drive element 1305, rotatably sleeved within the sleeve drive element.

Referring to FIG. 8A, an embodiment drive gear assembly 1310 includes a motor 1312 to drive a first bevel gear 1314, which in turn drives a primary bevel gear 1315 coupled to the primary drive. The bevel gear 1314 further drives a gear assembly 1316 for coupling power to a secondary drive. The gear assembly 1316 can include an intermittent idle gear 1317 for coupling to the secondary drive gear 1318. It would be appreciated that by selection of appropriate gear ratios, a predetermined drive ratio between the primary and secondary drives can be achieved.

FIG. 8B shows a gear coupling 1320, where a motor 1322 drives a bevel gear 1324 for simultaneously driving a primary gear 1325 and secondary gear 1326. It will be appreciated that this gear coupling will achieve opposite (equal velocity) rotation of the primary and secondary drives.

FIG. 9A through FIG. 9C shows an alternative gear assembly 1400 that uses a primary pinion gear 1402 to drive a primary gear 1404. In this example, the primary gear is defined by a female cavity having gear teeth orientated about the internal circumference. A second pinion gear 1406 is driven by the motor, and selectively engages a secondary gear 1408. It would be appreciated that the gearing ratios can be selected to provide a differential rotational speed between the primary drive 1420 and secondary drive 1422. It will also be appreciated that in this configuration, the primary drive and secondary drive rotates in opposite directions.

Referring to FIG. 9A and FIG. 9B, the second pinion gear 1406 can be selectively brought into and out-of engagement with the secondary drive gear 1408, depending on the rotational direction of the motor. In this example, clockwise rotation of the motor causes a radial pin 1410 to slide downward along an inclined slot 1412 formed in the second pinion gear, thereby raising the second pinion gear into geared engagement with the secondary drive gear 1408 (as shown in FIG. 9A). Reversing the rotation of the motor causes the radial pin to slide upwardly along inclined slot 1412 to draw the secondary pinion gear downward and out of engagement with the secondary drive gear 1408 (as shown in FIG. 9B).

Referring to FIG. 9 C, a one-way clutch element 1430 can be incorporated into the secondary pinion gear, for selective activation or deactivation of the second drive, based on the rotational direction of the motor. It will be appreciated that rotation of the motor in one direction will cause the clutch element to engage and rotate the pinion gear 1432 – to thereby drive the secondary drive gear 1408. Rotation of the motor in the opposite direction can cause the clutch 1430 to disengage, thereby allowing the pinion gear 1432 to spin freely - thereby not driving the secondary drive gear 1408.

Referring to FIG. 10A, FIG. 10B, FIG. 11A and FIG. 11B, a cooking apparatus can include a dual motor drive, whereby one of a plurality of drive motors can be selected to engage or drive a drive shaft, gearbox or drive coupling.

It will be appreciated that a cooking appliance can service multiple functions, including blending, processing and cooking. Food blending or processing is usually performed with blades or arms rotating at about 300rpm to 15000rpm. During the cooking process, the food is typically stirred to avoid sticking to the base of a heated vessel, wherein the blades or arms are rotated at less than 20rpm to minimise the breaking down of the food during the stirring action.

It will be appreciated that, while motor rotational speed can be varied by applying different voltages or varying frequencies, motors typically operate at maximum torque only within a narrow range of rotational speed. An electronic controller can be used to reduce the effect of a lack of torque, whereby sensing a blade/arm being stalled or becoming stalled, the control voltage can be increased momentarily. However it would be appreciated that the increased voltage being applied to the motor may also momentarily increase the rotational speed of the arms/blades.

It will be appreciated that, a gearbox can be used to provide a plurality of gearing ratios between the motor and arms/blades, such that a preferred rotational speed of the arms can be selected while maintaining a substantially optimal rotational speed of the motor. However, gearboxes often introduce noise and can occupy substantial room in an appliance.

It will be appreciated that, while switch reluctance and brushless DC motors motors can maintain a usable level of torque across a wide range of rotational speeds, they typically operate at rotational speeds above 40rpm. It will also be appreciated that switch reluctance brushless DC motors are typically more expensive than common universal motors.

According to an aspect of the invention, a kitchen appliance can include both a 'high speed' blending/processing motor and a 'low speed' stirring motor.

FIG. 10A and FIG. 10B show an embodiment cooking apparatus 2000 includes a base 2010 for supporting a cooking vessel 2012. Processing or stirring blades/arms 2014 are fixed to a coupling 2016. In this example, a male driven coupling 2018 is received by a female coupling 2020 for rotating the arms. The drive coupling 2020 is fixed to a shaft 2022. In this example, a universal motor 2030 is provided to drive the shaft 2022 in a food processing mode for providing a 'high speed' rotation of the blade/arms. By way of example, a secondary asynchronous motor 2032 can be selectively coupled to the shaft 2022 to rotate the arms in a stirring mode for providing a 'low speed' rotation of the blade/arms. In this example a solenoid 2034 can be used for selective engagement or disengagement of the secondary asynchronous motor 2032. In this example, a processor module 2036 is adapted to control each of the primary motor 2030, secondary motor 2032 and activating solenoid 2034.

FIG. 10A shows the cooking apparatus 2000 in a primary processing mode, with the secondary motor disengaged. FIG. 10B shows the kitchen apparatus configured in a stirring mode with the secondary motor engaged to and causing rotation of, the shaft and blades/arms.

It will be appreciated that, by way of example, the secondary motor is configured to provide a counter rotation of the blade/arms during the secondary stirring mode, when compared to the primary processing mode. It will be appreciated that this counter rotation of the main blades/arms enables, the leading edge (typically sharper edge) of the blade/arm used during the processing mode becomes a training edge during a stirring mode – such that the arm may 'push' or 'stir' the food in the vessel.

In this example embodiment, the secondary asynchronous motor engages the shaft 2022 through a pair of bevelled gears 2040 and 2042 - for rotating the shaft 2022.

FIG. 11A and FIG. 11B show an alternative embodiment kitchen apparatus 2100, wherein a bevelled gear 2140 is operatively associated with a one-way (or clutch) bearing 2144 for enabling free spinning of the gear coupling to decouple the secondary motor 2032 (asynchronous or synchronous) from the drive shaft 2022.

In an embodiment, the one way (clutch) bearing 2144 is used to couple the bevelled gear 2140 to the secondary asynchronous motor. When the driveshaft is driven by the primary motor 2030, turning of the bevel gear 2142 causes the engaged bevelled gear 2140 to free spin freely, without transferring movement to the secondary asynchronous motor (as shown in FIG. 11A). The primary universal motor can be engaged during the processing mode for high speed turning of the blade/arms. The secondary asynchronous motor can be engaged in the stirring mode to cause low speed rotation of the mixing arms (in a reverse direction relative to the operation of the primary universal motor – as shown in FIG. 11B). Rotation of the asynchronous motor 2032 causes the one-way (clutch) bearing 2144 to engage the bevel gear 2140 that drives the slave gear 2142 causing rotation of the shaft 2022 and stirring arms 2014.

It will be appreciated that each of the primary motor and/or secondary motor can be selected as any one from the set of: asynchronous motor, synchronous motor, brushless motor, indication motor, switched reluctance motor, and reluctance motor.

By operating the stirring arms during the stirring mode in the opposite direction to that of the processing mode, stirring is performed by the other edge of the arms, which are typically blunt, for moving or pushing the food around the vessel. It will be appreciated that, in the stirring mode, the secondary asynchronous motor drives the gear 2140 and 2142 to rotate the shaft 2022.

It will be further appreciated that during the stirring mode, the asynchronous motor 2032 can drive rotation of the shaft 2022 and the primary universal motor 2030. As the rotation speed of the shaft during the stir mode is relatively low, the primary universal motor 2030 (not powered) only provides a small additional load.

It would be appreciated that a multi-function cooking appliance can be used to enable preparation and cooking within a single apparatus. However, as a meal typically consists of many ingredients, each requiring a different amount of processing and cooking, such preparation and cooking must be separated into multiple stages. A user can interact with the apparatus by: incrementally adding ingredients to the cooking vessel; reconfiguring the apparatus to perform the next stage; and/or stopping the apparatus before adding next ingredient and proceeding to a later stage of preparation or cooking. The process of incrementally adding ingredients to the cooking vessel can be automated incorporating an automatic dispensing module. The automatic dispensing module can comprise of one or more ingredient reservoirs that a user can preload with ingredients. The reservoirs can be automatically released into the cooking vessel in accordance with a predetermined sequence. It would be appreciated that by using an automatic dispensing module the user would not need to be present to facilitate adding of the ingredients at the end of each stage and that the heating/processing could continue uninterrupted.

Referring to FIG. 12A to FIG. 15E, an automatic dispensing module can be used in a cooking apparatus to selectively dispense ingredients into a processing/cooking vessel.

Referring to FIG. 12A through FIG. 12D, an embodiment automatic dispensing module 3000 can be operatively associated with (or included in) a cooking appliance 3010. In this embodiment, a plurality of ingredient reservoirs 3012 are included within the automatic dispensing module. Each ingredient reservoir comprises a respective egress element (or means) 3014, such that each egress element can be independently activated for releasing the respective ingredients located within the respective reservoir.

It would be appreciated that by releasing ingredients from the lower reservoirs through to the upper reservoirs, released ingredients are dispensed into the cooking vessel (for example, as shown in FIG. 12A through FIG. 12D). Independent operation of an activation/release element 3016 of the respective egress element 3014 can be controlled by a processing module 3020.

It would be appreciated that the processing module can also control the drive components 3022 and heating components 3024 for processing and cooking the ingredients within the vessel 3026.

It would be appreciated that, the egress elements can be controlled by a release element (for example in the form of a solenoid, motor, magnetic catch).

FIG. 12B shows the activation of a first activation/release element 3030 and egress element 3032 for release of an ingredient 3034 from an automatic dispensing module through automated control by the processor module 3020.

FIG. 12C and FIG. 12D show the release of the second and third ingredient reservoirs respectively.

FIG. 13 shows an alternative embodiment automatic dispensing module 3100 that cooperates with (or is included in) a kitchen apparatus 3010. As with the previous embodiment, the controller module 3020 can independently control the motor 3022 and heating element 3024 for processing and cooking ingredients in the vessel 3026. It will be appreciated that the motor and heating elements are independently controllable in these embodiments.

In this embodiment, the automatic ingredient dispenser module includes one or more stackable rotatable carousels 3130, wherein rotation of the carousel dispenses ingredients to a cooking vessel 3026. Rotation of the carousels is by a motor 3132 that has a selective geared engagement with each of the carousels – such that each carousel can be located in sequence to dispense food into the cooking vessel below.

Each carousel unit is selectably coupled to the motor drive 3032, for selective rotation of a carousel unit 3130. By way of example, the motor drive can be coupled to an exterior pinion gear 3134 that engages an exterior circumferential gear 3136 about the periphery of the carousel unit. The automatic dispensing module includes a base element 3140, for example in the form of a semicircle base for supporting a first ingredient 3142 (see FIG. 15A).

FIG. 14A and FIG. 14D show views of a single carousel element 3130. Each carousel, by way of example only, can be an open cylinder having a radial inner wall 3144 that can 'push' the ingredients over the edge of the base element or carousel platform located below. Each carousel having an upper platform 3146 (for example in the form of a semicircle) for supporting ingredients placed above. In this example, the exterior circumferential gear 3136 extends for only half the circumference. A stop element 3138 is used to limit rotation of the carousel.

FIG. 15A through FIG. 15E show a sequence of dispensing ingredients contained within a four level automatic dispensing module.

FIG. 15A shows a loaded automatic dispensing module comprising four stacked carousel units each comprising a respective ingredient.

FIG.15B shows rotation of the lower carousel 3150 causing the respective ingredient 3152 to be dispensed through the void 3154 created by the base element. It would appreciated that by rotating carousel 3150, the carousels above are also rotated due to their abutting engagement (through gravity) with the respective lower carousels.

FIG. 15C shows that selective rotation of a second carousel 3160, which causes the respective ingredient 3162 to be dispensed through the void 3154. It would be appreciated that by rotating carousel 3160, the carousels above are also rotated due to their abutting engagement (through gravity) with the respective lower carousels. Carousel 3150 is retained in the open configuration by a stop element (for example feature 3138 shown in FIG. 14C).

FIG. 15D shows that the selective rotation of carousel 3170, which causes selective dispensing of the respective ingredient 3172. Upper carousel is rotated while lower carousels are retained in an open configuration.

FIG. 15E shows the selective rotation of 3180 causes dispensing of the respective ingredient 3182. Lower carousels are retained in an open configuration.

It will be appreciated that the rotation of the carousel can be controlled through activation of the motor for a time interval or through feedback from sensors or switches provide a signal indicative of carousel configuration. Selective engagement of the pinion gear with one or more of the carousels can be achieved by axle movement of the pinion gear. It would be appreciated that, in this embodiment, the staggered configuration of the carousel shown in FIG. 15A enables a pinion gear spanning each of the carousels to first engage the lower first carousel 3150 and third carousel 3170, such that after a half rotation the circumferential gears associated with the second carousel 3160 and fourth carousel 3180 respectively engage the pinion gear. When only the circumferential gears associated with the second carousel 3160 and fourth carousel 3180 engage the pinion gear- as given that the lower first carousel is no longer directly driven - the second, third and fourth carousels rotate. Upon completion of a further half turn, the pinion gear then only engages the third carousel 3170, and both the first carousel 3150 and second carousel 3160 are no longer driven by the pinion gear and retained by respective stop elements. This sequence can continue until all carousel are in the open configuration.

FIG. 16A through FIG. 16C shows a flow chart for methods of operating a cooking apparatus.

FIG. 16A shows a flow chart for a method 3200 for pre-configuring a cooking appliance having an automatic ingredient dispenser module. This method 3200 includes, by way of example only, the steps of:

STEP 3210: activate the machine, proceed to STEP 3212.

STEP 3212: determines if preset recipe is selected: if preset recipe is selected proceed to STEP 3214; if preset recipe is not selected proceed to STEP 3226.

STEP 3214: retrieves preset cooking profile, proceed to STEP 3216.

STEP 3216: display an ingredient list required to be provided in each ingredient reservoir; proceed to STEP 3218.

STEP 3218: determine if the automatic dispensing module has been presented; if the automatic dispensing module has been presented proceed to STEP 3220; if the automatic dispensing module has not been presented proceed to STEP 3216.

STEP 3220: determine if each individual ingredient reservoir is close for (and typically received ingredients); if each ingredient reservoir is closed proceed to STEP 3224 otherwise if one or more ingredient reservoirs are open proceed to STEP 3222.

STEP 3222: instructs the user to provide ingredients and or close the ingredient reservoir, proceeding to STEP 3220.

STEP 3224: determine if start has been initiated by the user: if start has been initiated commence a multistage preparation/cooking process.

STEP 3226: determine if the appliance lid is closed; if the appliance lid is closed proceed to STEP 3228; otherwise proceed to STEP 3230.

STEP 3228: commence operation of the apparatus, proceeding to a user defined preparation/cooking process.

STEP 3230: indicates to the user to replace lid, proceed to STEP 3212.

FIG.16B shows an embodiment method 3300 for providing feedback control of rotational speed, vibration and temperature within a cooking appliance. Method 3300 includes the steps of:

STEP 3310: identifying a process time.

STEP 3312: determine if process/cooking time has completed: if the processing time has not completed proceed to STEP 3114, if the processing/cooking time has completed proceed to STEP 3340

STEP 3314: proceed to confirming/adjusting rotational speed of the arms (STEP 3316), reading/adjusting the target rotational speed based on vibration (STEP 3322), reading/adjusting process/cooking temperature (STEP 3328).

STEP 3316: obtained data indicative of a process arm rotational speed, determine if the current rotational speed is over of under the target speed (STEP 3318), and if so adjust the current rotational speed (STEP 3320), returning to STEP 3312.

STEP 3322 obtain data indicative of vibration within the apparatus, if the vibration is over a predetermined threshold (STEP 3324) then reduce a target speed of the arms (STEP 3326), otherwise proceed to STEP 3312.

STEP 3328 obtain data indicative of process/cooking temperature, if over or under a predetermined target temperature (STEP 3330) then adjust the heating input control to raise or lower the current temperature (STEP 3332); otherwise proceed to STEP 3312.

FIG.16C shows an embodiment data sequence 3400 for enabling staged control of a cooking process. The display can present a predefined procedure or recipe 3410 (with relevant details). A first stage 3420 identifies that the apparatus is ready to commence 3422, and presents relevant data about the stage (including temperature, speed and time). At completion of a first stage, the apparatus proceeds to a second stage 3430, and presents relevant data about the stage (including temperature, speed and time). This process continues for each stage (for example a third stage 3440 and a fourth stage 3442).

It will be appreciated that a cooling module can be used to cool/chill ingredients for a cooking process, or provide for improved storage.

FIG. 17A through FIG. 17C show embodiment kitchen appliances (4000, 4001, 4002), including:

a base 4010 comprising one or more drive elements 4012, 4014 coupled to a drive coupling 4016;

a processing/cooking vessel 4022 having processing or mixing arms 4020 located within and driven through a driven coupling 4018 operatively associated with drive coupling 4016;

an automatic dispensing module 4024 for providing ingredients to the vessel;

a user interface 4026 for enabling user input and presenting status display;

a heating element 4028 for heating/cooking food within the vessel;

a (fixed or detachable) cooling module 4030 for cooling food within the vessel; and

a processor module 4032 adapted to control operation of the apparatus.

It would be appreciated that a cooling module can provide advantages by:

- allow for processing of recipes that require heating and cooling of food during the preparation/cooking process;
- enabling a reduction in the time food is exposed to specific temperatures (for example, between 4DegC and 60DegC);
- reducing residual heat that can maintain food between specific temperatures (for example, 4DegC and 60DegC) or overcook the ingredients;
- promptly cooling food to a safer refrigeration temperature to thereby prolonging shelf life;
- reducing the requirement that a user manually relocated the cooked food to a separate refrigerated environment upon completion; and
- reducing the base footprint of the apparatus by integrating a removable/detachable cooling module.

Referring to FIG. 17A, an optional (fixed or detachable) cooling module 4100 can include a compressor 4110 coupled to a condenser 4112 wherein the refrigerant is passed through an expansion valve 4114 then through a heat exchanger 4116 before returning to the compressor. The heat exchanger 4116 cools a separate coolant located in a return path 4120, which is driven by a pump 4122. A processor module 4130 controls the operation of the compressor, condenser and pump. The coolant return path 4120 can be releasably coupled to a cooling container/jacket 4140 such that the cooling fluid can pass through the cooling container/jacket to cool the cooking vessel. Valve assemblies 4142 can be provided between the cooling module and the base and/or cooling container/jacket. A pair of data coupling elements 4144 enables data communication between the main processor module 4032 and the cooler processor module 4130.

The valve assemblies 4142 between the cooling module and the main body or cooling container/jacket can include two valve element (valve couplings) that, when engaged, allows coolant flow to the coolant container/jacket and return there from. The valve assemblies can be biased to shut when disengaged.

FIG. 17B shows a coolant module 4200 directly and releasablly coupled to a container/jacket 4240 for cooling the processing/cooking vessel 4018. This removes flow of coolant through the base of the apparatus as shown in FIG. 17A.

FIG. 17C shows a coolant module 4030 directly and releasablly coupled to processing/cooking vessel 4018 having an integrated cooling jacket 4340.

FIG. 18A through FIG. 18N show an embodiment user interface 5000 for use with a multifunction cooking apparatus. It will be appreciated that the user interface includes a plurality of user input elements, and one more display elements.

FIG. 18A shows a recipe input element 5010 that enables user selection of a predefined recipe or process, as indicated in the display portion 5012. Typically the recipe input element is rotated to provide user selection of the recipe. A manual user selection element 5014 can be used to selectively set time speed and temperature of selection (for example as indicated in display portion 5016 for time). A plurality of setting selectors 5020, 5022, 5024 can selectively enable user setting of time, speed and temperature respectively. The user selection element 5014 can then be used to adjust the respective time speed and temperature.

For example, as shown in FIG. 18B selection of input 5022 can enable user specification of a speed setting through adjustment of the element/dial 5014. Each of the plurality of selection elements (5020, 5022, 5024) can include a selection indicator (for example a button illumination).

Referring to FIG. 18C, for user specification of recipe settings, a recipe mode can be entered (for example) by rotating or pressing the recipe element 5010. Upon user selection of a predefined recipe, the apparatus will retrieve all the steps/stages and relevant parameters. User selection of element 5014 can be used to sequence through the steps of the selected recipe. In this mode, the selection elements (5020, 5022, 5024) will be disabled.

Referring to FIG. 18D, to select a specific STEP in a predefined process or recipe, an adjustment element/dial 5014 can be used to sequence through to the desired step.

Referring to FIG. 18E, recipe selection element 5010 can be used to select a 'more recipes' mode, such that more recipes options are displayed (for example, by scrolling across the base of the display).

As shown in FIG. 18F and FIG. 18G, upon selection of an additional 'more recipes', the user adjustment element 5014 can be used to scroll through the predefined steps of the process/recipe,

Referring to FIG. 18H, by way of example only, pressing the recipe selection element 5010 can return the recipe display portion 5012 to the start of the recipe selection list.

Referring to FIG. 18I, by way of example only, a manual mode of operation can be entered by pressing the manual selection element 5014. This manual mode is displayed in the display portion 5012, and enables input selectors (5020, 5022 and 5024).

Referring to FIG. 18J, further input selector elements include: a scale/weight zero selector 5030; a measurement unit selector 5032 (for example selecting between imperial or metric measurement units); a volume selection element 5034, a start/cancel selector 5036; a pulse selector element 5038 for initiating a momentary for power; and a power selector element 5040 for placing the device in a on/standby or off configuration.

Referring to FIG. 18J, in a preferred embodiment, the input selector elements (5030, 5032, 5034) are preferably 10mm press buttons, user input selector elements (5020, 5022, 5024) are 13mm press buttons with a 17mm surround light ring, input selector elements (5036, 5038, 5040) are 18mm press buttons with a surrounding 22mm light ring, user input selector 5010 is a 36.5mm selector dial with a centre push button, and input selector 5014 is a 29mm selector dial with a centre push button.

FIG. 18K through FIG. 18N show, by way of example only, configuration of a process/cooking using a recipe selection of 'chicken curry'.

Referring to FIG. 18K, the user input selector 5010 can be rotated to select chicken curry from the recipe list 5012. It would be appreciated that each stage within the predefined recipe/process can comprise a combination of time speed or temperature settings which will be automatically preloaded into the processor module for carrying out that stage of the processing/cooking operation.

Referring to FIG. 18L, stage one-of-five is displayed, which suggests a time of 2 minutes, a speed setting 1 and a temperature 100DegC. After adding the required ingredients, input selector 5036 can be pressed to commence the processing/cooking.

Referring to FIG. 18M, at the commencement of stage one, stage two-of-five is indicated. It would be appreciated that in this embodiment a further input selector 5050 can be selected to provide a bit more processing/cooking. An illumination ring about the input selector 5050 can be illuminated at the completion of each step, to highlight the option to the user. By selecting the input selector 5050, by way of example only, a predefined percentage of the previous cooking time can be used in combination with the other settings to provide a bit more processing/cooking. Otherwise the next stage can commence (automatically or manually)

Referring to FIG. 18N, shows the status of the user interface at the conclusion of stage one-of-five and at the commencement of stage two-of-five, where the user selects input selector 5050 causing the apparatus to revert to stage one-of-five for a further 24 seconds of processing/cooking with a speed setting and temperature setting as predefined for that stage. At the completion of additional possessing/cooking of stage one-of-five the apparatus proceed to enable the user to perform further processing of stage one-of-five or proceed to stage two-of-five (automatically or manually).

FIG. 19 shows a embodiments method 5100 of an example cooking process comprising a plurality of discrete steps (5101, 5102, 5105), wherein at the completion of each step or stage the user can select further processing (5111, 5112, 5115) with a user input on the device's interface that communicates with the device's processor. In an embodiment additional processing, parameters of speed and temperature conform to the stage being extended, and the length of time can be a predetermined percentage of the stage durations. The predetermined percentage may be constant across all stages of specified for each stage. Alternatively, the duration of additional processing/cooking may be calculated on the basis of the parameters of speed, temperature and time associated with the stage. The additional processing option can preferably be repeated more than once for any (and each) stage as may be required.

As shown in Figure 20, a cooking appliance, for example, of the kinds previously discussed may utilised both (for example) a low speed output geared (or internally geared) motor or stepper motor (preferably less than about 20 rpm and preferably with gearing to achieve that speed) 6000 and a higher speed motor (preferably higher than 1,000rpm or alternatively about 10,000 rpm) 6001 each with a separate power train comprising, for example, belting or gears for the purpose of driving a rotating processing blade 6002 over a wide range of speeds. In the example of Figure 20, a relatively low speed output motor, for example, a slow speed synchronous motor is directly coupled to a power train having a first drive gear 6003 to a second or driven gear 6004. The driven gear 6004 is mounted to the processing's blades driveshaft 6005. The driven gear 6004 may be directly mounted on the driveshaft 6005 or can be mounted to a one-way clutch bearing 6006 that transmits torque to driveshaft 6005 in only one direction. The driveshaft 6005 is supported by bearings 6007 as required to cause the rotation of the blade arrangement 6008. The shaft and blade arrangement 6005, 6008 are also capable at rotating at higher speeds than can be provided by the low speed motor 6000. This is done by coupling a higher speed motor such as an universal, brushless SRM (switched reluctance motor) or BLDC (brushless permanent magnet) type motor to the driveshaft 6005 with, for example, a drive belt 6009. In this example, the larger, high speed motor 6001 has an output sheave or a hub 6010 that is adapted to drive the belt 6009. The hub and belt 6009, 6010 may be toothed in some examples. Using the belt 6009, the motor 6001 drives a sheave or hub 6011 that is affixed to the driveshaft 6005. In some examples, the driven sheave 6011 may be larger than the driving sheave 6010 so as to achieve a speed reduction relative to the operating speed of the high speed motor 6001. In this example, the optional one–way bearing 6006 prevents the low speed motor 6000, first drive gear 6003 and second or driven gear 6004 from rotating when the high speed motor 6001 is driving the blade arrangement 6008. In this example, the rotational axis of both the low speed motor and the high speed motor are remote from and parallel with the driveshaft 6005. The low speed motor is used to stir foods at low speeds and the high speed motor is used for processing foods.

As shown in Figure 21 the high speed motor 6001 can drive the blade arrangement 6008 in a direct drive arrangement, the motor's output shaft 7001 being directly mechanically coupled to the rotating shaft that drives the remainder of the assembly blade or arrangement 6008. In this example, the low speed motor 6000 has an output shaft 7002 that drives a first gear 6003. The first gear 6003 drives a second gear 7003 that is affixed to a shaft 7004 that drives the high speed motor's armature either directly or indirectly. Thus, torque from the low speed motor 6000 is transmitted to the blade arrangement 6008 by the drive train's gears 6003, 7003, and through the high speed motor itself. When the high speed motor 6001 is operating, the rotation of the input shaft 7004 is not transmitted to the first gear of 6003, the second gear 7003 or the low speed motor 6000 owing to the presence of a one-way clutch bearing 6006 of the kind illustrated in Figure 20. This arrangement eliminates the need for the belt and sheave depicted in Figure 20. The examples of Figure 20 and 21 are suitable for driving the blade arrangement 6008 over a wide range of useful stirring and processing speeds.

It will be appreciated that the illustrated cooking applicant and associated modules overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

In the claims below and the description herein, any one of the terms comprising, comprised of or which comprises is an open term that means including at least the elements/features that follow, but not excluding others. Thus, the term comprising, when used in the claims, should not be interpreted as being limitative to the means or elements or steps listed thereafter. For example, the scope of the expression a device comprising A and B should not be limited to devices consisting only of elements A and B. Any one of the terms including or which includes or that includes as used herein is also an open term that also means including at least the elements/features that follow the term, but not excluding others. Thus, including is synonymous with and means comprising.

Similarly, it is to be noticed that the term coupled, when used in the claims, should not be interpreted as being limitative to direct connections only. The terms “coupled” and “connected”, along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Thus, the scope of the expression a device A coupled to a device B should not be limited to devices or systems wherein an output of device A is directly connected to an input of device B. It means that there exists a path between an output of A and an input of B which may be a path including other devices or means. “Coupled” may mean that two or more elements are either in direct physical, or that two or more elements are not in direct contact with each other but yet still co-operate or interact with each other.

As used herein, unless otherwise specified the use of the ordinal adjectives “first”, “second”, “third”, etc., to describe a common object, merely indicate that different instances of like objects are being referred to, and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking, or in any other manner.

As used herein, unless otherwise specified the use of terms “horizontal”, “vertical”, “left”, “right”, “up” and “down”, as well as adjectival and adverbial derivatives thereof (e.g., “horizontally”, “rightwardly”, "upwardly", etc.), simply refer to the orientation of the illustrated structure as the particular drawing figure faces the reader, or with reference to the orientation of the structure during nominal use, as appropriate. Similarly, the terms "inwardly" and "outwardly" generally refer to the orientation of a surface relative to its axis of elongation, or axis of rotation, as appropriate.

Similarly it should be appreciated that in the above description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the Detailed Description are hereby expressly incorporated into this Detailed Description, with each claim standing on its own as a separate embodiment of this invention.

Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

Furthermore, some of the embodiments are described herein as a method or combination of elements of a method that can be implemented by a processor of a computer system or by other means of carrying out the function. Thus, a processor with the necessary instructions for carrying out such a method or element of a method forms a means for carrying out the method or element of a method. Furthermore, an element described herein of an apparatus embodiment is an example of a means for carrying out the function performed by the element for the purpose of carrying out the invention.

In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

Thus, while there has been described what are believed to be the preferred embodiments of the invention, those skilled in the art will recognize that other and further modifications may be made thereto without departing from the spirit of the invention, and it is intended to claim all such changes and modifications as fall within the scope of the invention. For example, any formulas given above are merely representative of procedures that may be used. Functionality may be added or deleted from the block diagrams and operations may be interchanged among functional blocks. Steps may be added or deleted to methods described within the scope of the present invention.

It will be appreciated that an embodiment of the invention can consist essentially of features disclosed herein. Alternatively, an embodiment of the invention can consist of features disclosed herein. The invention illustratively disclosed herein suitably may be practiced in the absence of any element which is not specifically disclosed herein.

What is claimed is:

1. An electrical cooking apparatus having a food processing vessel within which resides a rotating blade assembly, having a driven shaft comprising:

a heating element that cooperates with the vessel;

a stirring motor that rotates the blade assembly for stirring foods in the vessel; and

a second motor that rotates the blade assembly;

the second motor having a speed range for conventional processing.

2. The apparatus of claim 1, wherein:

the blade assembly further comprises a driven shaft;

a first power train interconnecting the stirring motor to the driven shaft; and

a second power train interconnecting the second motor to the driven shaft.

3. The apparatus of claim 2, wherein:

the second power train comprises a belt that transmits torque from the second motor to the driven shaft.

4. The apparatus of claim 2, wherein:

separate power trains are used to interconnect both the stirring motor and the second motor to the driven shaft.

5. The apparatus of claim 1 wherein:

the apparatus has an accessory and a processor and a detector that can convey an identification data regarding the accessory to the processor;

the apparatus having changeably operational parameters;

the processor adapted to cause changes in the operational parameters based on the identification data.

6. The apparatus of claim 5, wherein:

the speed of the motor is limited by the processor after identification data is received by the processor.

7. The apparatus of claim 1, wherein:

the apparatus has a processor that can implement cooking program having stages;

the apparatus having a user interface with a user input that communicates with the processor to cause an extension of a complete stage by a calculated amount.

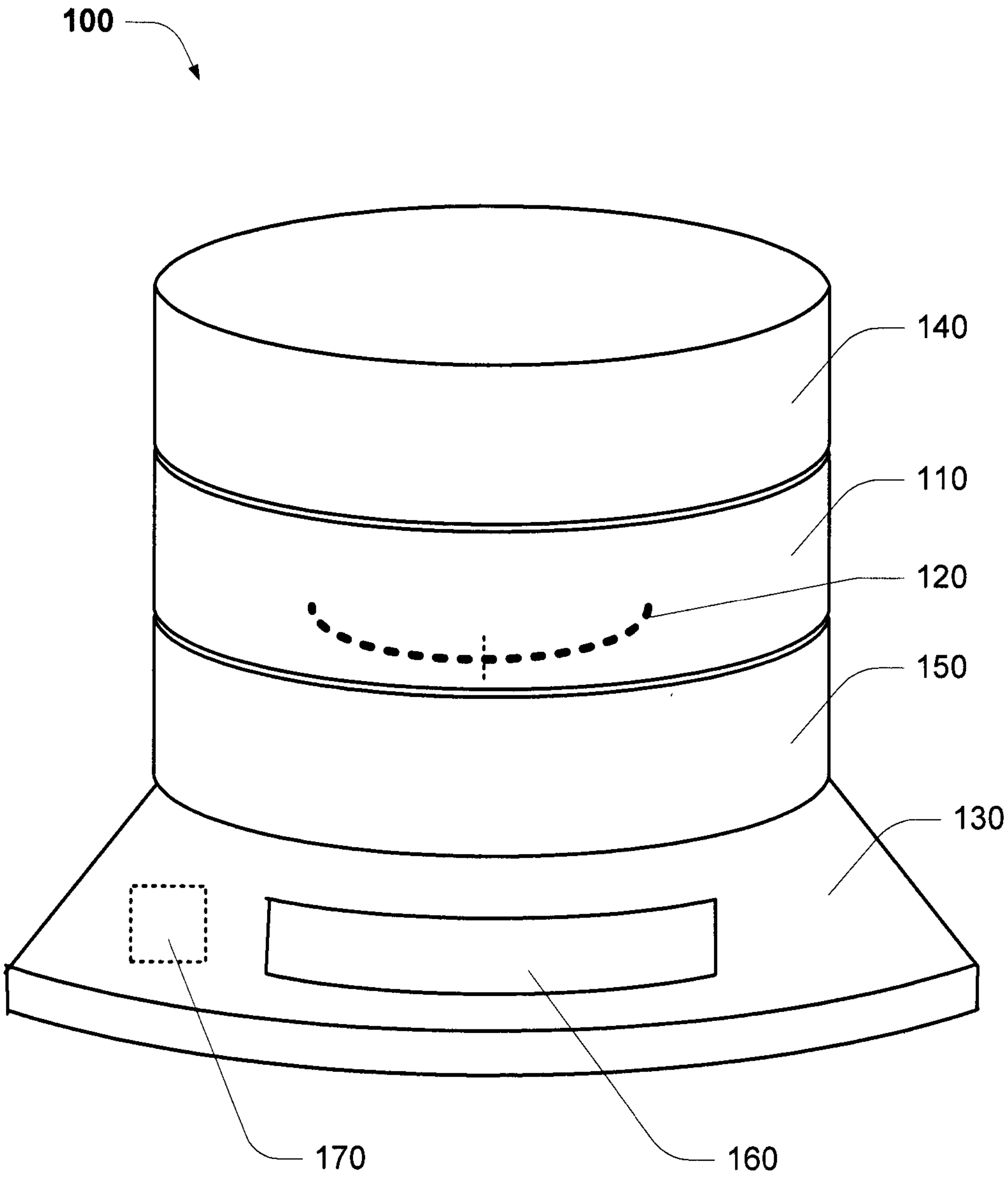

FIG. 1

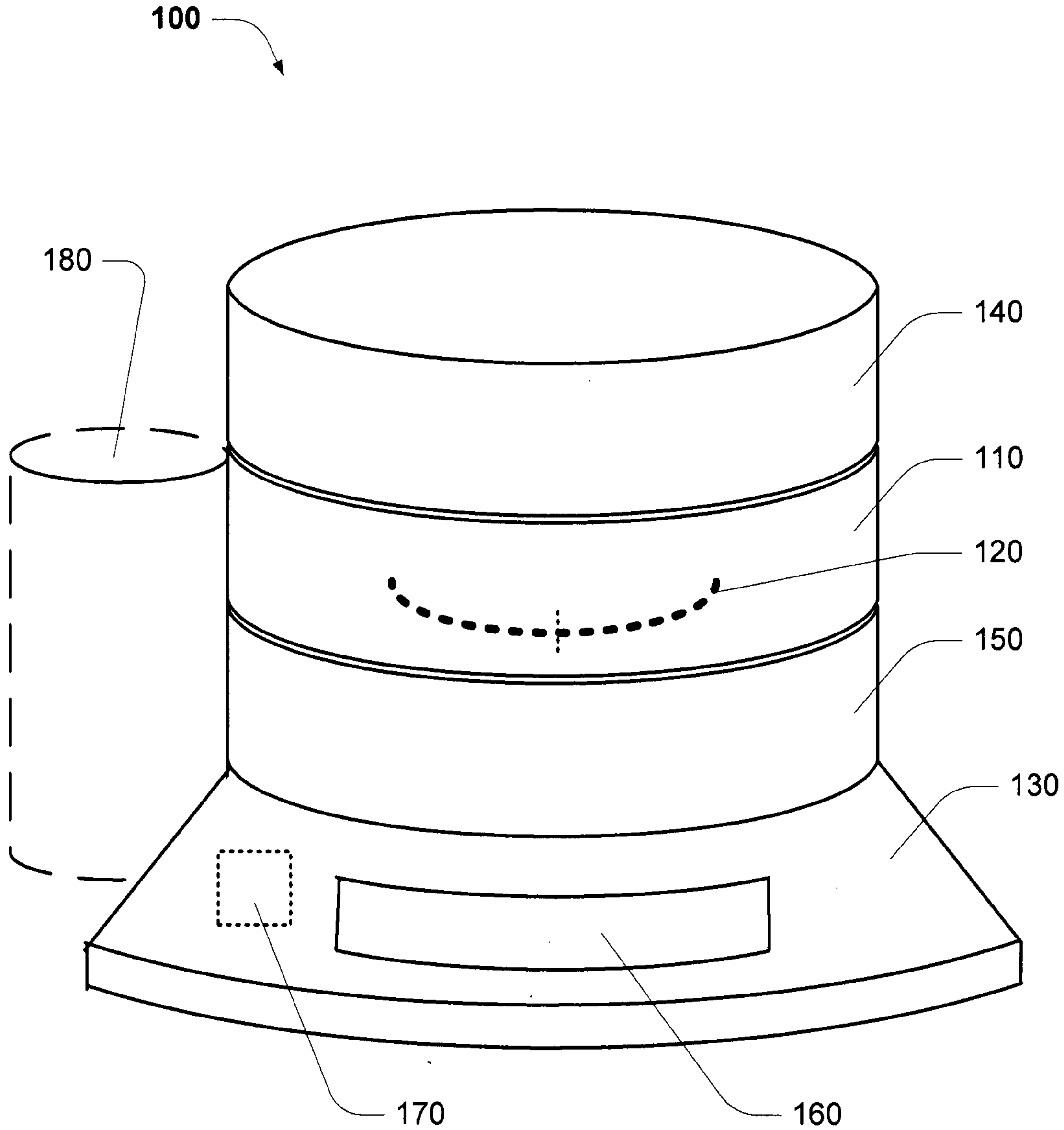

FIG. 2

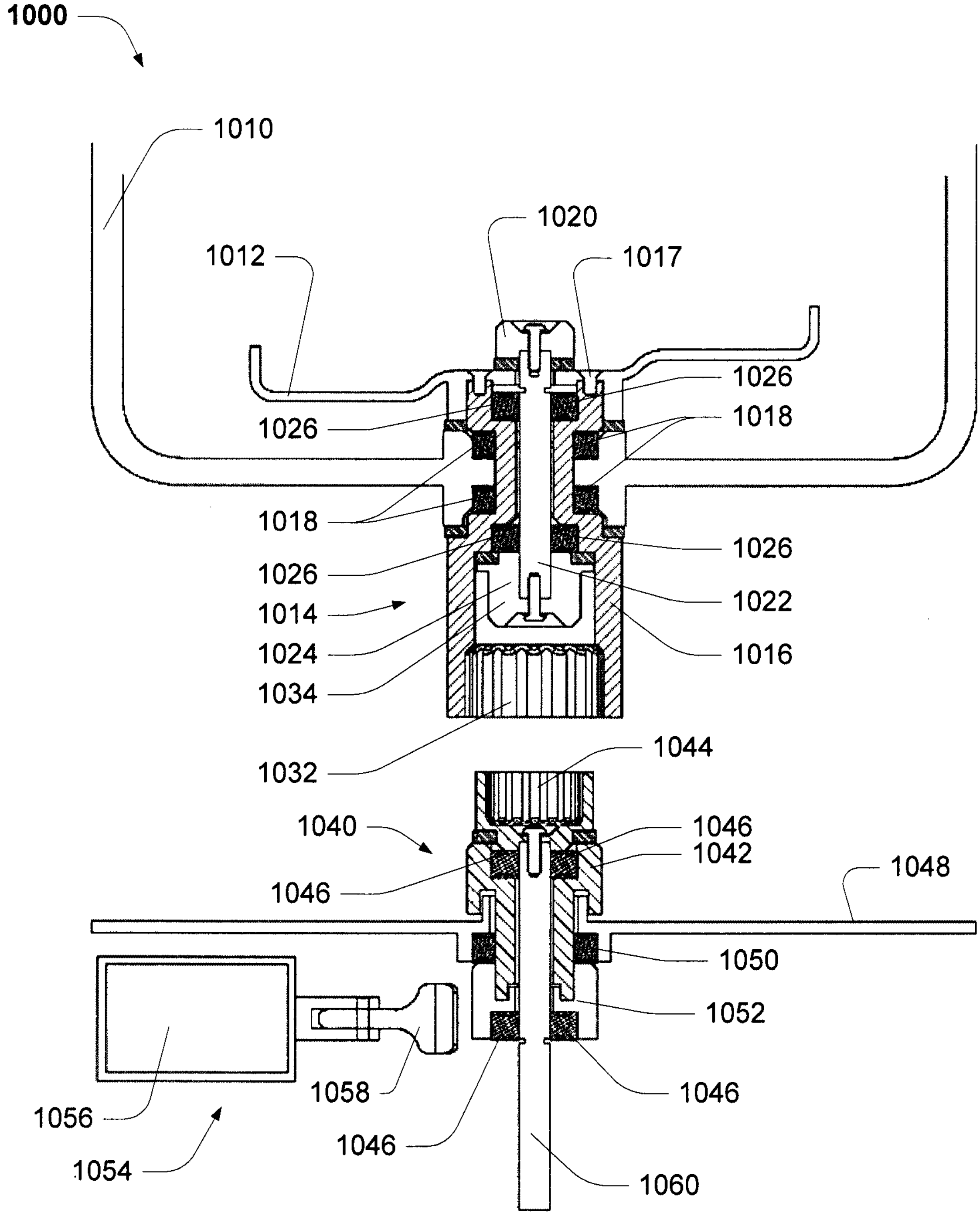
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FIG. 3A

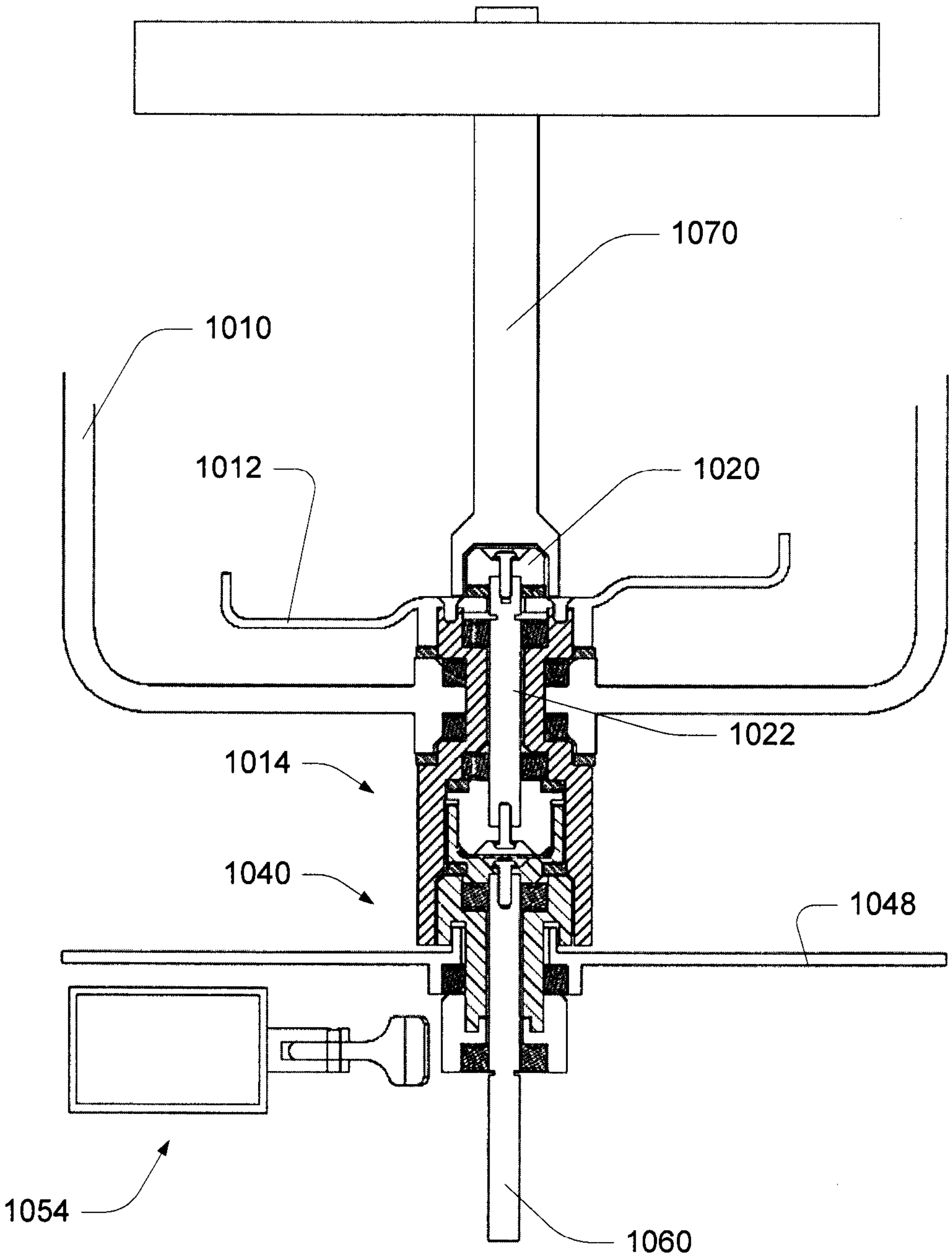

FIG. 3B

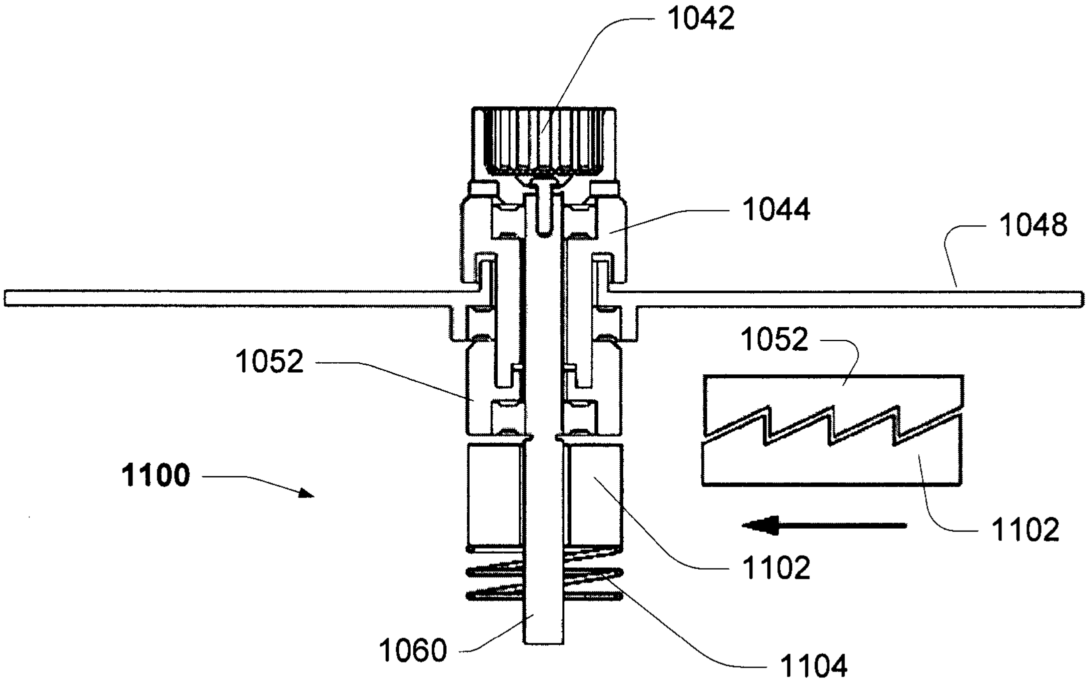
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FIG. 4A

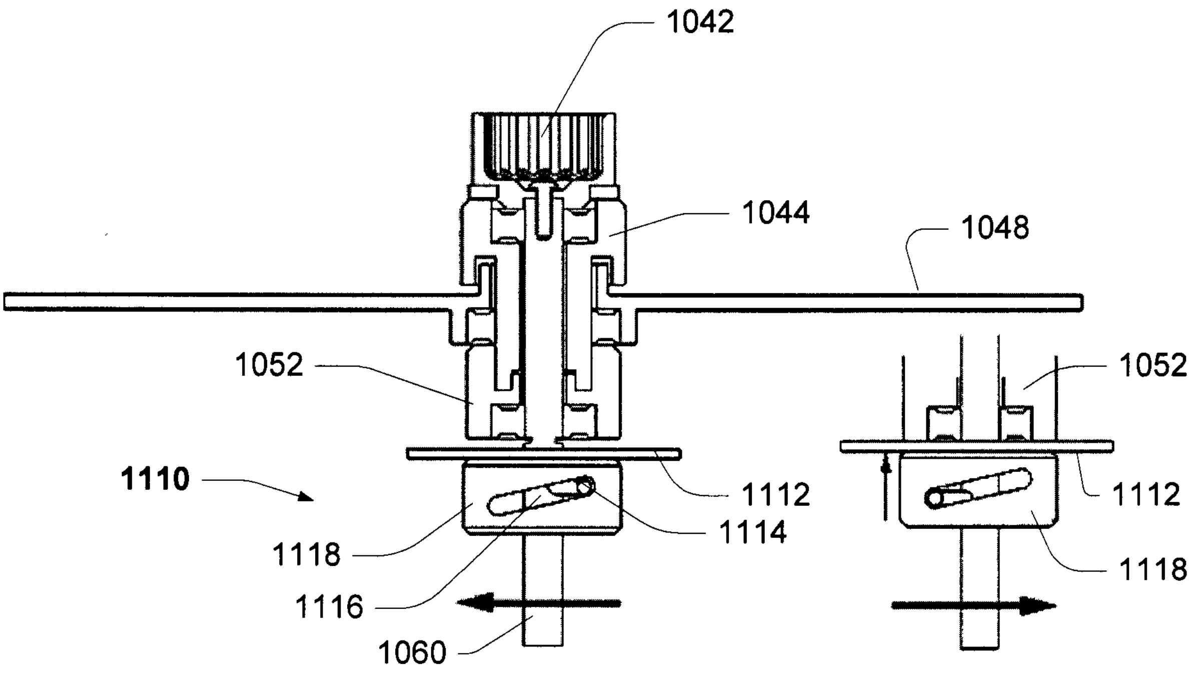
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FIG. 4B

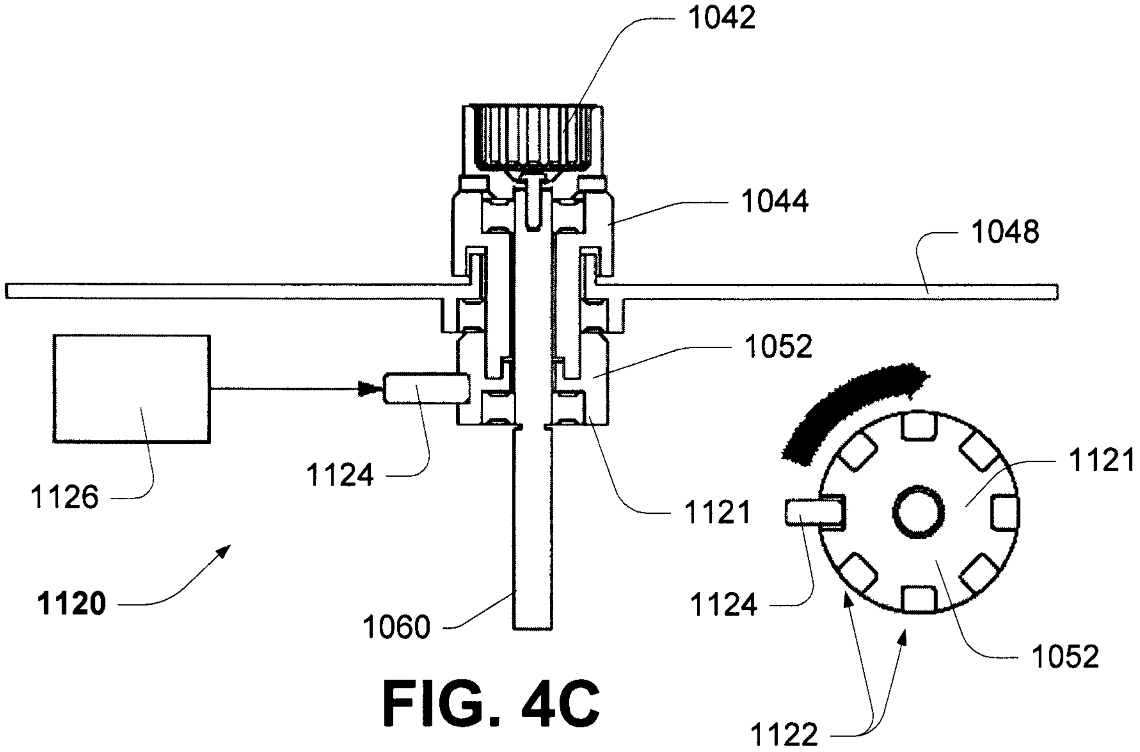
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FIG. 4C

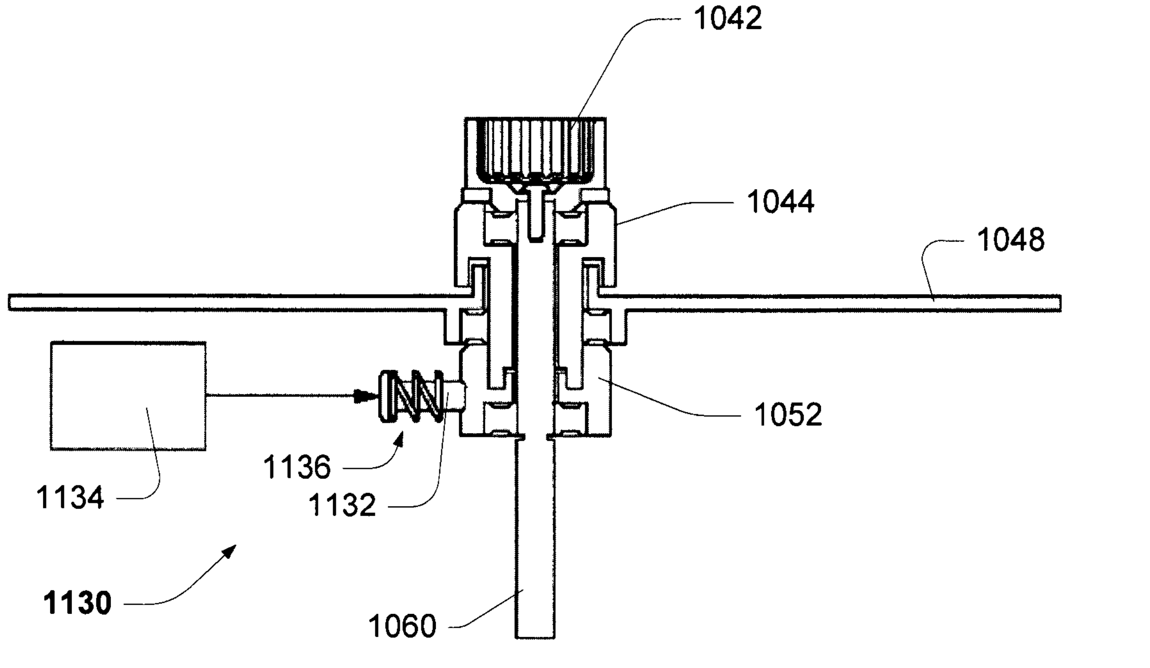
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FIG. 4D

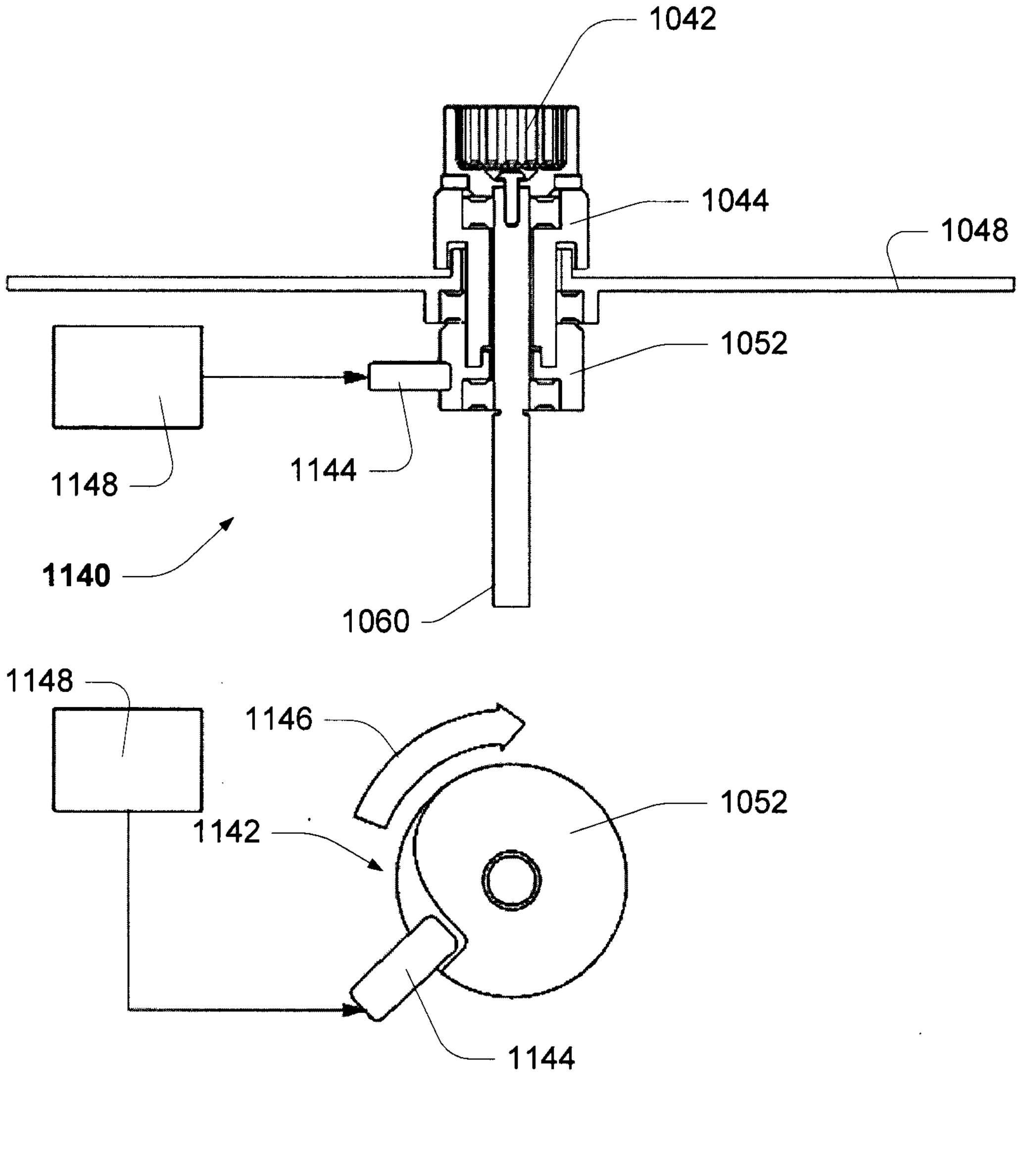
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FIG. 4E

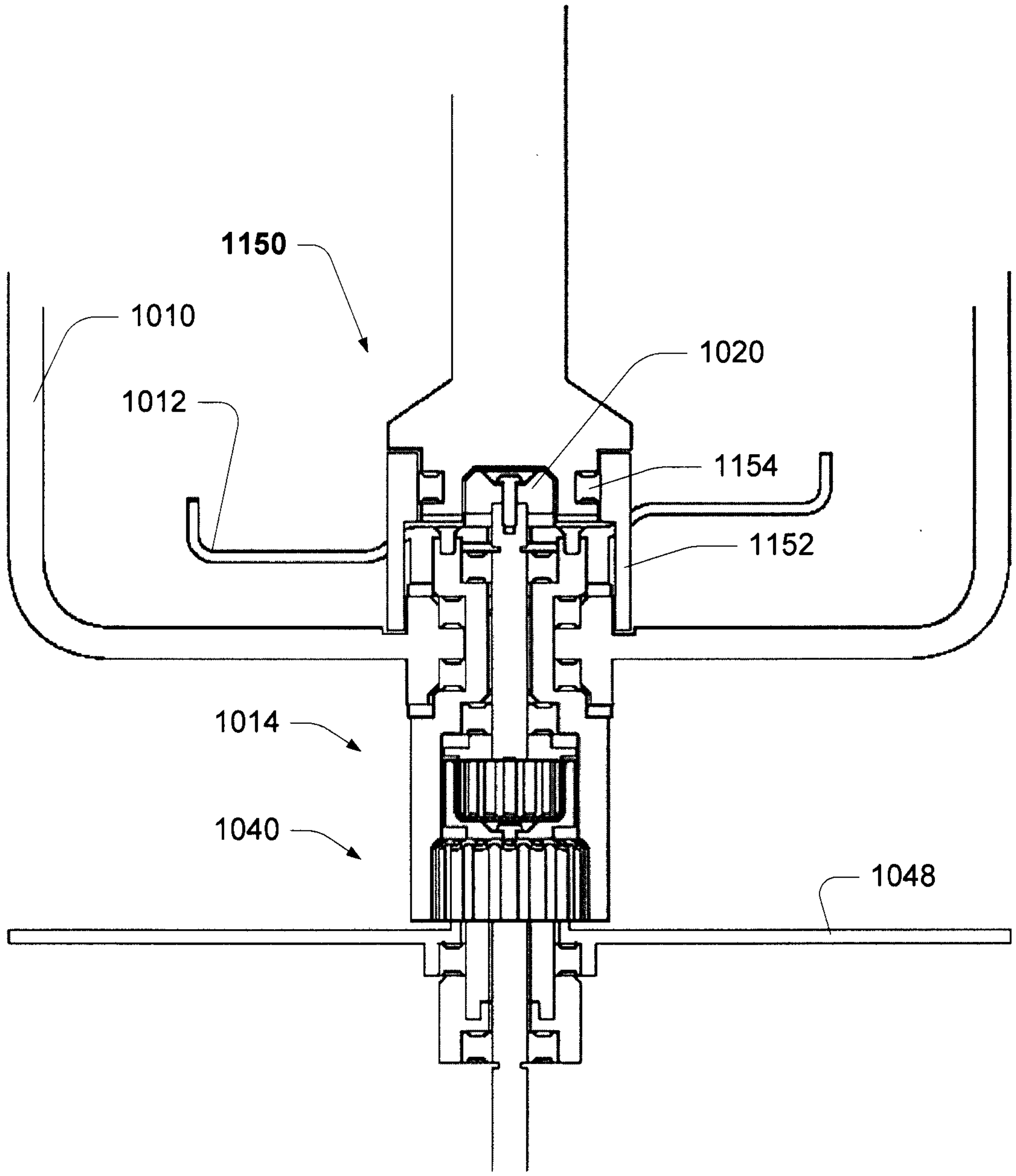


FIG. 5

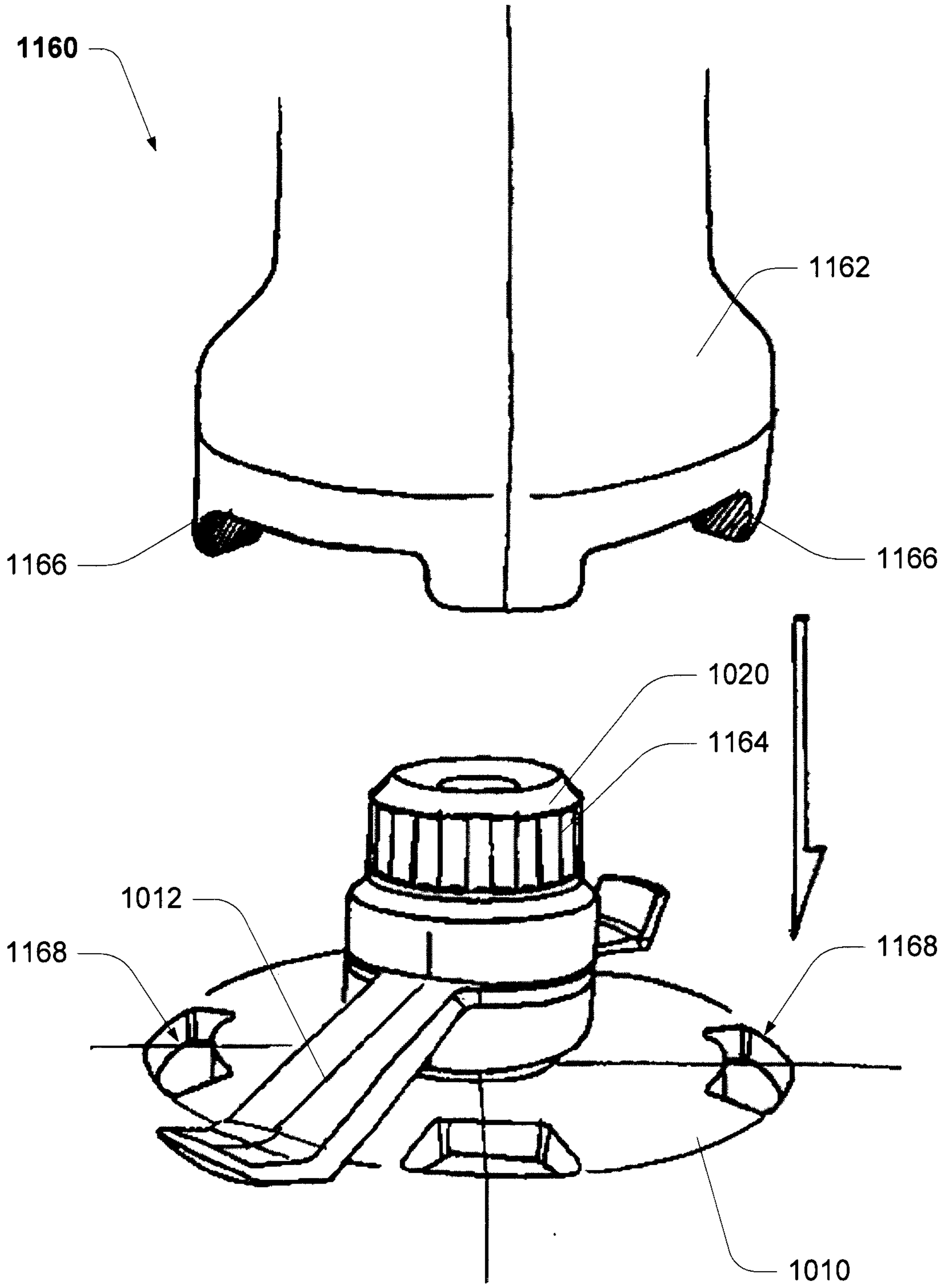


FIG. 6

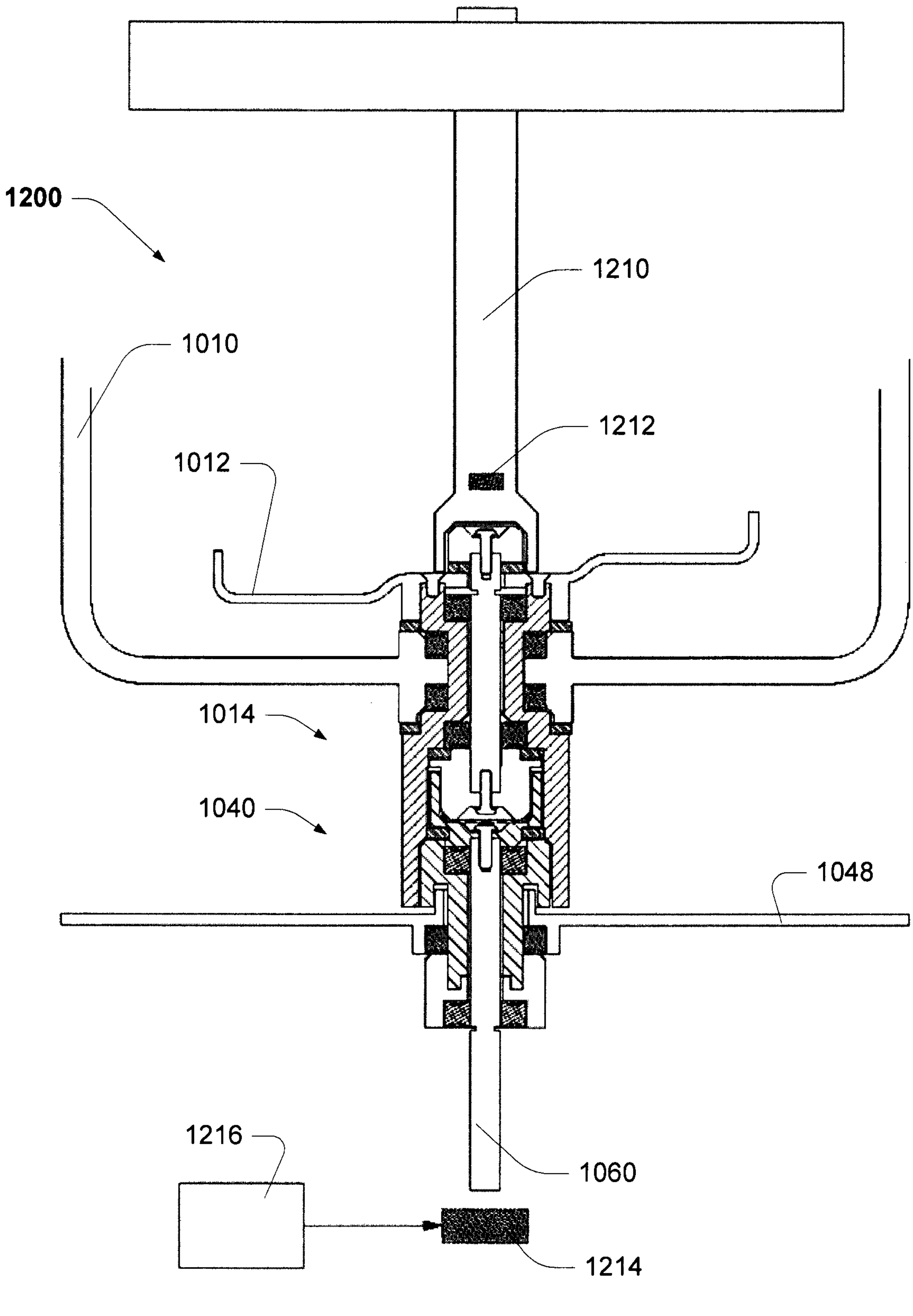


FIG. 7A

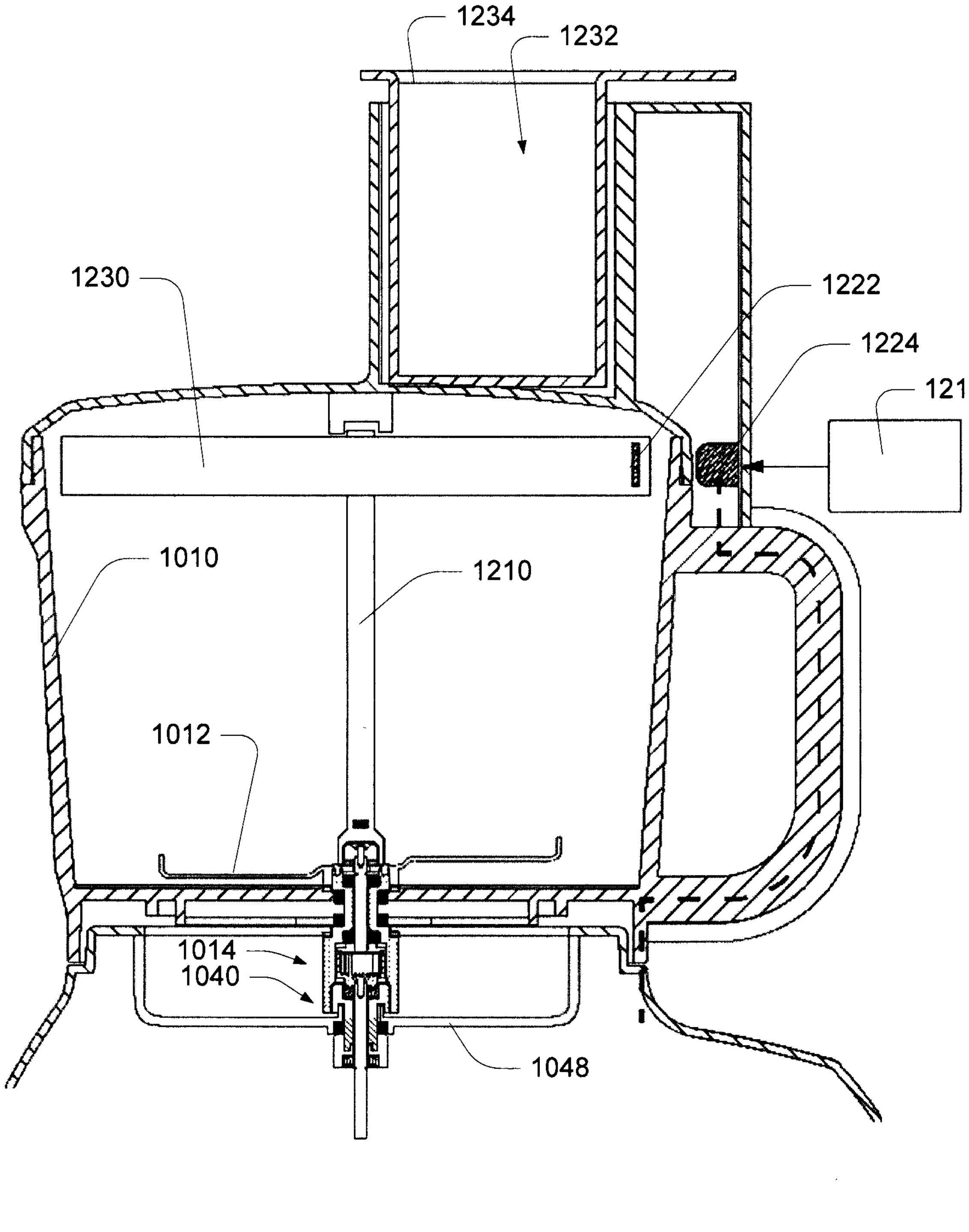


FIG. 7B

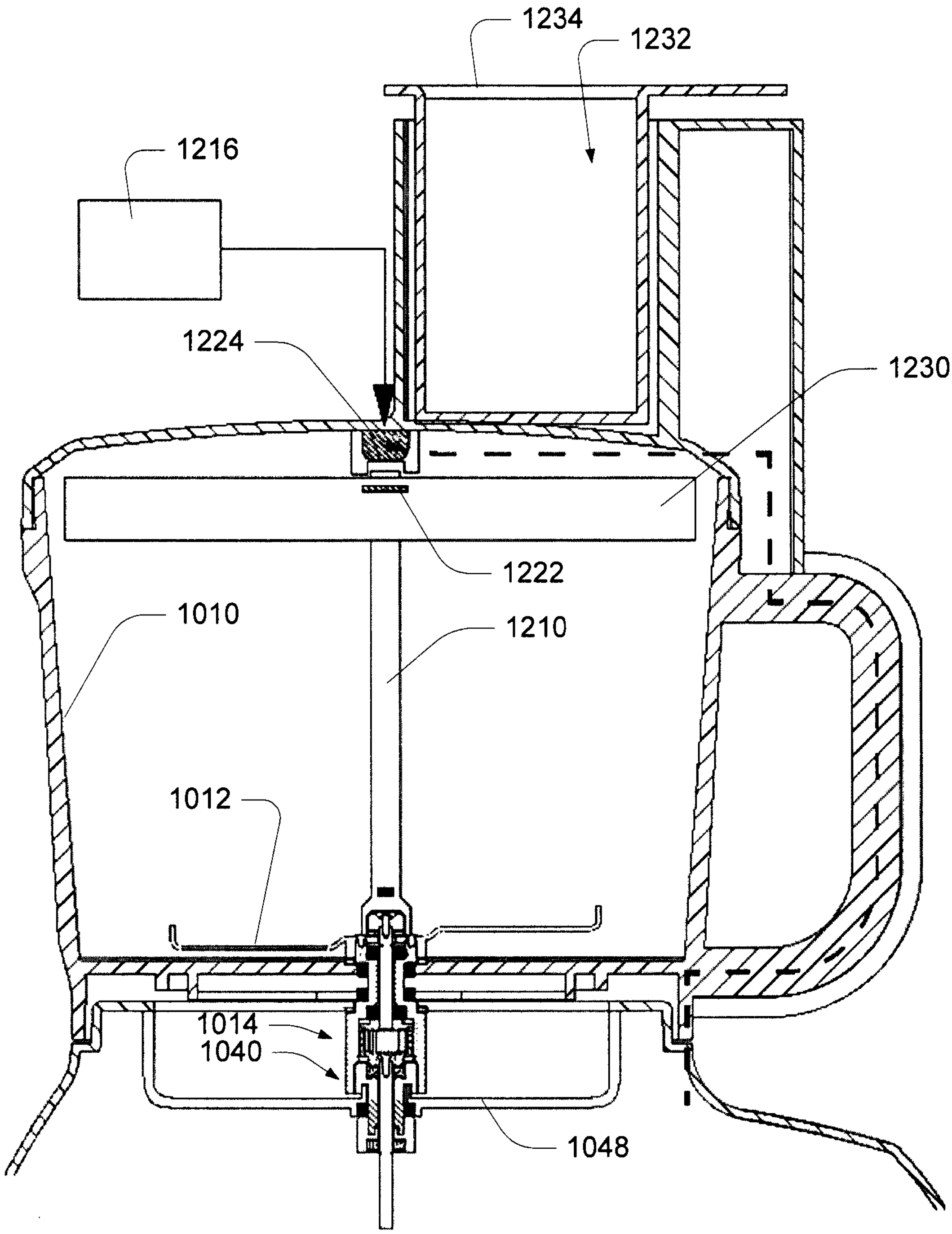


FIG. 7C

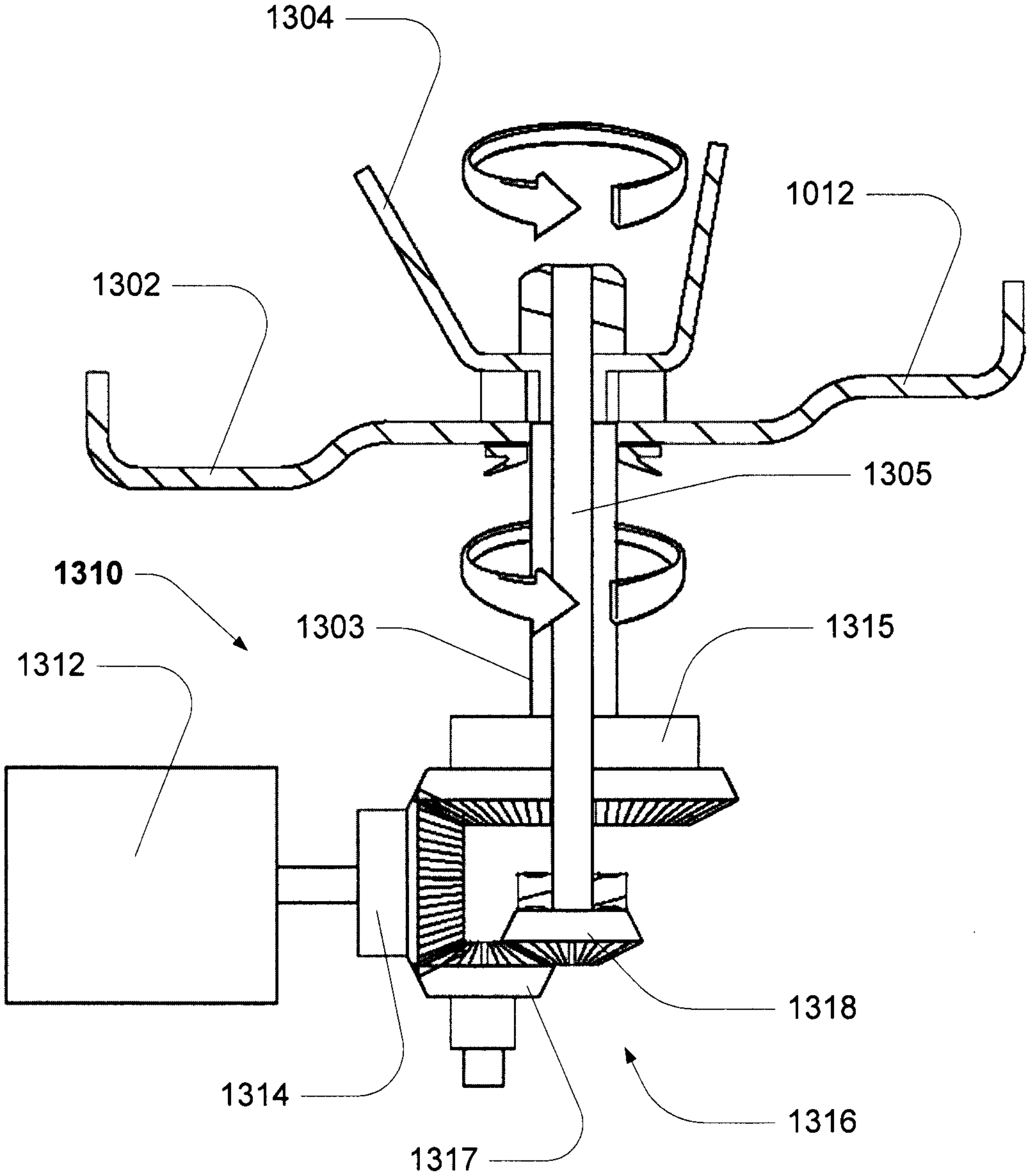


FIG. 8A

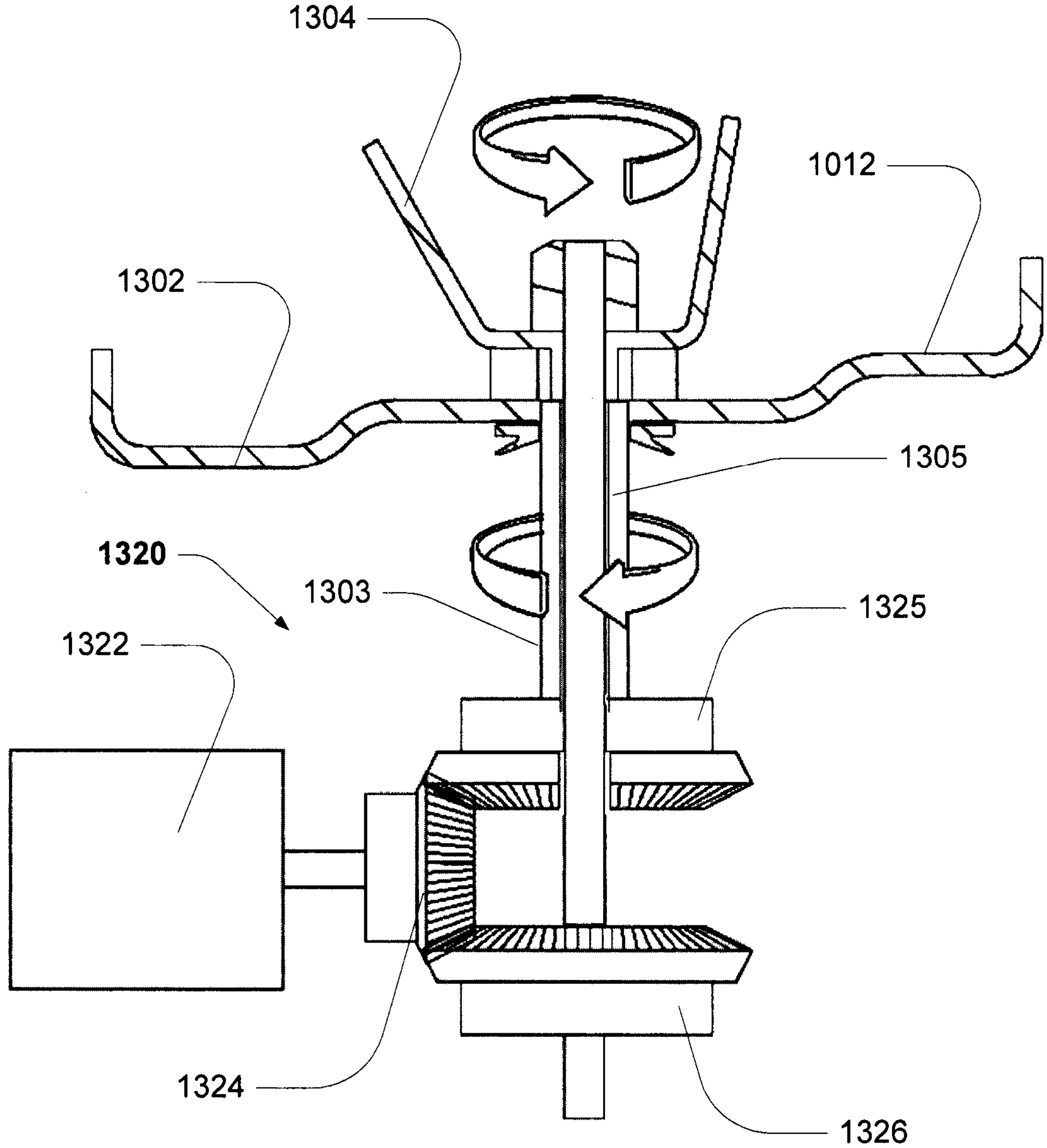


FIG. 8B

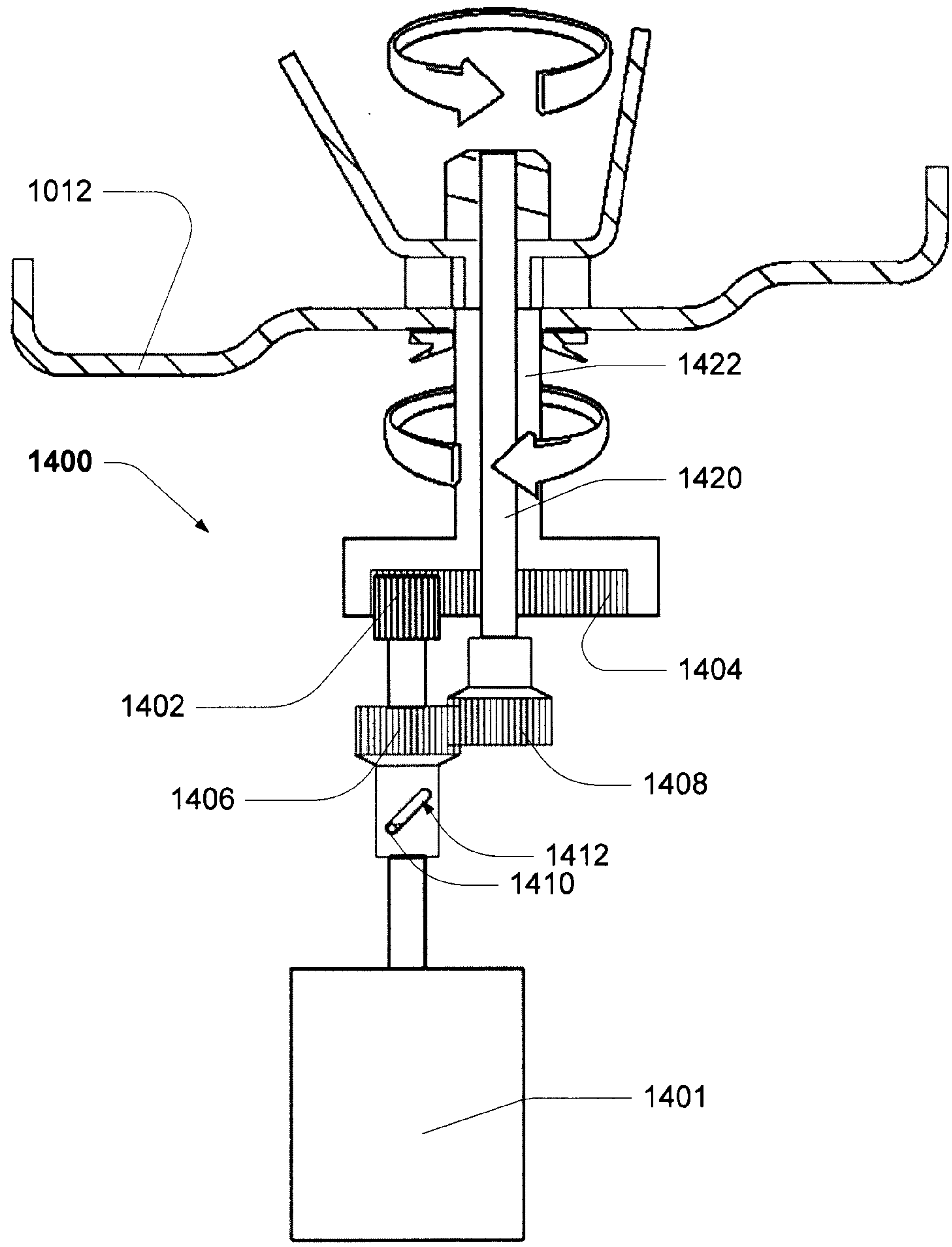


FIG. 9A

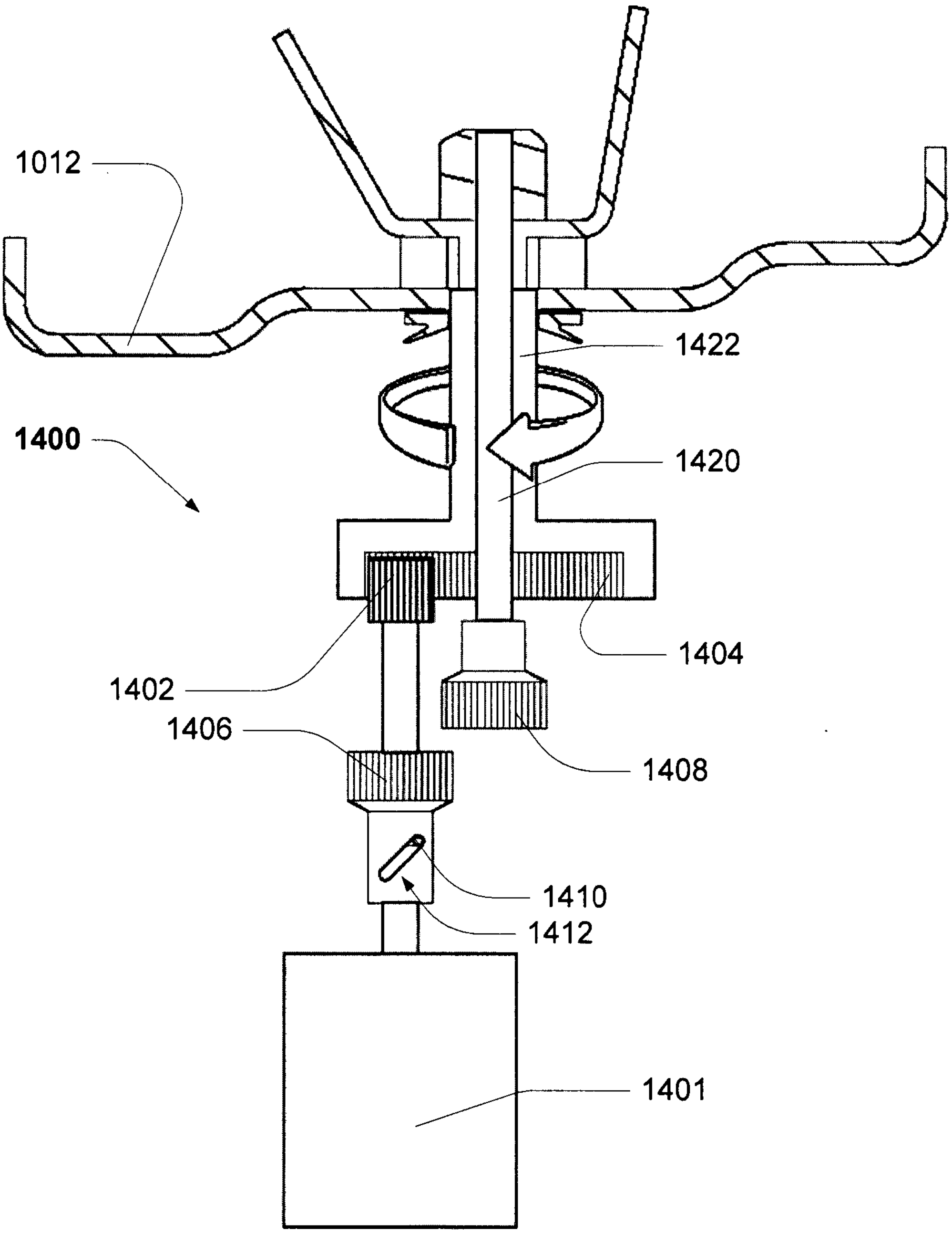


FIG. 9B

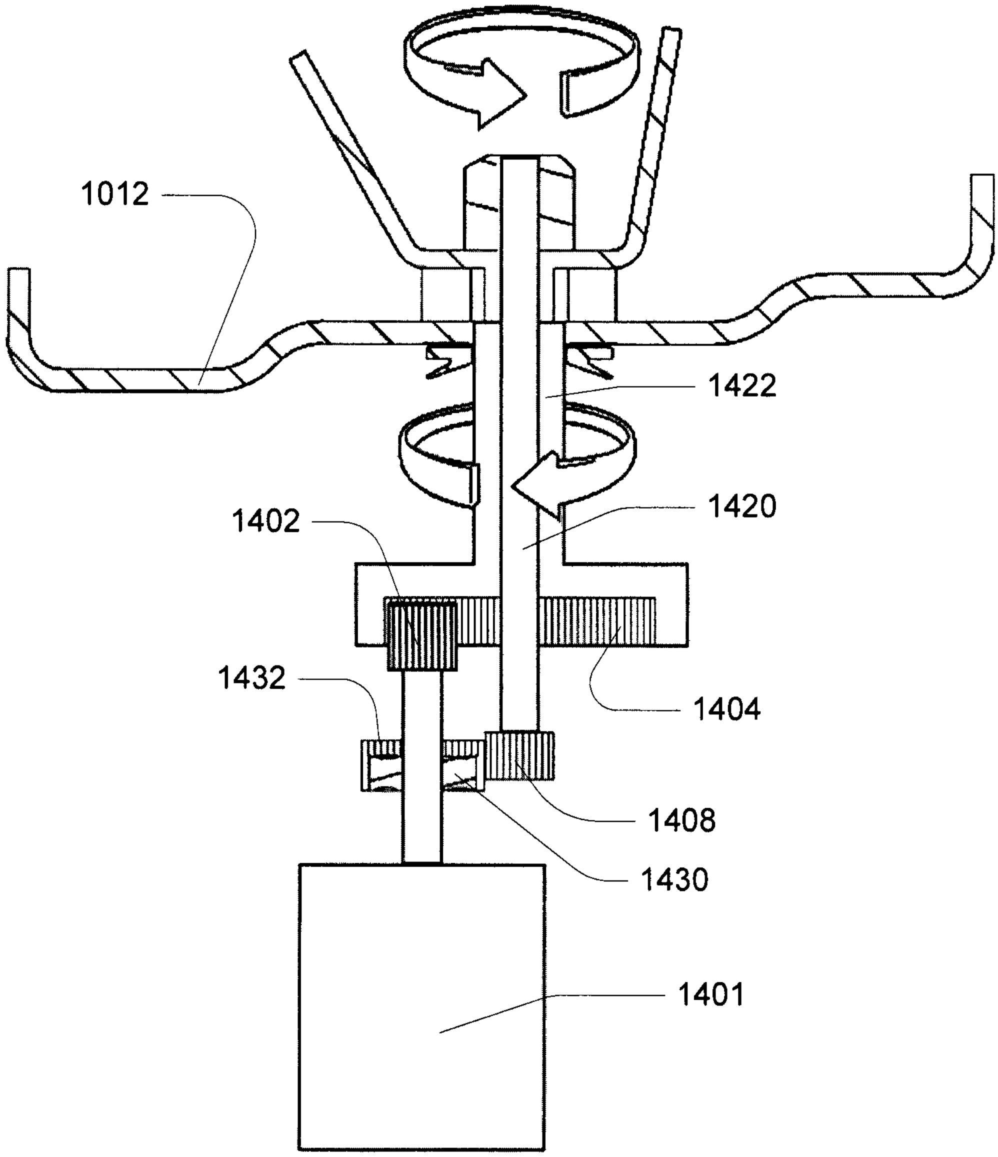


FIG. 9C

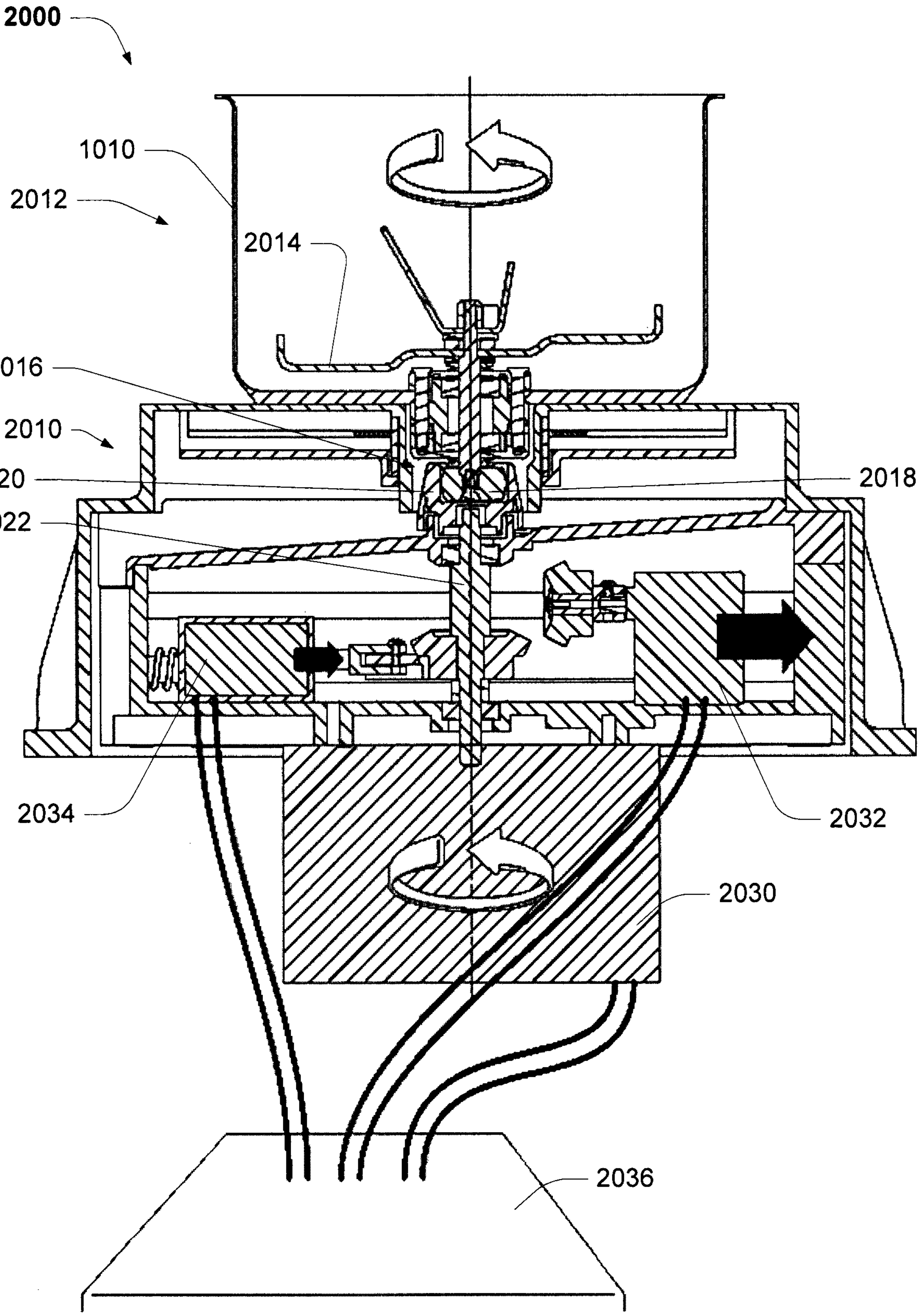

2000
1010
2012
2014
2016
2010
2020
2018
2022
2034
2032
2030
2036

FIG. 10A

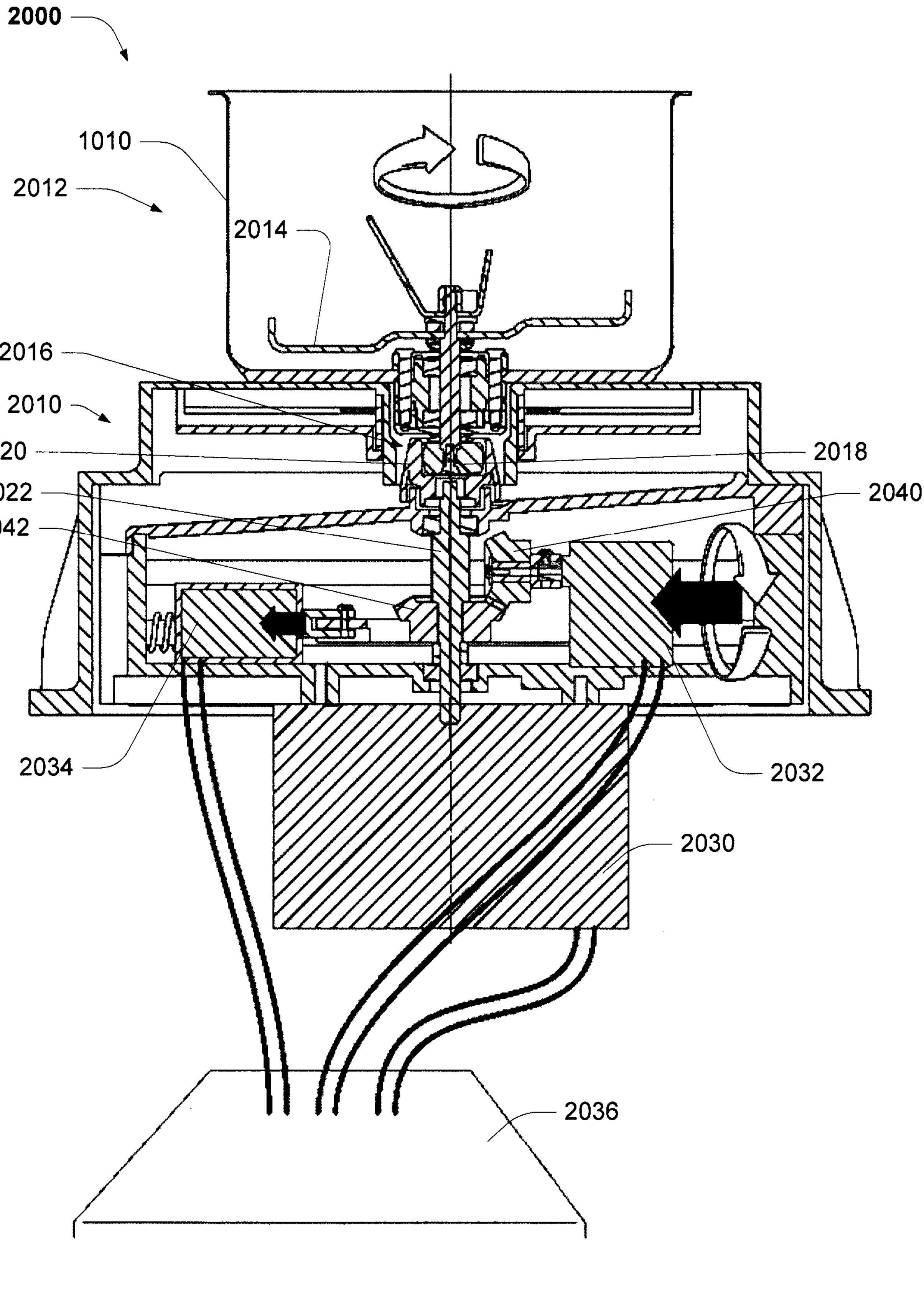

2000
1010
2012
2014
2016
2010
2020
2018
2022
2040
2042
2034
2032
2030
2036

FIG. 10B

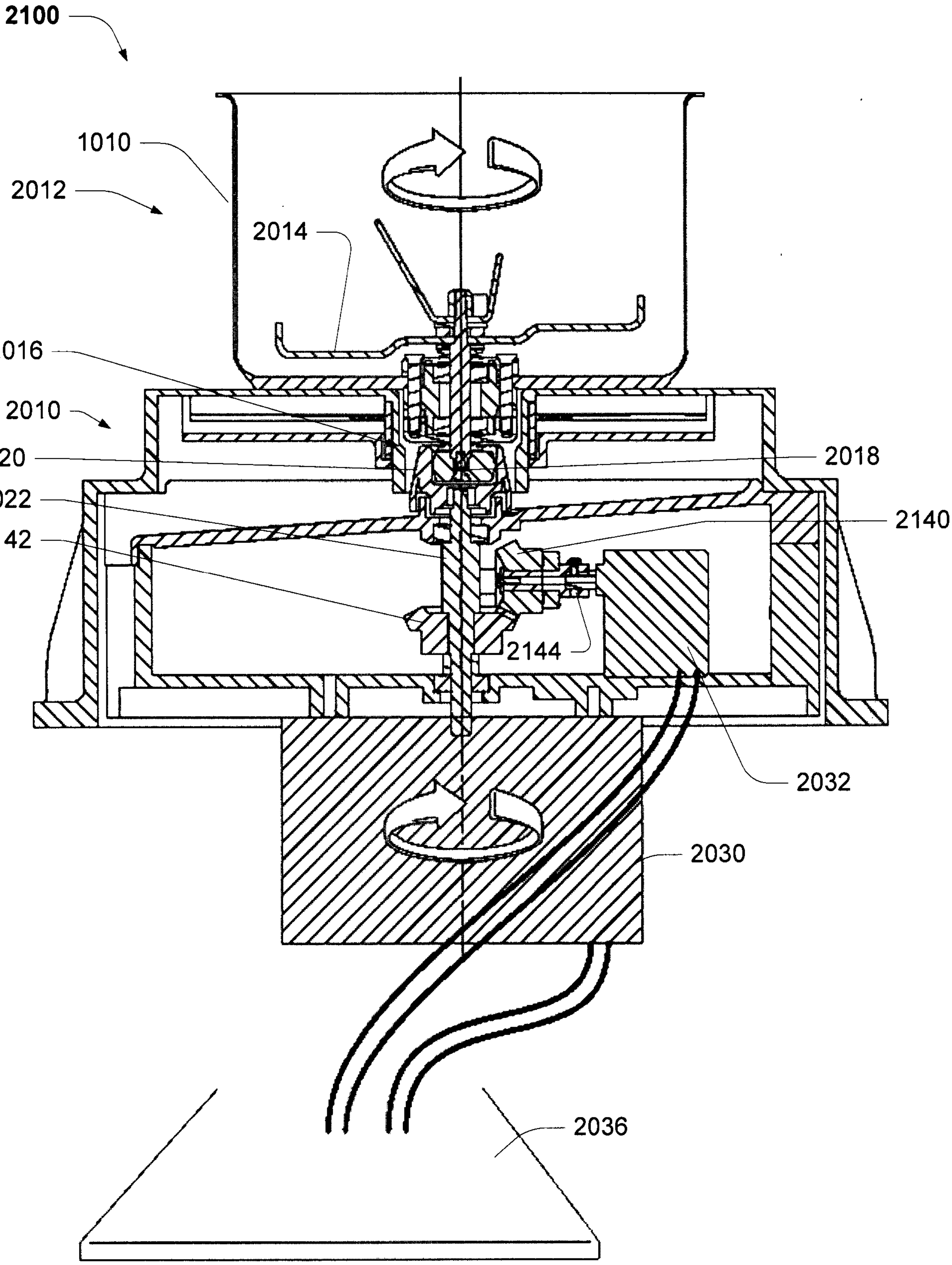

2100
1010
2012
2014
2016
2010
2020
2018
2022
2140
2142
2144
2032
2030
2036

FIG. 11A

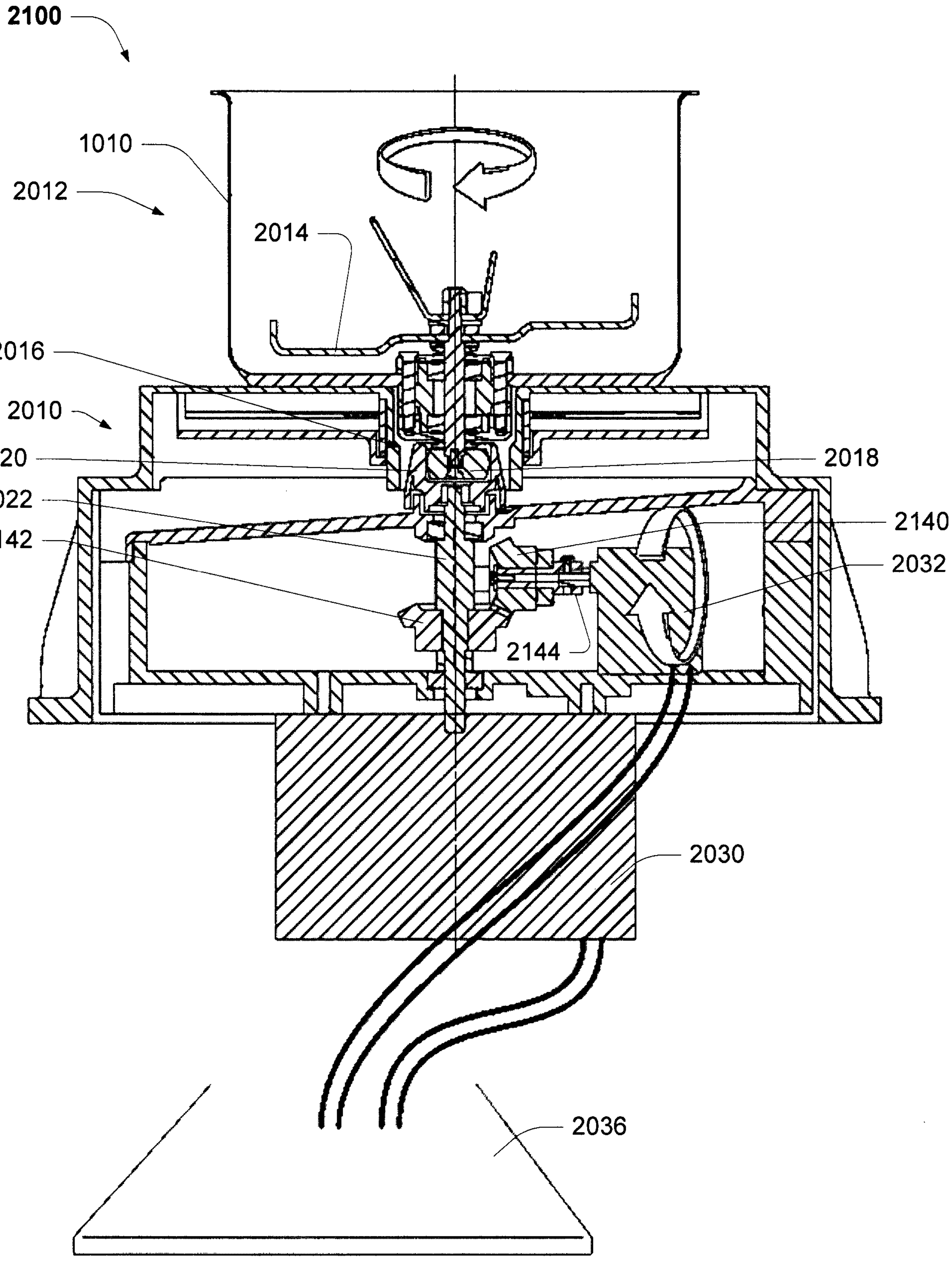

2100
1010
2012
2014
2016
2010
2020
2018
2022
2140
2142
2032
2144
2030
2036

FIG. 11B

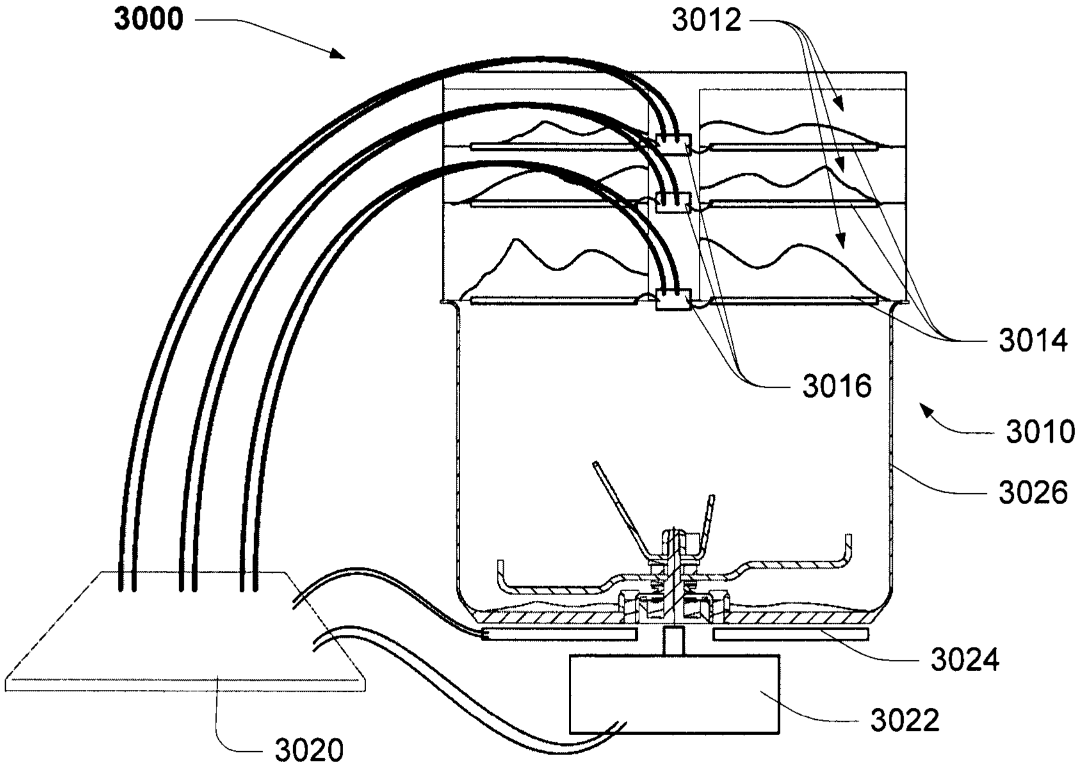


FIG. 12A

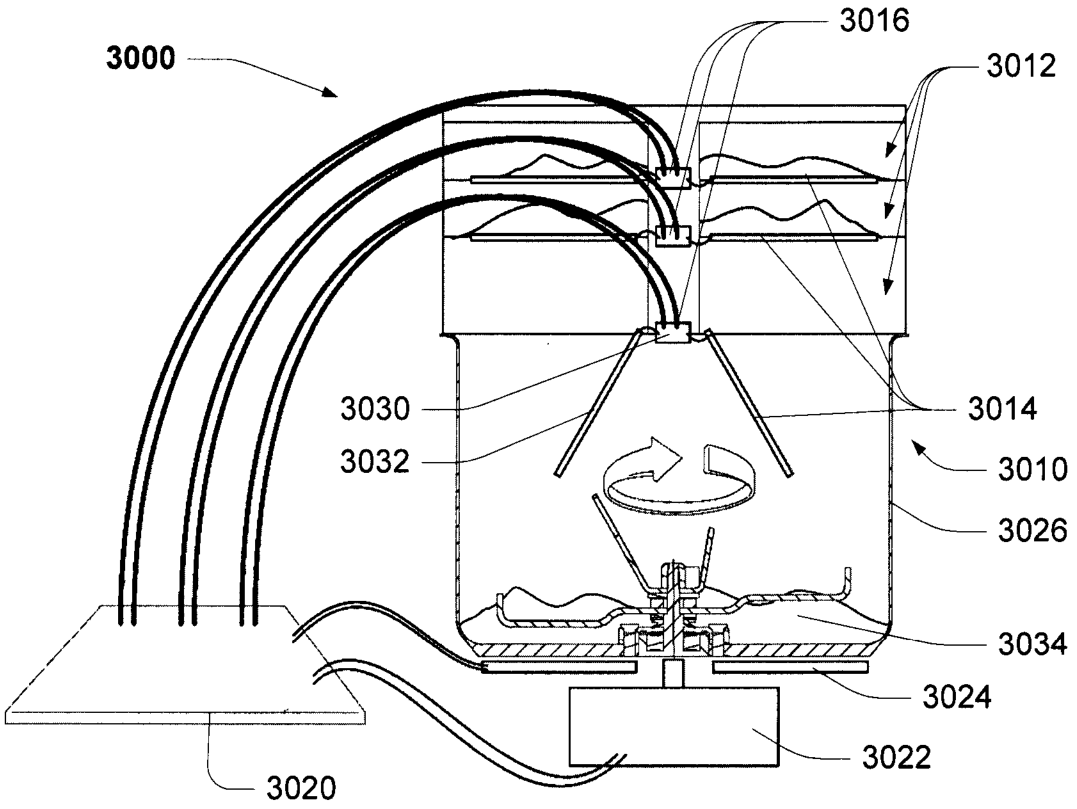


FIG. 12B

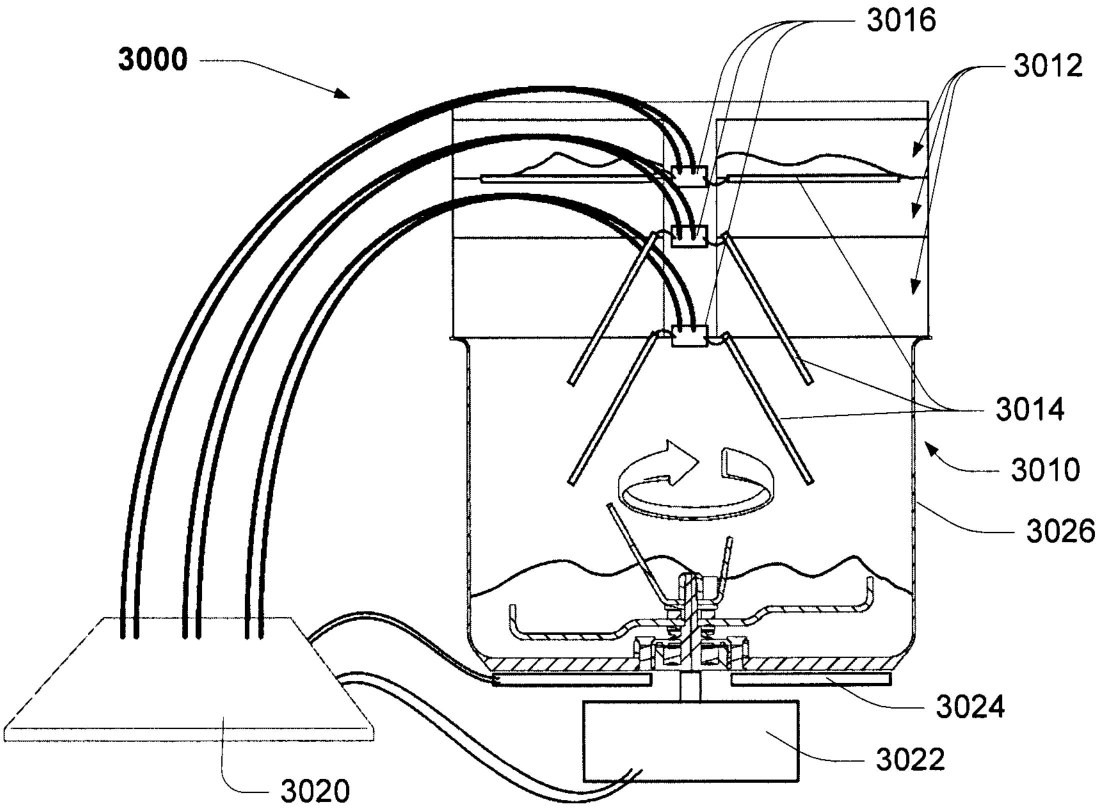


FIG. 12C

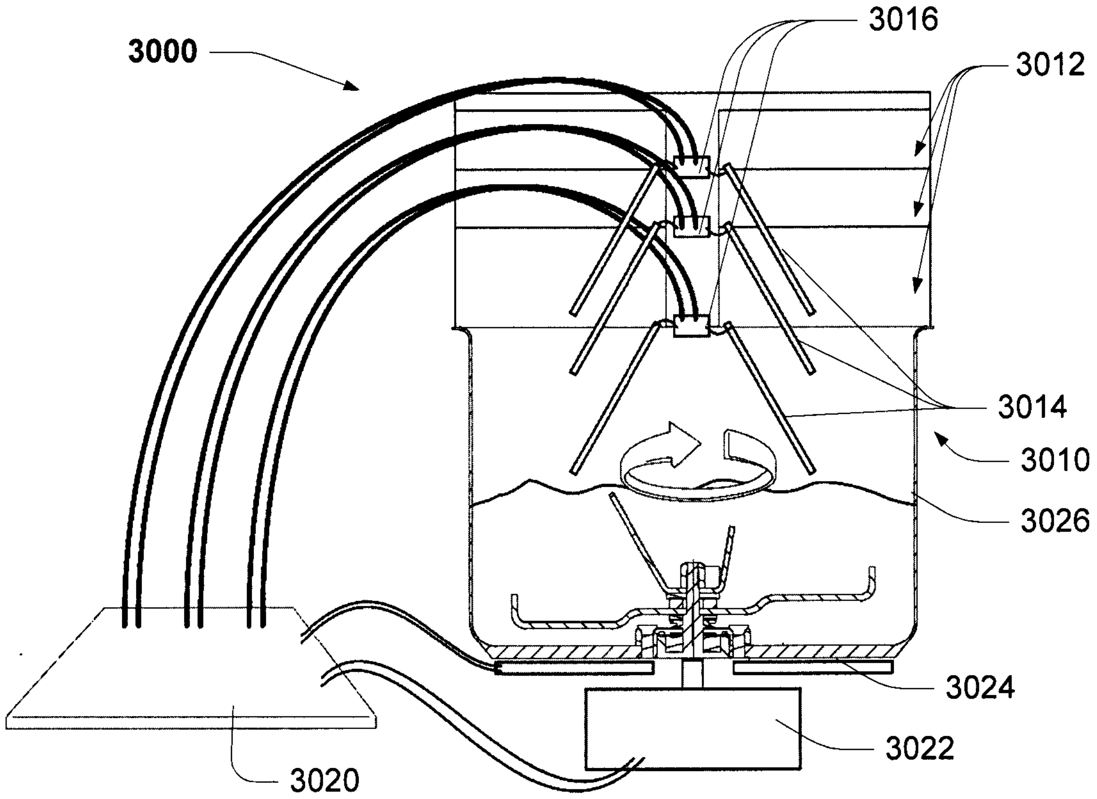


FIG. 12D

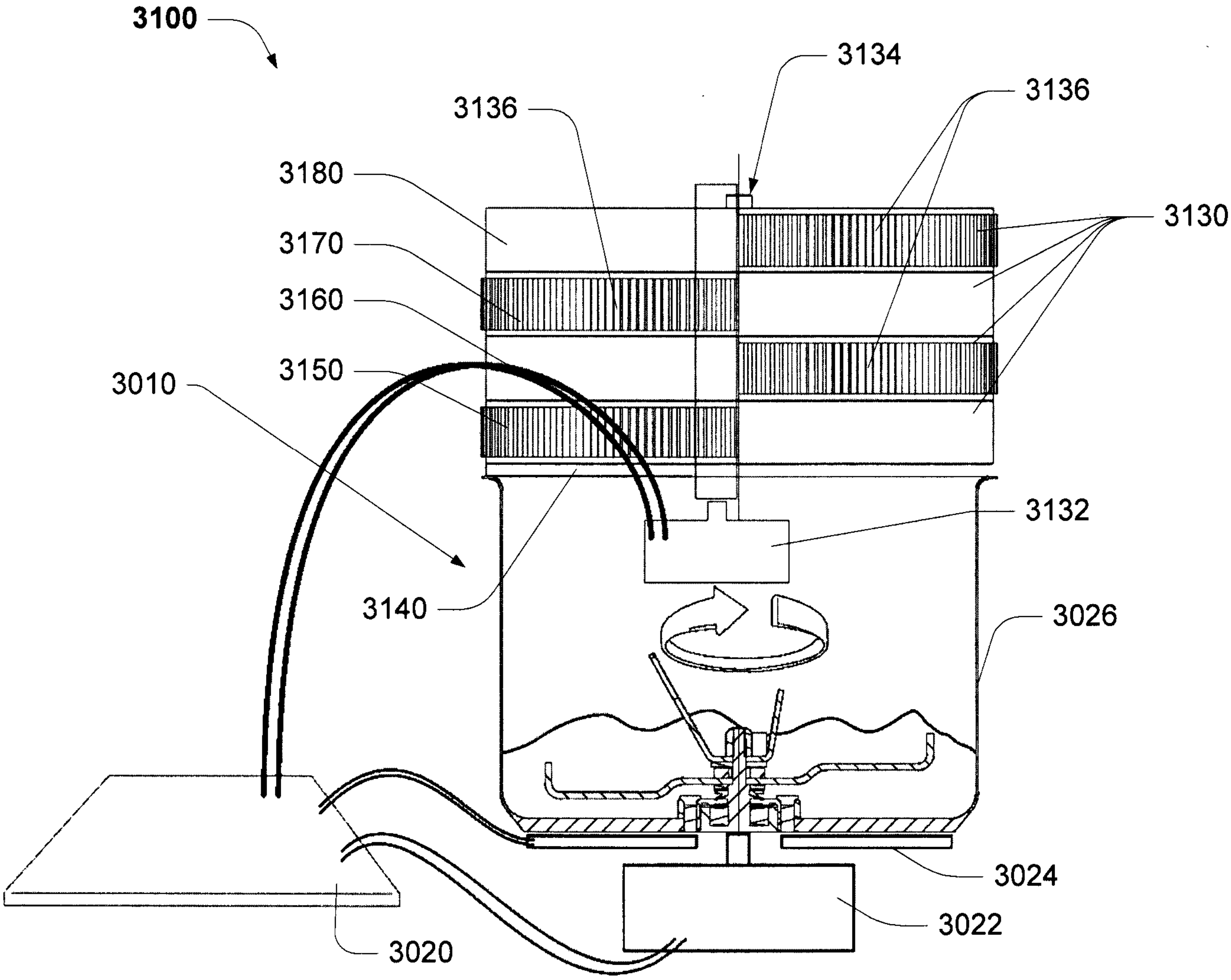

3100
3134
3136
3136
3180
3130
3170
3160
3150
3010
3132
3140
3026
3024
3022
3020

FIG. 13

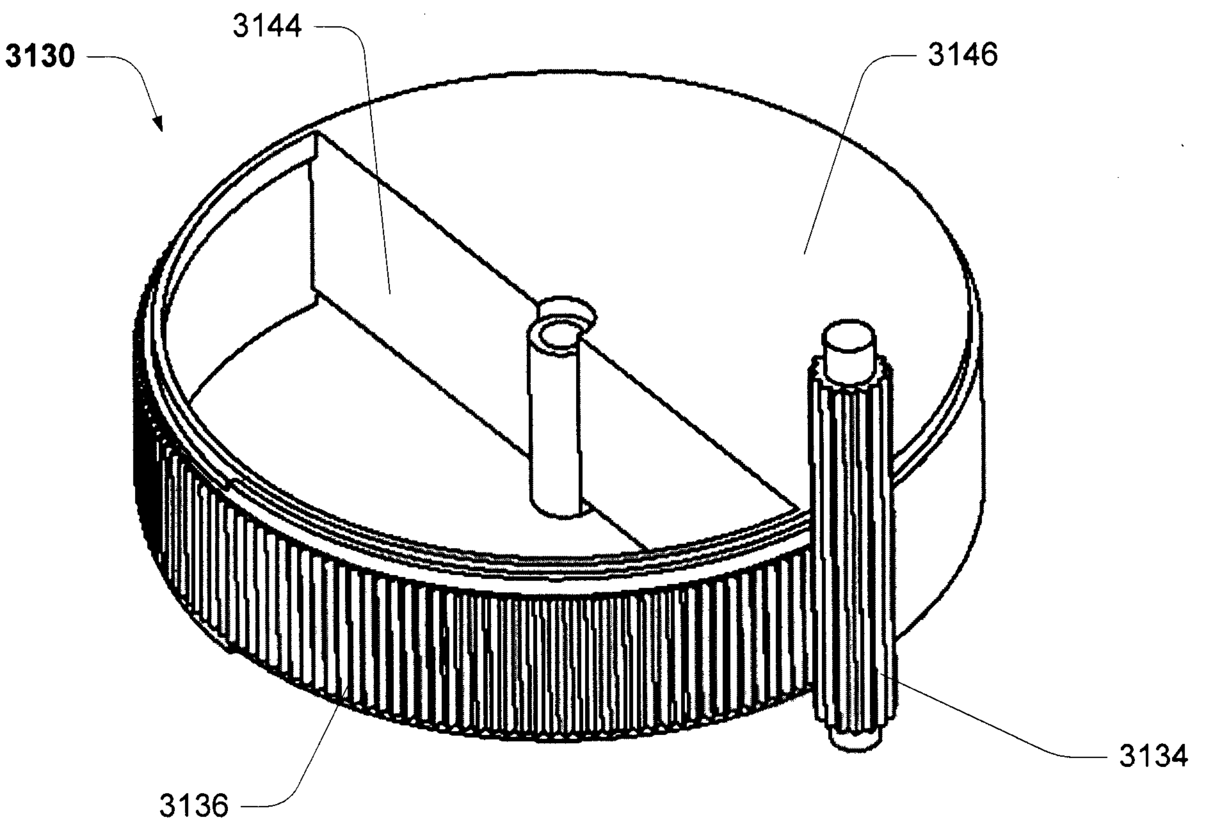


FIG. 14A

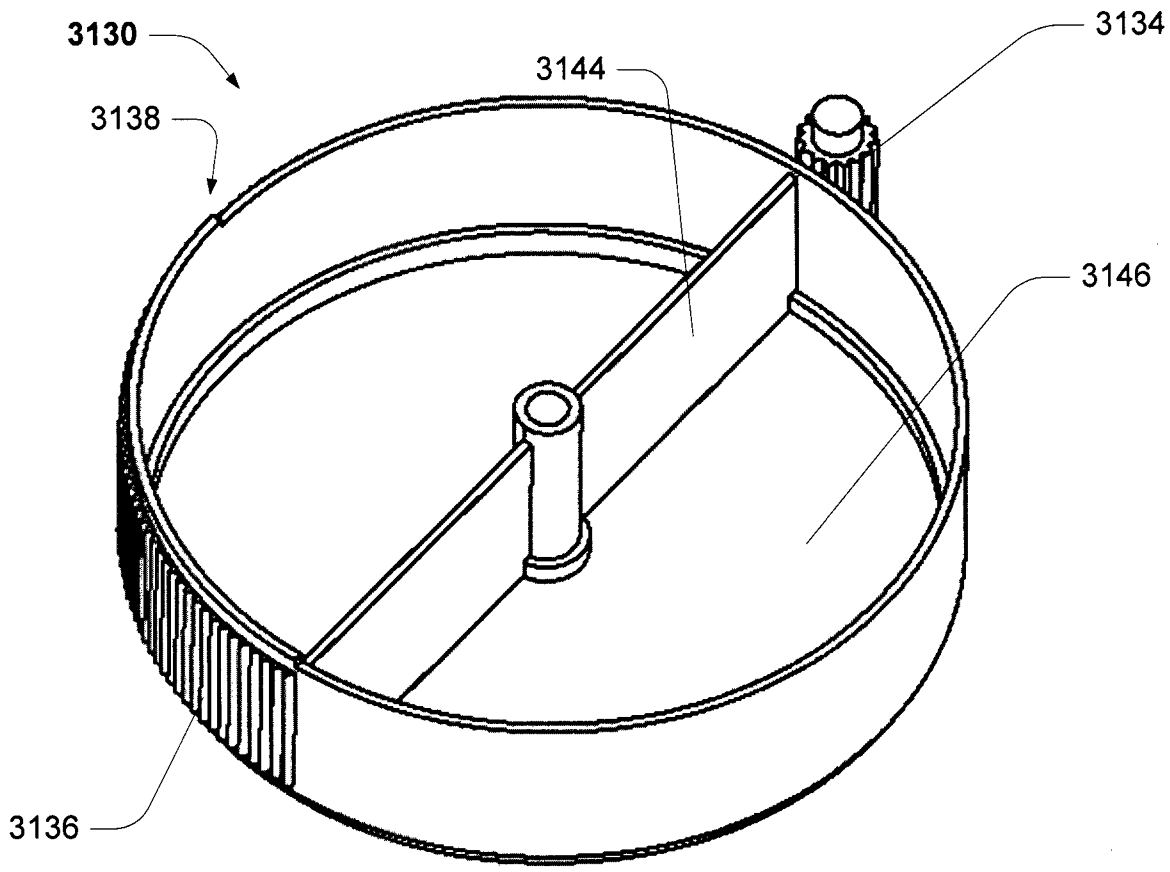


FIG. 14B

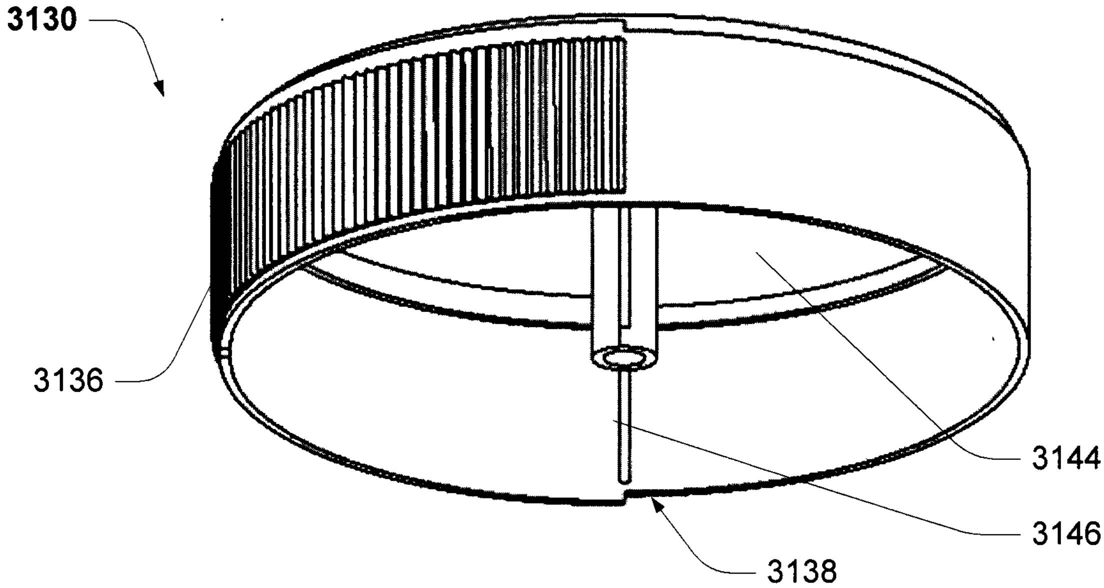


FIG. 14C

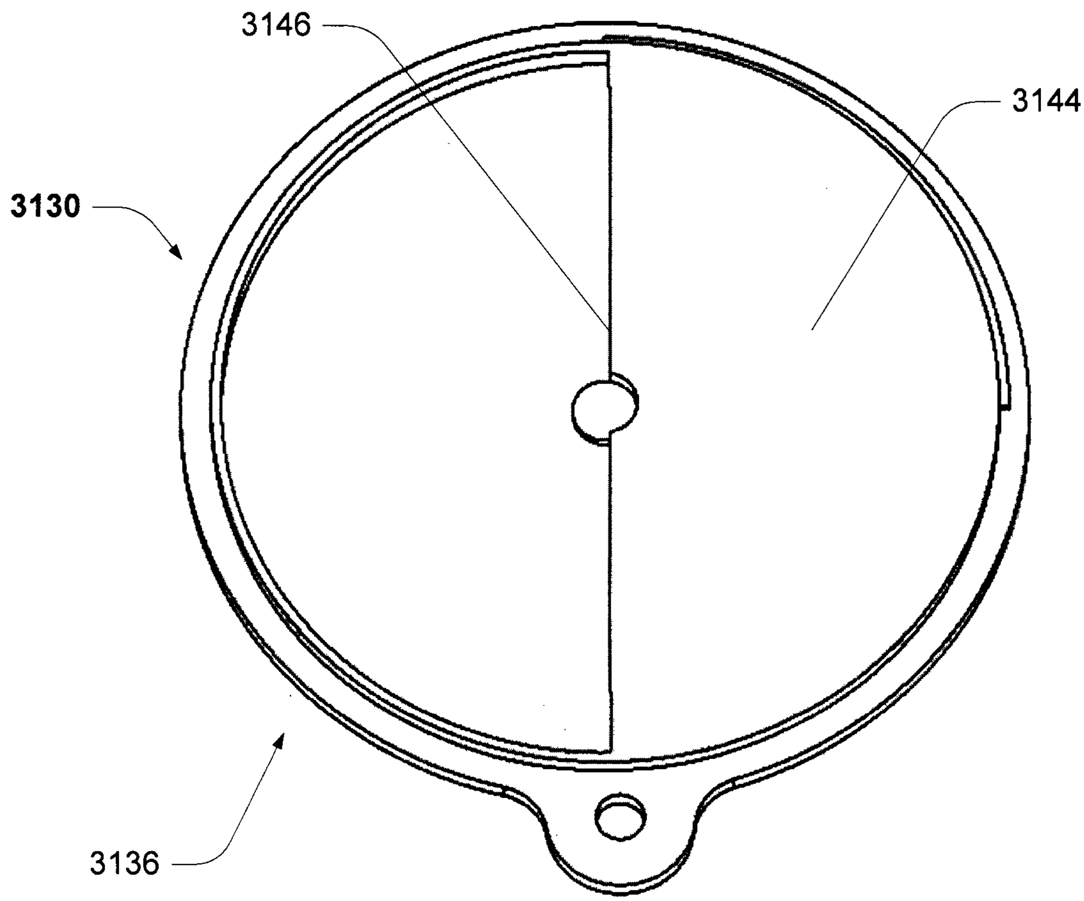


FIG. 14D

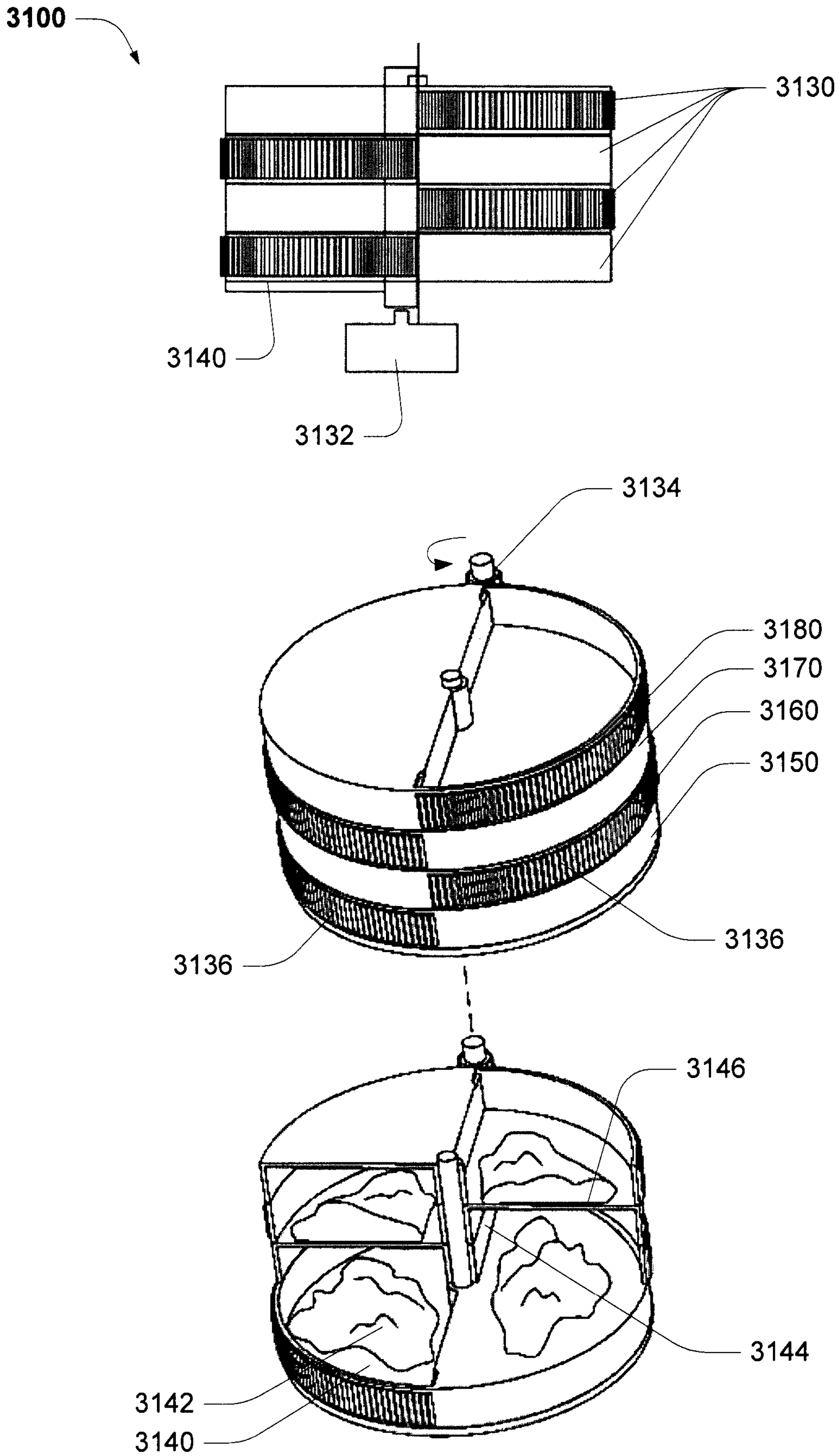
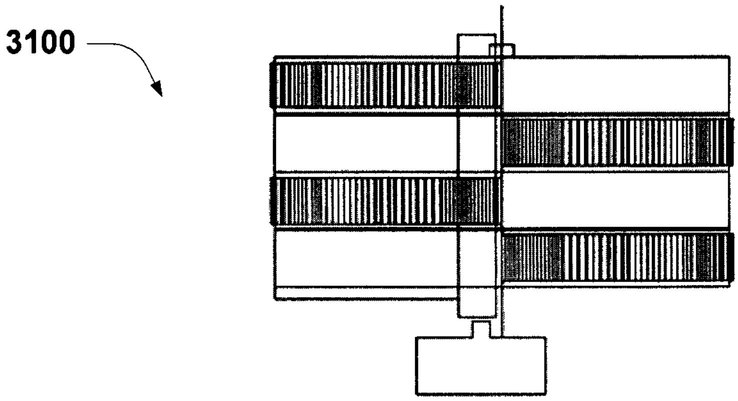

3100
3130
3140
3132
3134
3180
3170
3160
3150
3136
3136
3146
3144
3142
3140

FIG. 15A



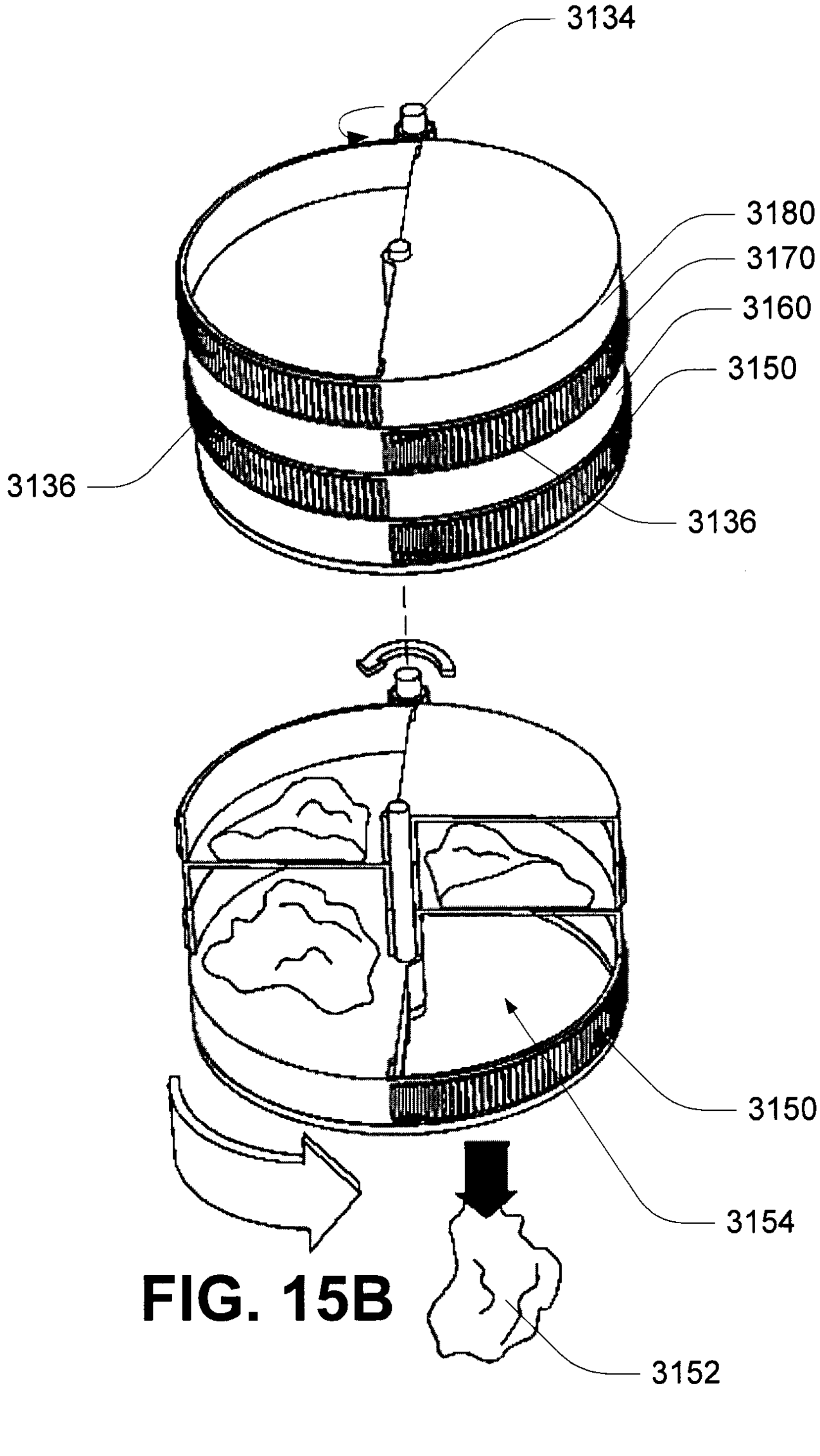


FIG. 15B

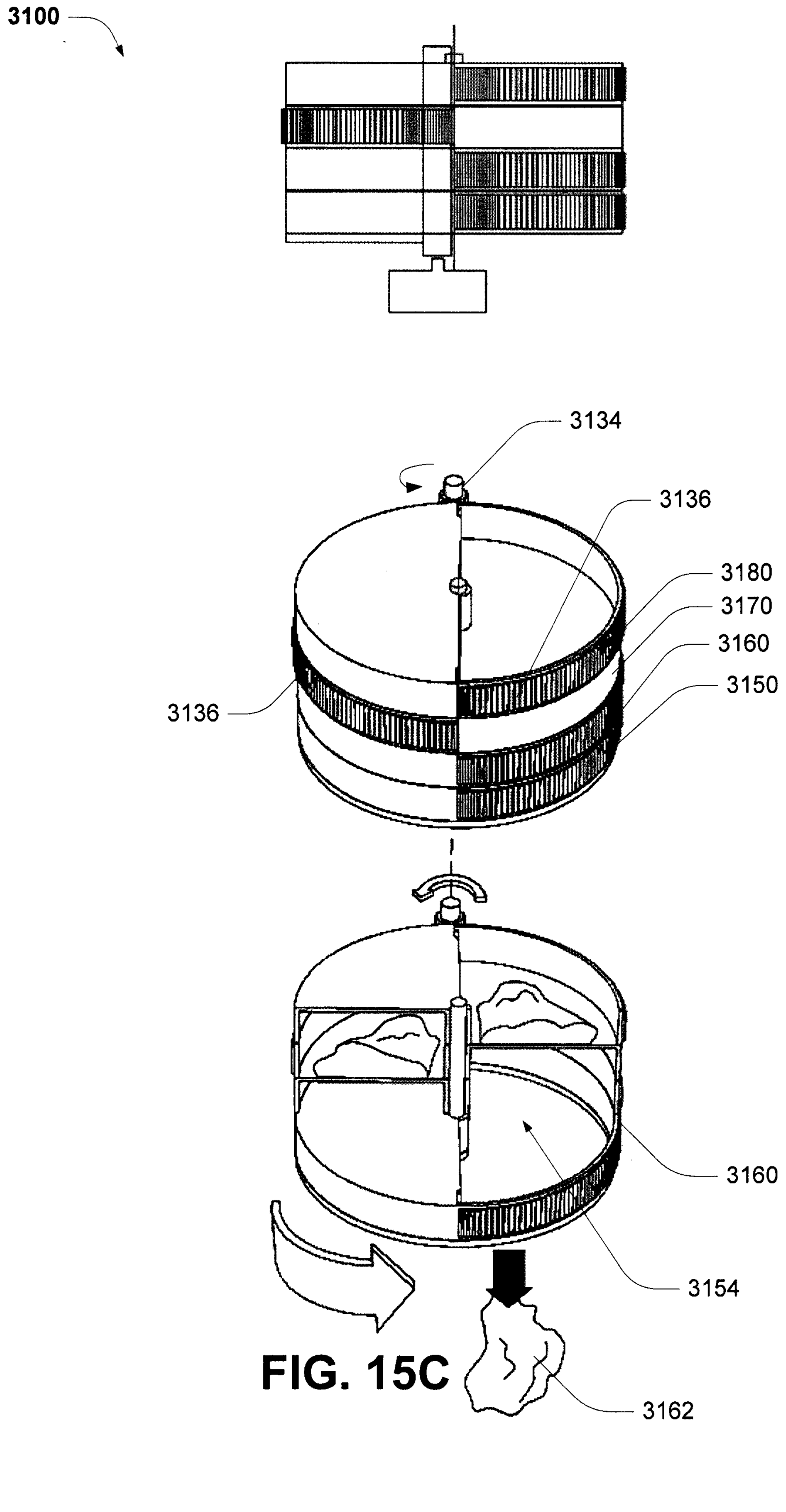


FIG. 15C

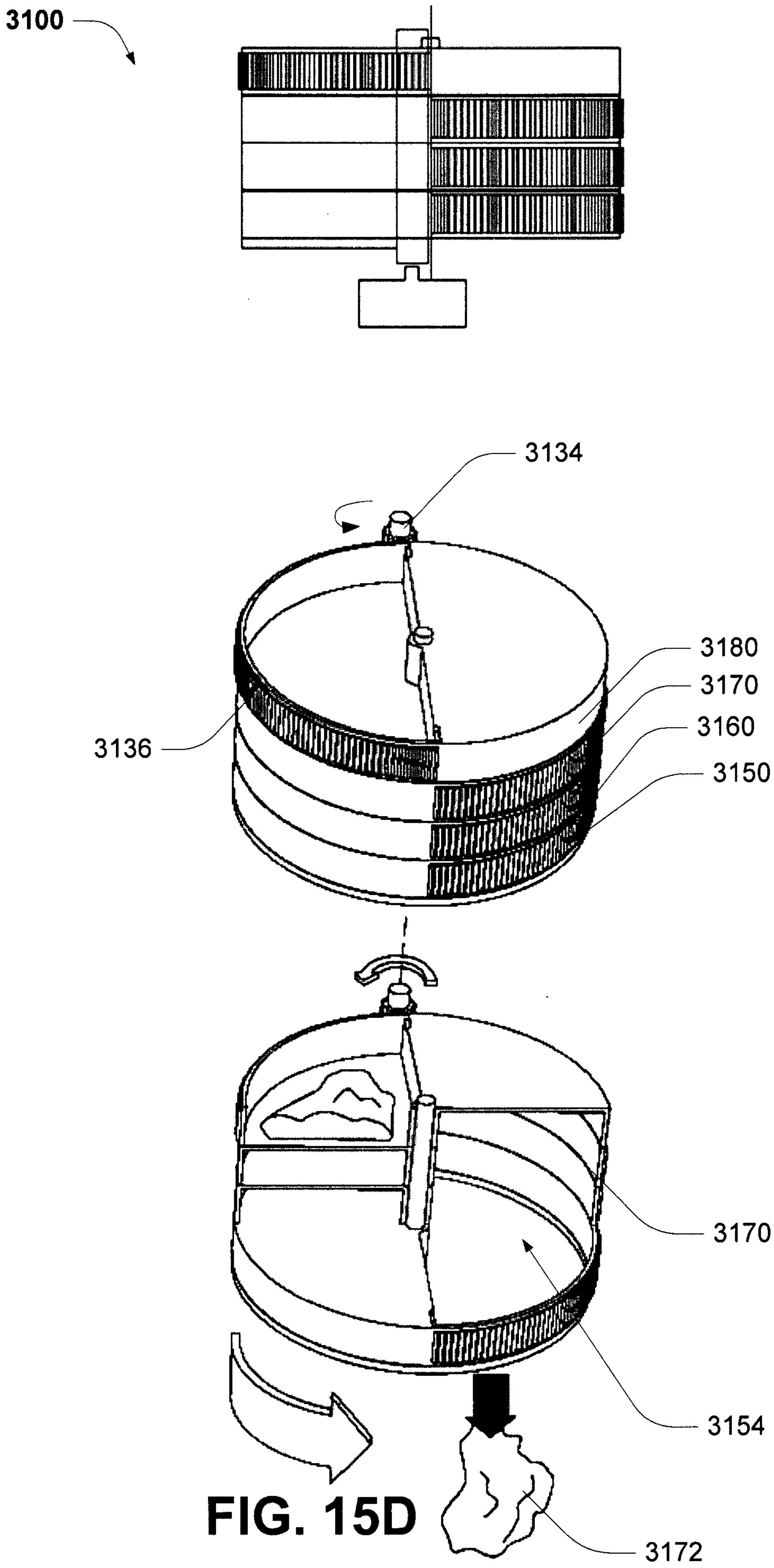
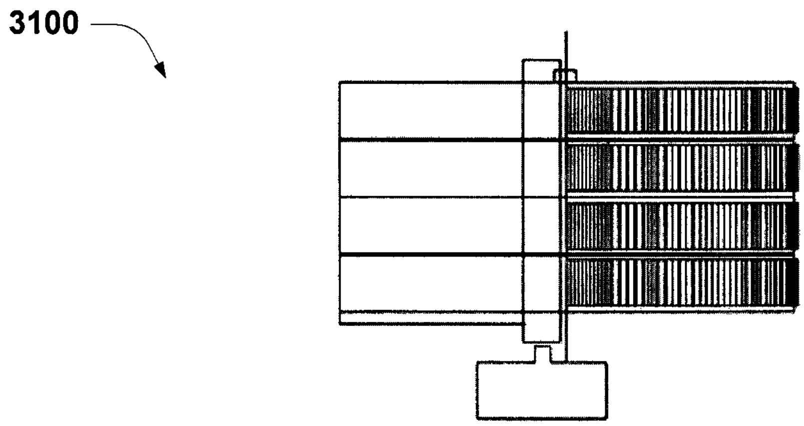


FIG. 15D



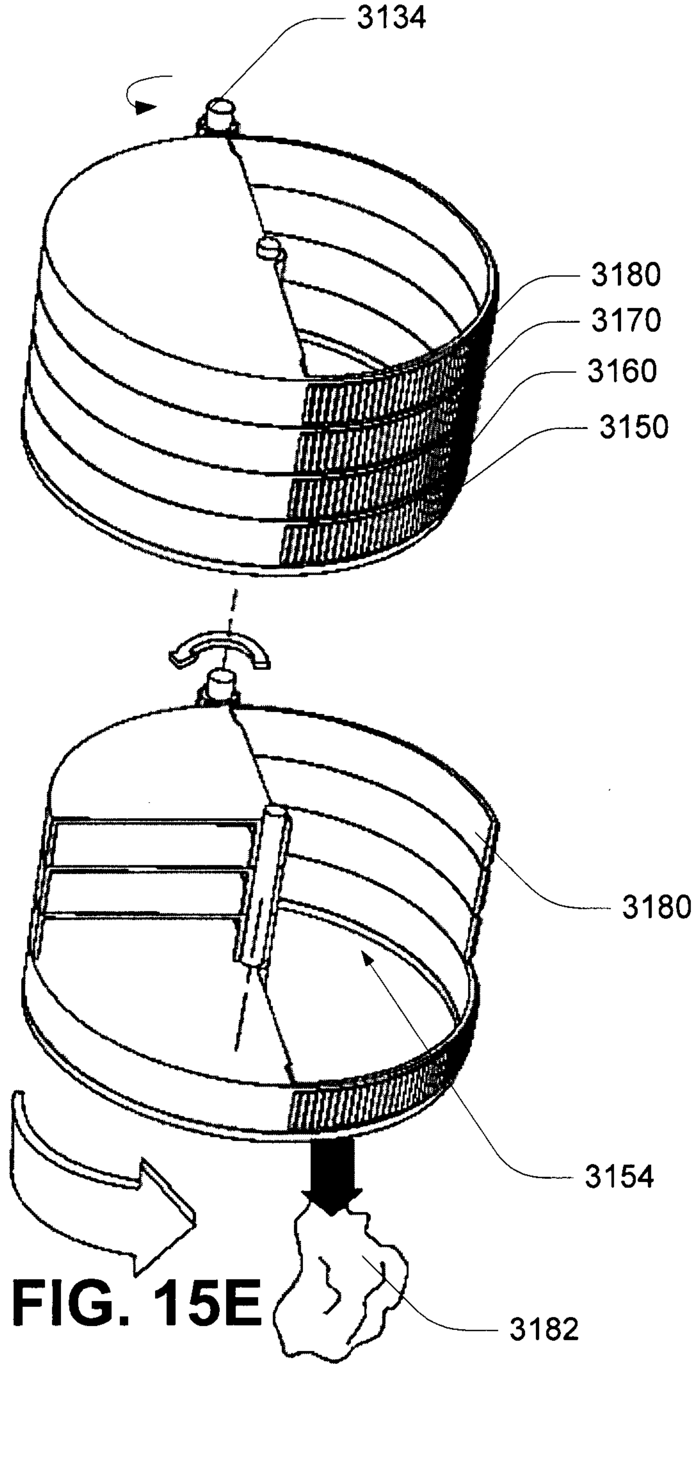


FIG. 15E

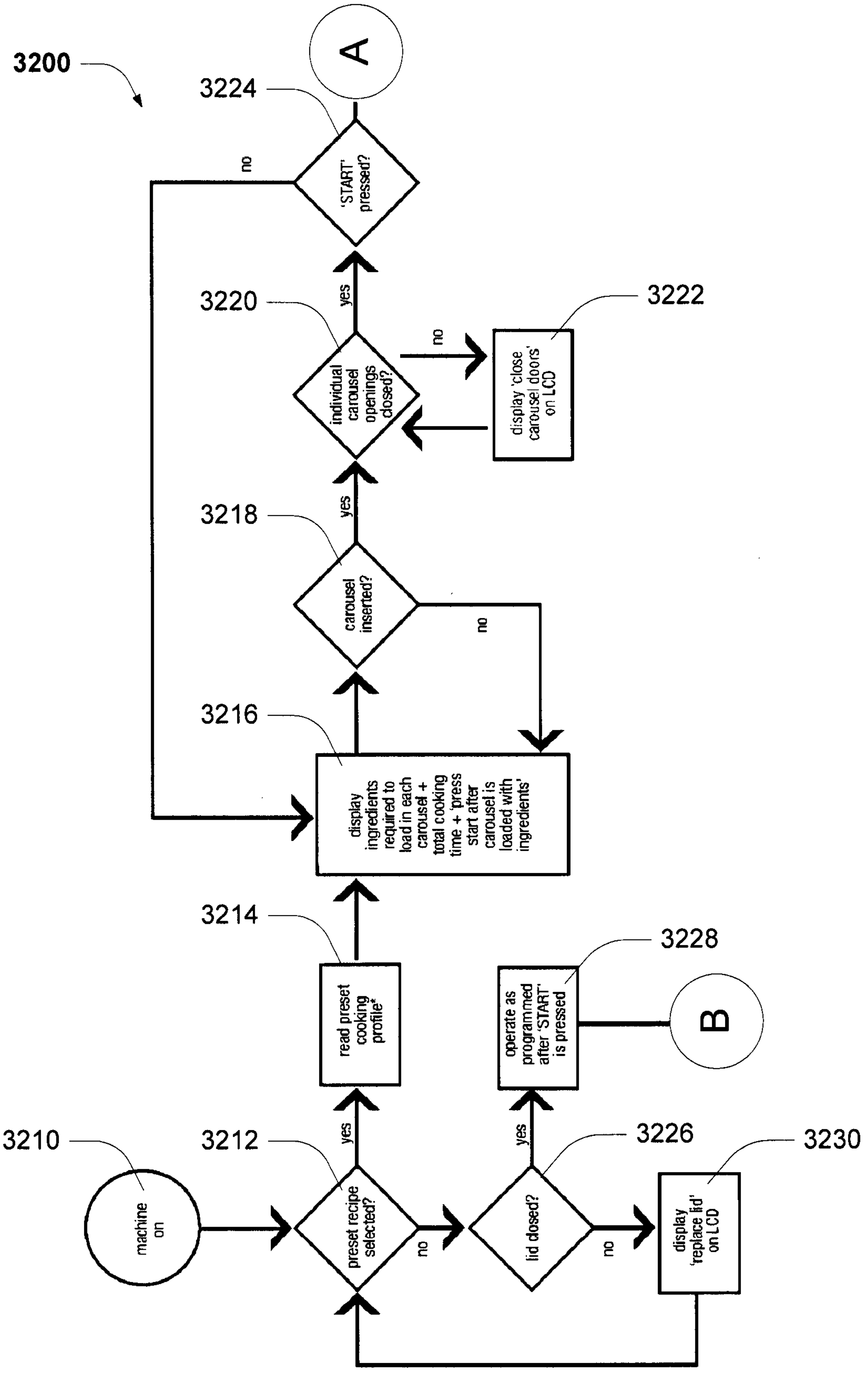

3200
3210
machine on
3212
preset recipe selected?
yes
no
3214
read preset cooking profile
3216
display ingredients required to load in each carousel + total cooking time + 'press start after carousel is loaded with ingredients'
3218
carousel inserted?
yes
no
3220
individual carousel openings closed?
yes
no
3222
display 'close carousel doors' on LCD
3224
'START' pressed?
no
A
3226
lid closed?
yes
no
3228
operate as programmed after 'START' is pressed
B
3230
display 'replace lid' on LCD

FIG. 16A

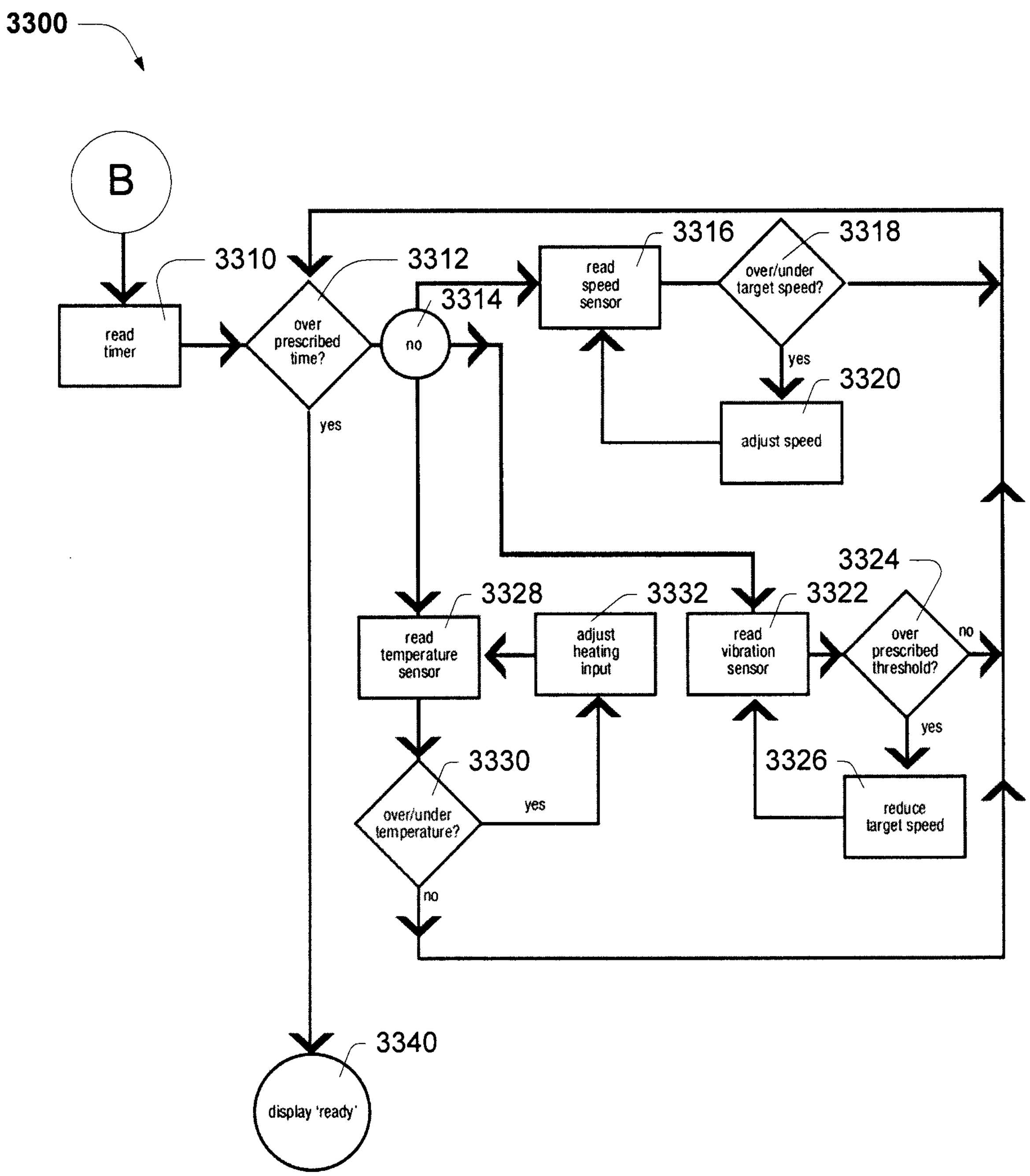

3300
B
3310
read timer
3312
over prescribed time?
yes
3314
no
3316
read speed sensor
3318
over/under target speed?
yes
3320
adjust speed
3324
3322
read vibration sensor
over prescribed threshold?
no
yes
3326
reduce target speed
3328
read temperature sensor
3332
adjust heating input
3330
over/under temperature?
yes
no
3340
display 'ready'

FIG. 16B

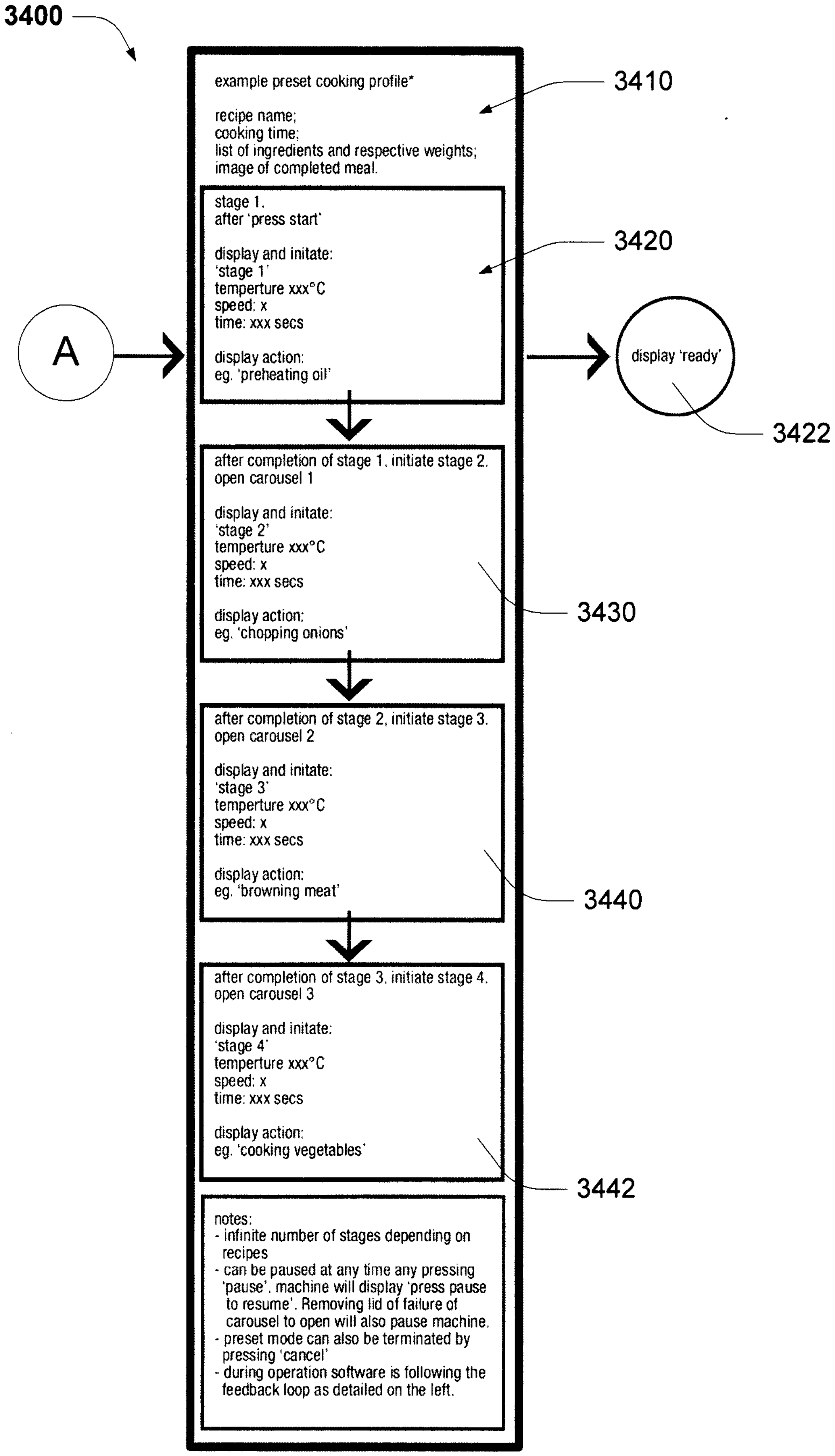

3400
example preset cooking profile*
recipe name;
cooking time;
list of ingredients and respective weights;
image of completed meal.
3410
stage 1.
after 'press start'
display and initate:
'stage 1'
temperture xxx°C
speed: x
time: xxx secs
display action:
eg. 'preheating oil'
3420
A
display 'ready'
3422
after completion of stage 1, initiate stage 2.
open carousel 1
display and initate:
'stage 2'
temperture xxx°C
speed: x
time: xxx secs
display action:
eg. 'chopping onions'
3430
after completion of stage 2, initiate stage 3.
open carousel 2
display and initate:
'stage 3'
temperture xxx°C
speed: x
time: xxx secs
display action:
eg. 'browning meat'
3440
after completion of stage 3, initiate stage 4.
open carousel 3
display and initate:
'stage 4'
temperture xxx°C
speed: x
time: xxx secs
display action:
eg. 'cooking vegetables'
3442
notes:
- infinite number of stages depending on recipes
- can be paused at any time any pressing 'pause', machine will display 'press pause to resume'. Removing lid of failure of carousel to open will also pause machine.
- preset mode can also be terminated by pressing 'cancel'
- during operation software is following the feedback loop as detailed on the left.

FIG. 16C

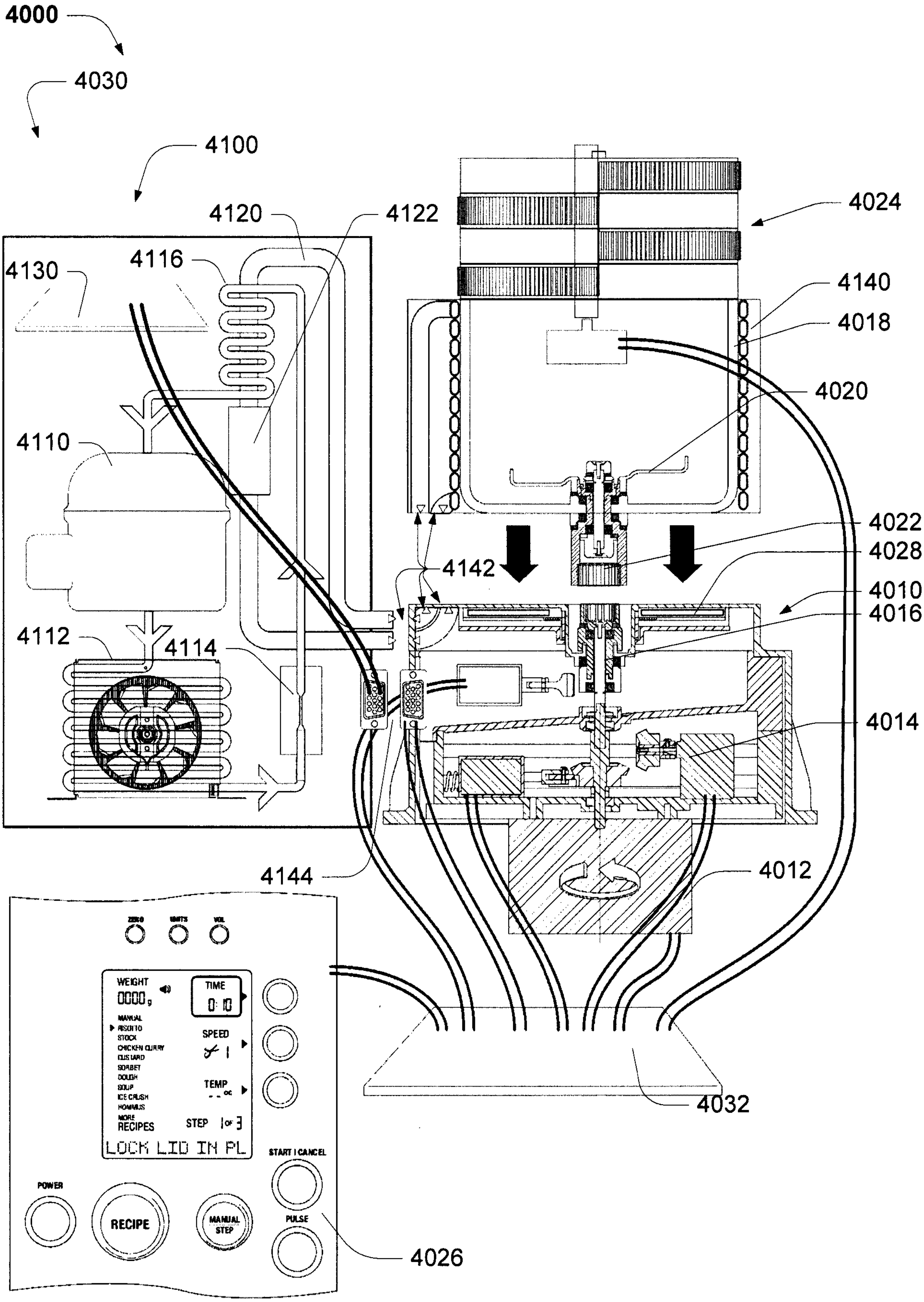

4000
4030
4100
4120
4122
4116
4130
4024
4140
4018
4020
4110
4022
4028
4142
4010
4016
4112
4114
4014
4144
4012
ZERO
UNITS
VOL
WEIGHT
0000 g
TIME
0:10
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE RECIPES
SPEED
TEMP
STEP
LOCK LID IN PL
START | CANCEL
PULSE
POWER
RECIPE
MANUAL STEP
4032
4026

FIG. 17A

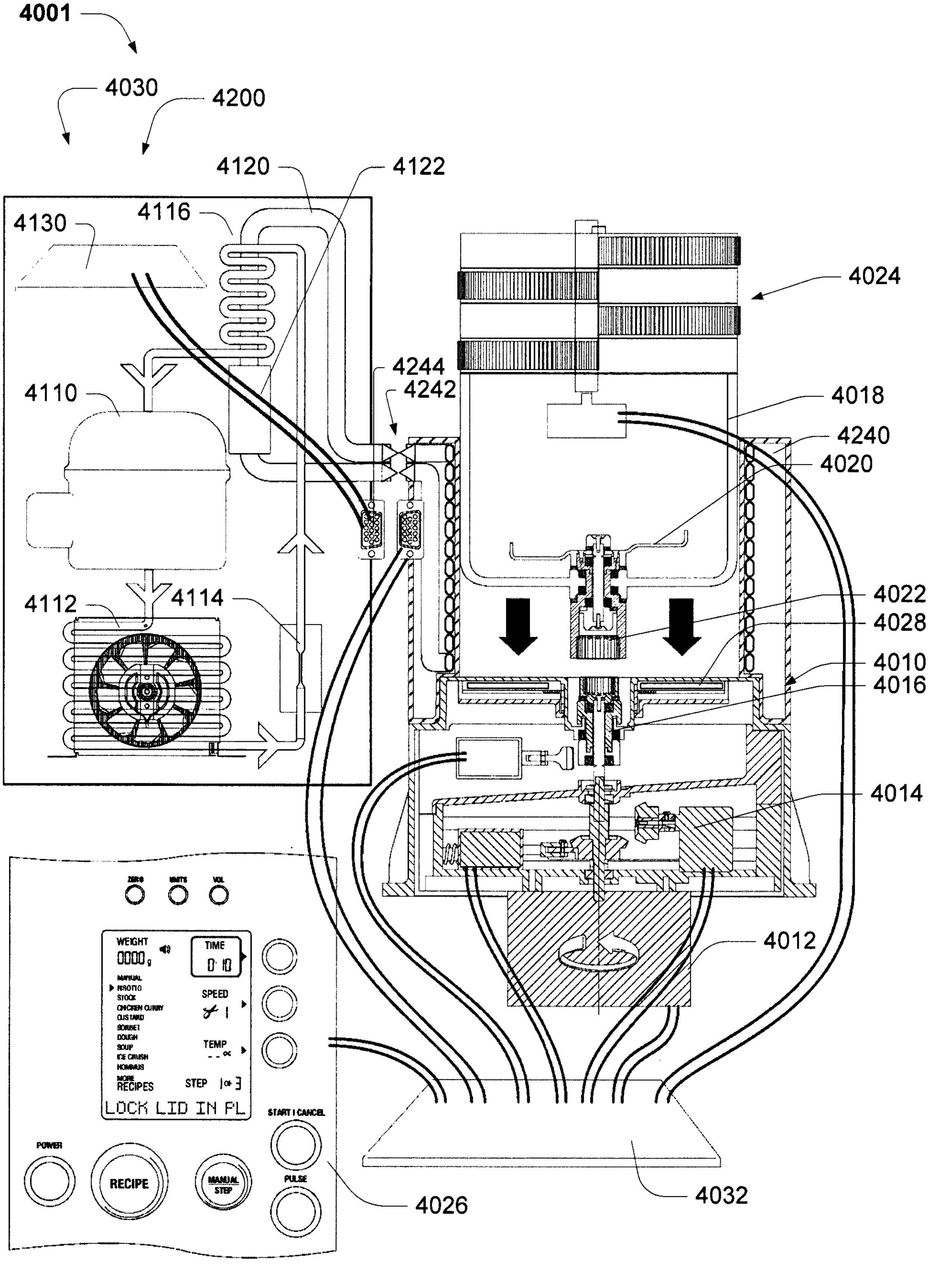

4001
4030
4200
4120
4122
4116
4130
4024
4244
4242
4110
4018
4240
4020
4112
4114
4022
4028
4010
4016
4014
ZERO
UNITS
VOL
WEIGHT
0000 g
TIME
0:10
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE RECIPES
SPEED
TEMP
STEP
LOCK LID IN PL
4012
START | CANCEL
POWER
RECIPE
MANUAL STEP
PULSE
4026
4032

FIG. 17B

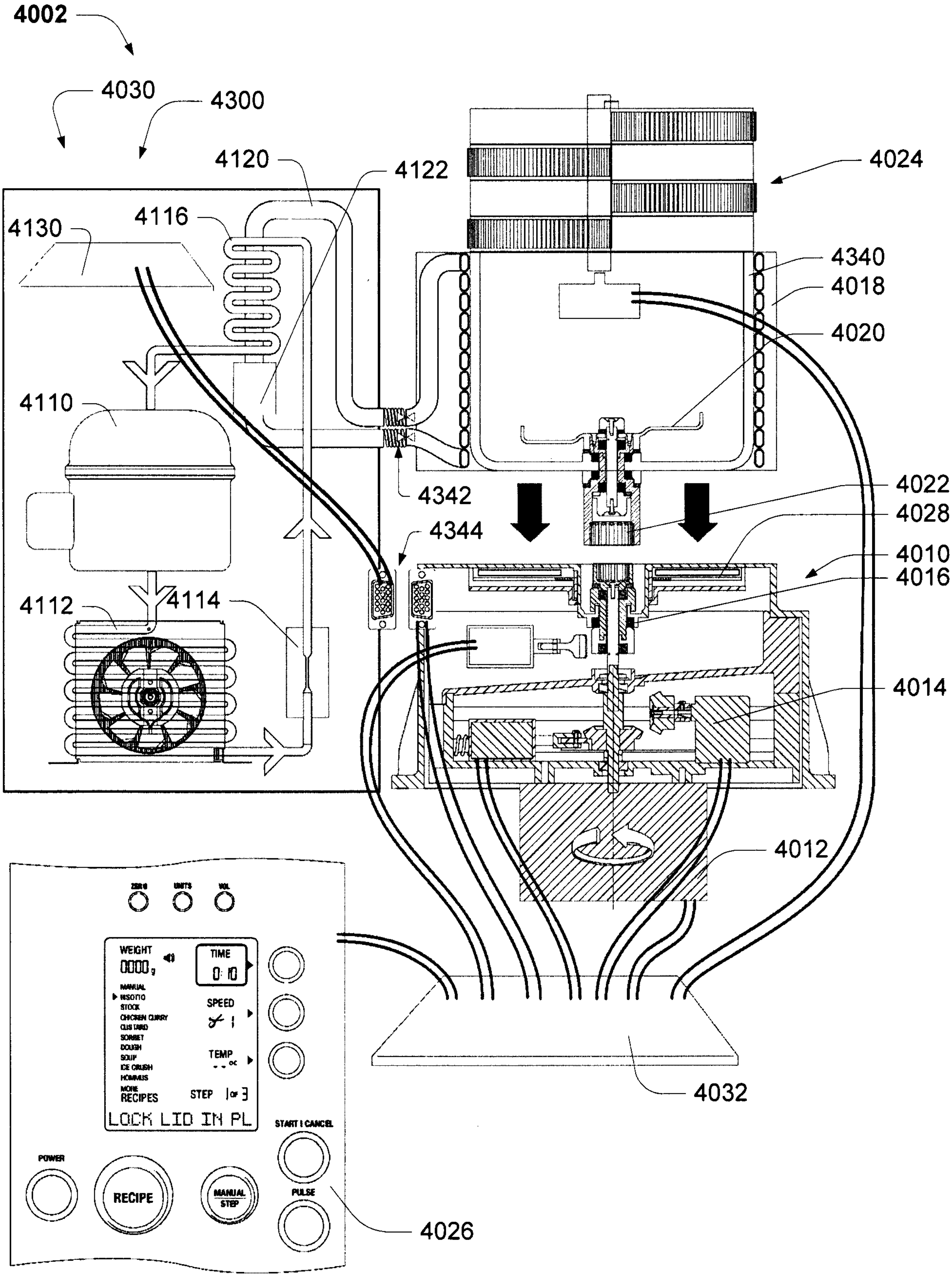

4002
4030
4300
4120
4122
4024
4116
4130
4340
4018
4020
4110
4342
4022
4028
4344
4010
4016
4112
4114
4014
4012
ZERO
UNITS
VOL
WEIGHT
0000 g
TIME
0:10
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE RECIPES
SPEED
TEMP
STEP 1 OF 3
LOCK LID IN PL
START | CANCEL
POWER
RECIPE
MANUAL STEP
PULSE
4032
4026

FIG. 17C

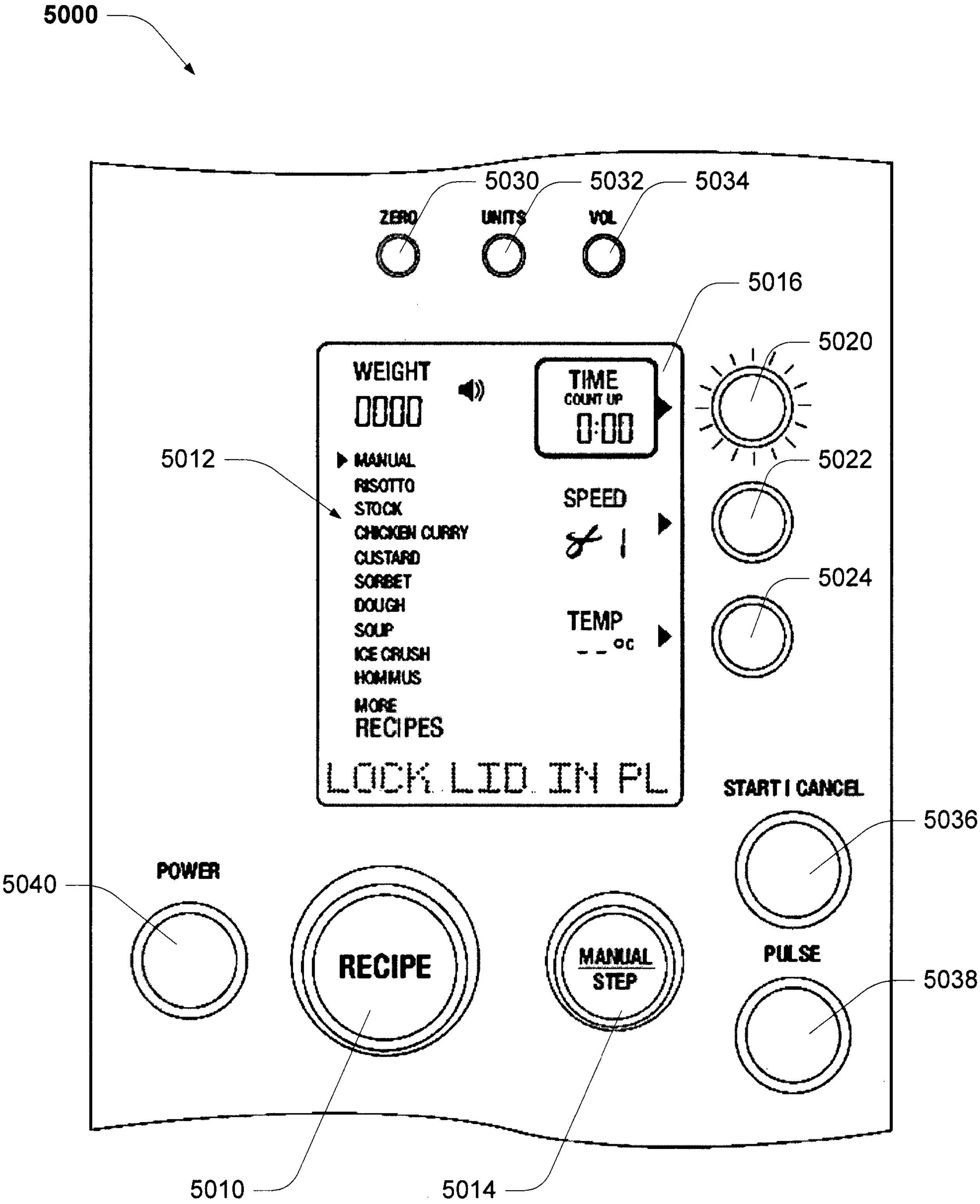

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
COUNT UP
0:00
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
TEMP
- - °C
5022
5024
LOCK LID IN PL
START I CANCEL
5036
POWER
5040
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18A

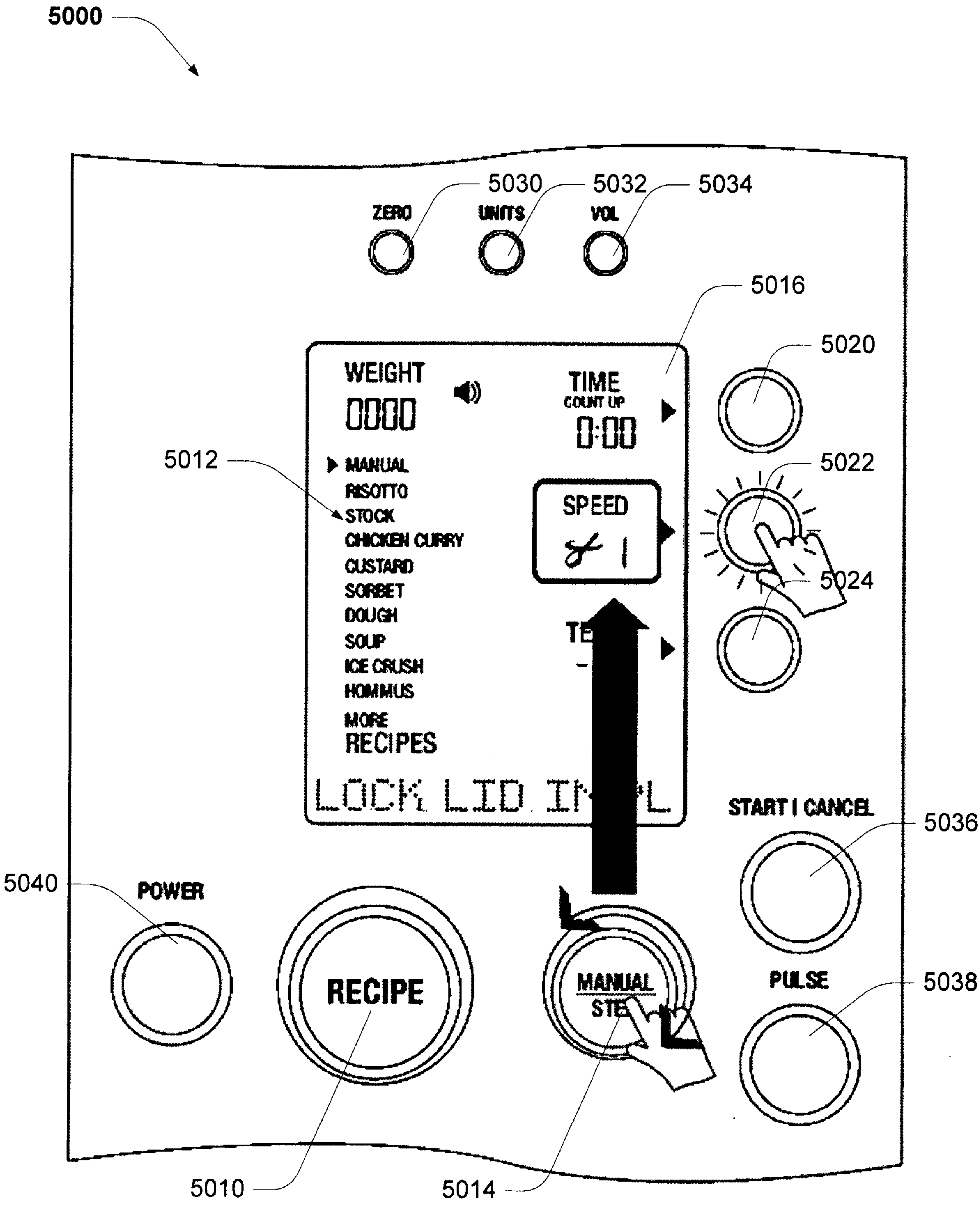

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
COUNT UP
0:00
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
5022
5024
LOCK LID I
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
PULSE
5038
5010
5014

FIG. 18B

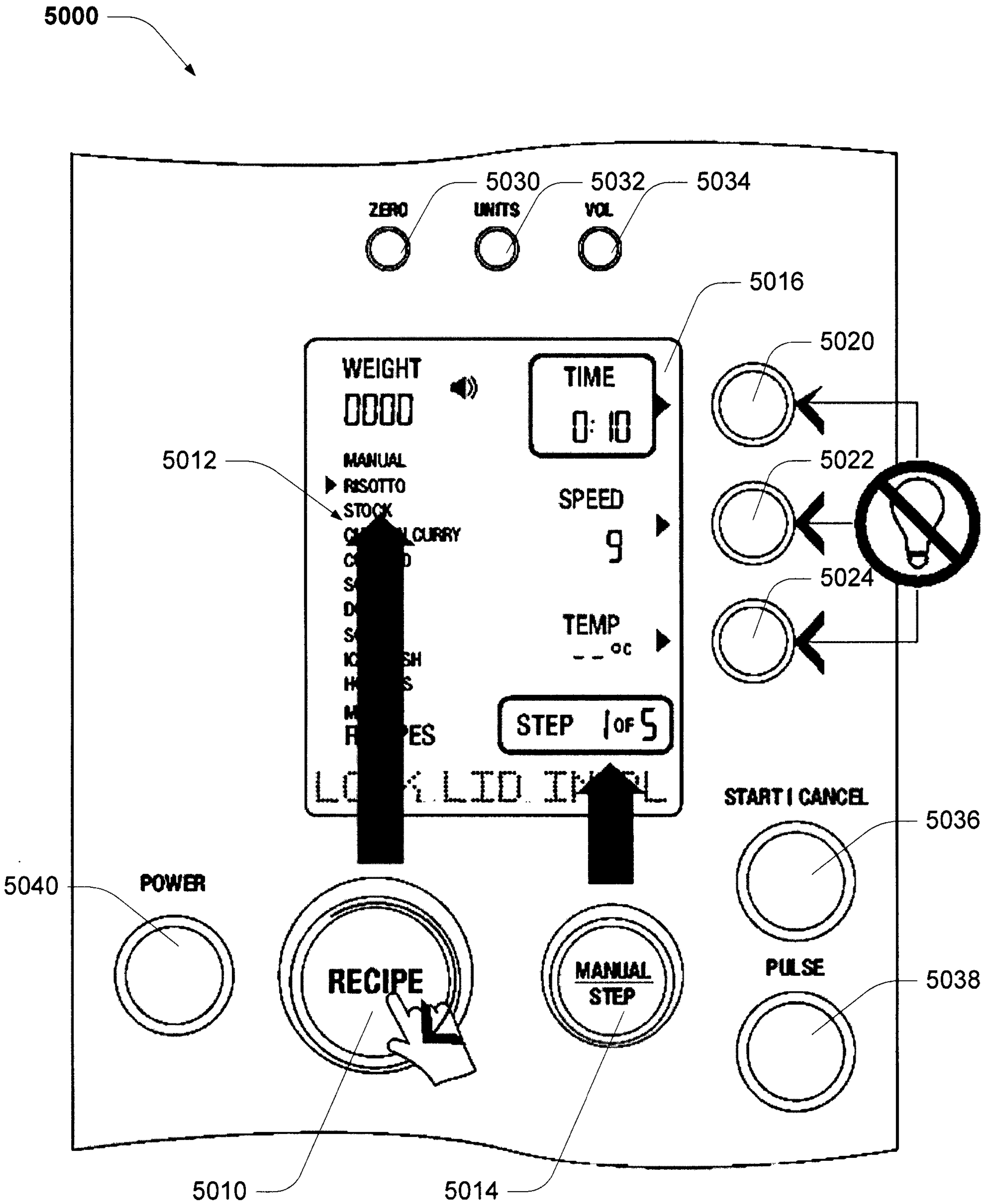

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
0:10
5022
5012
MANUAL
RISOTTO
STOCK
SPEED
9
5024
TEMP
-- °C
STEP 1 OF 5
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18C

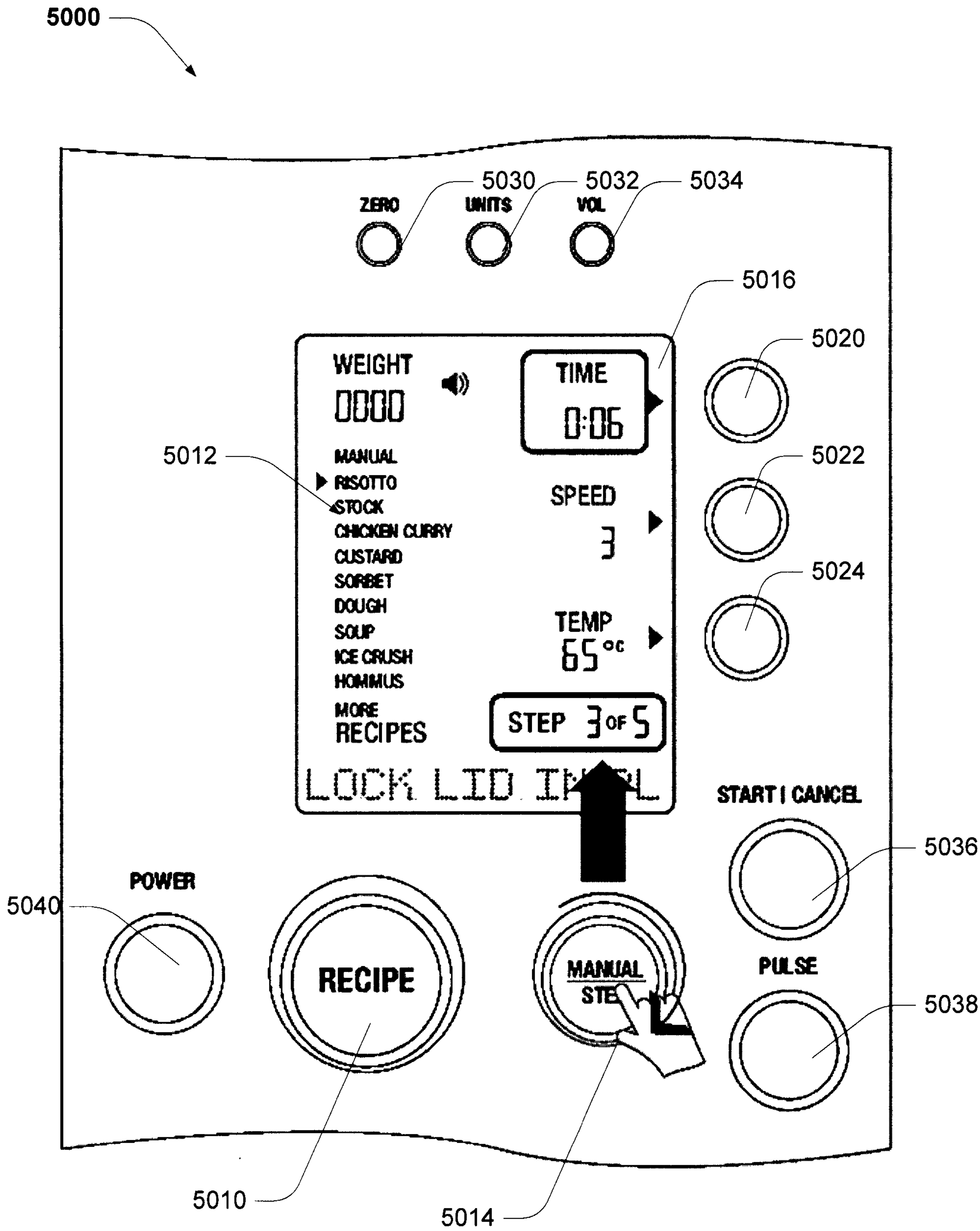

5000
ZERO
UNITS
VOL
5030
5032
5034
5016
5020
5022
5024
WEIGHT
0000
TIME
0:06
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
3
TEMP
65°C
STEP 3 OF 5
LOCK LID
START | CANCEL
5036
POWER
5040
RECIPE
MANUAL
PULSE
5038
5010
5014

FIG. 18D

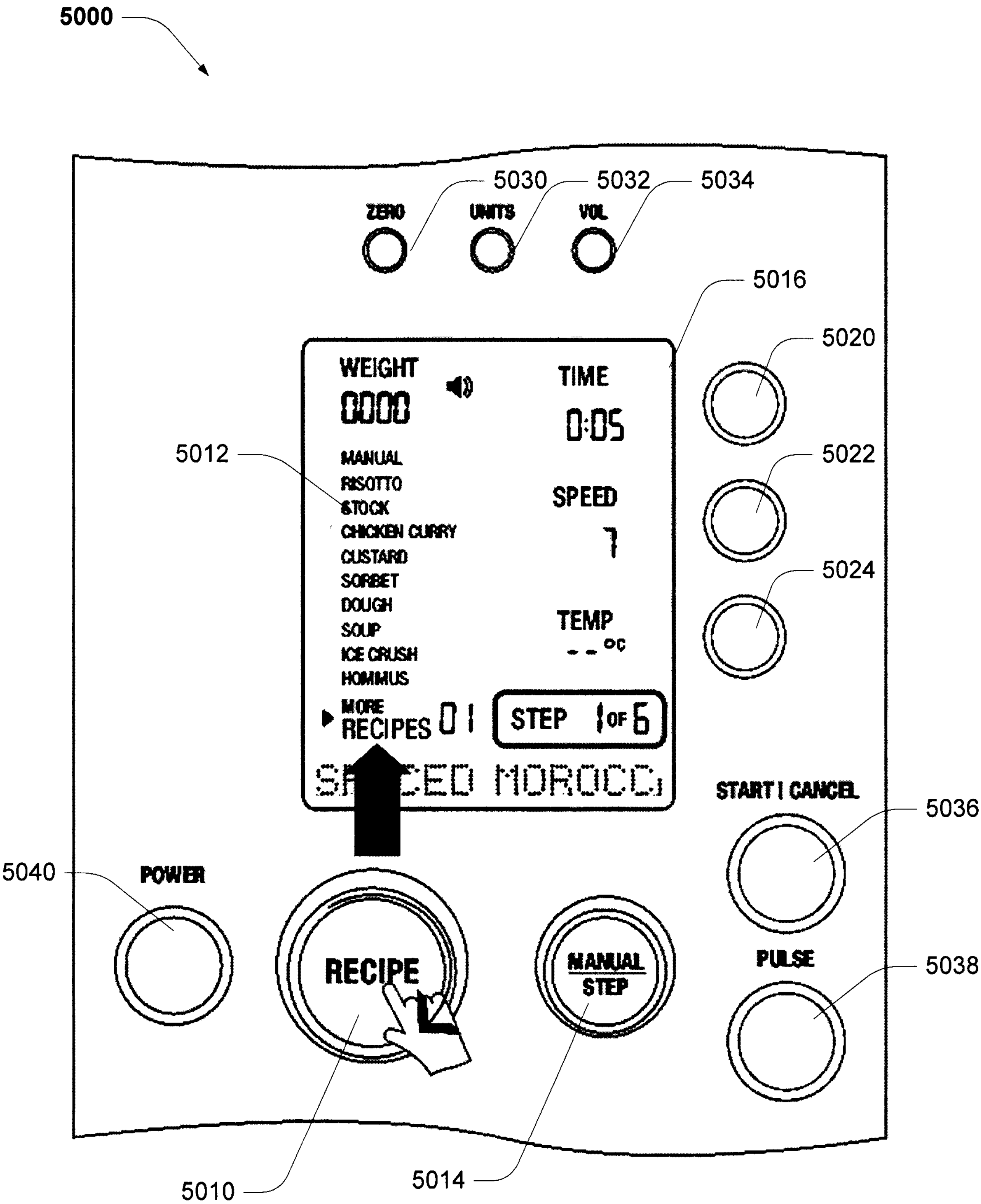

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
0:05
5022
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
01
SPEED
7
5024
TEMP
-- °C
STEP 1 OF 6
START | CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18E

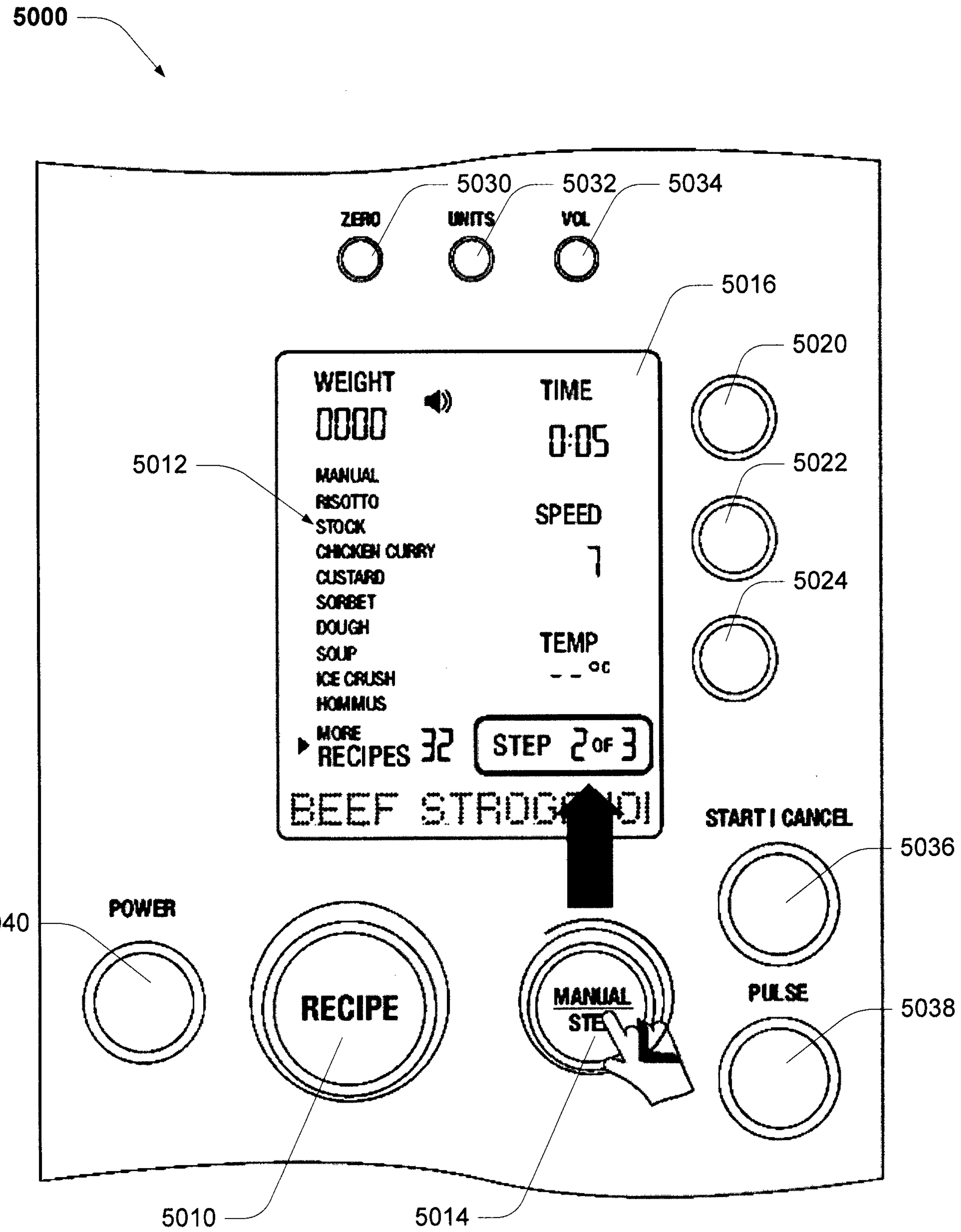

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
0:05
5022
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
SPEED
7
5024
TEMP
- - °C
MORE
RECIPES 32
STEP 2 OF 3
BEEF STROG
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STE
PULSE
5038
5010
5014

FIG. 18F

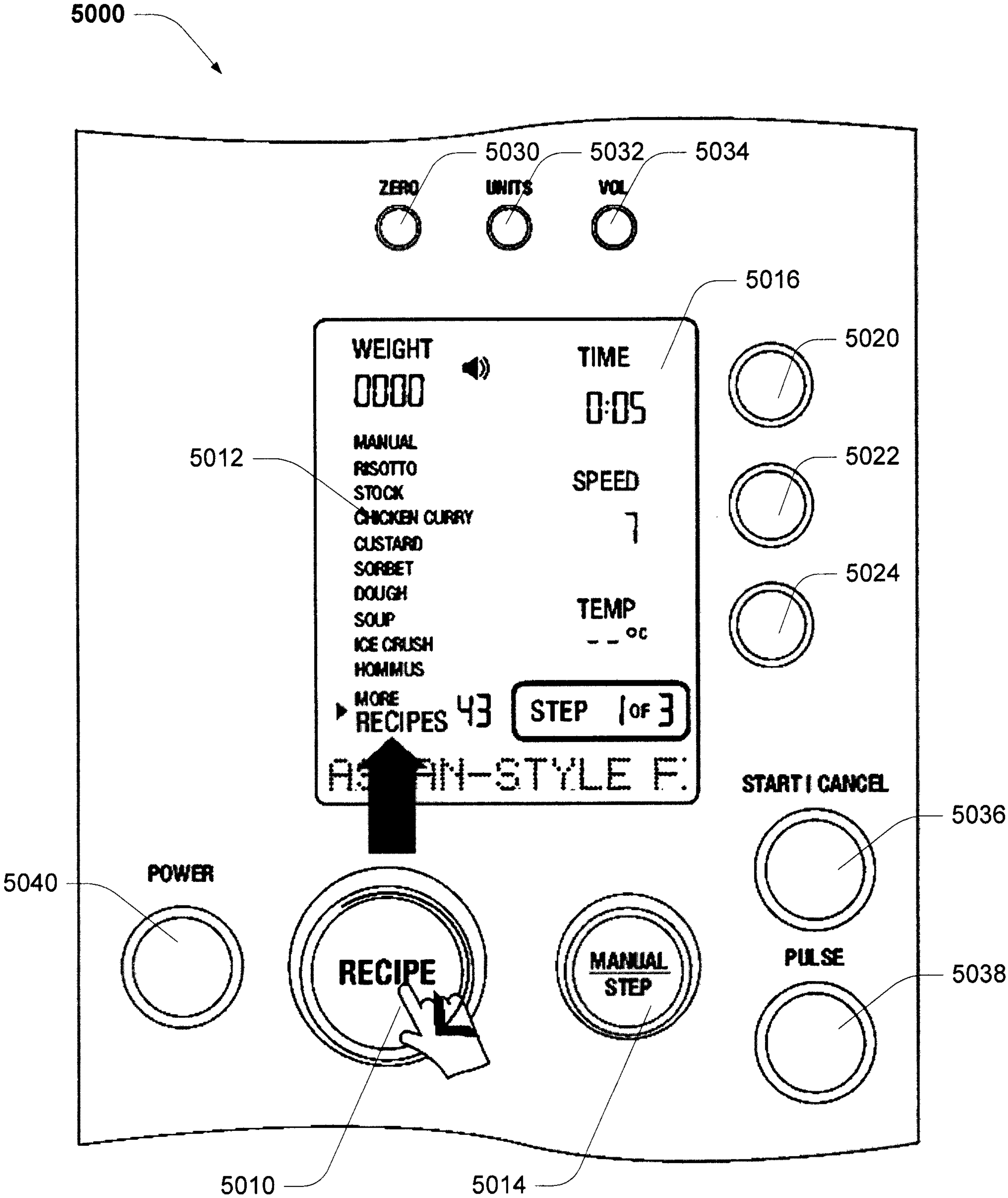

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
WEIGHT
TIME
0000
0:05
5020
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
SPEED
7
5022
TEMP
-- °C
5024
MORE
RECIPES 43
STEP 1 OF 3
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18G

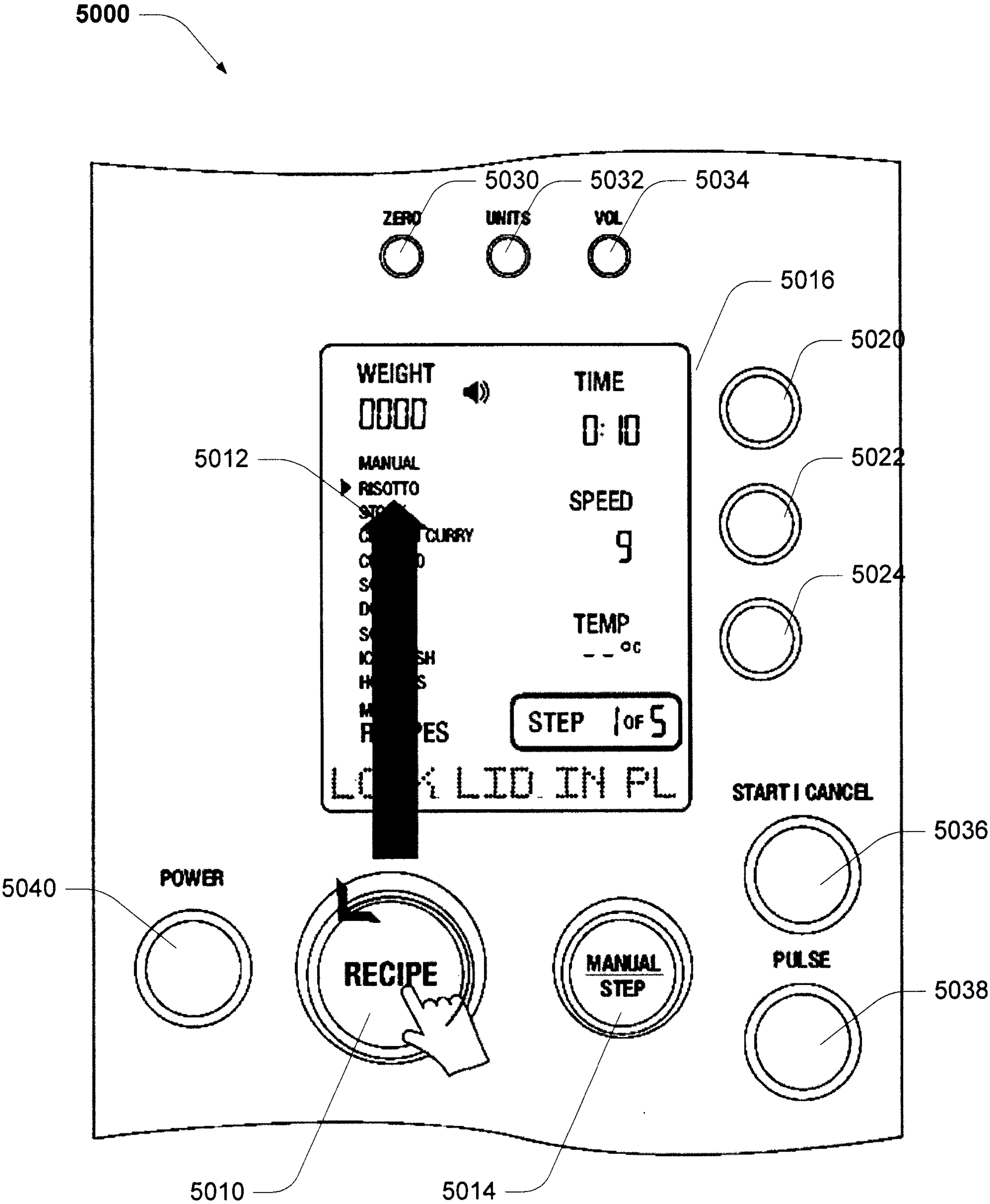

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
5022
5024
WEIGHT
0000
TIME
0:10
5012
MANUAL
RISOTTO
CURRY
SPEED
9
TEMP
-- °C
STEP 1 OF 5
LOCK LID IN PL
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18H

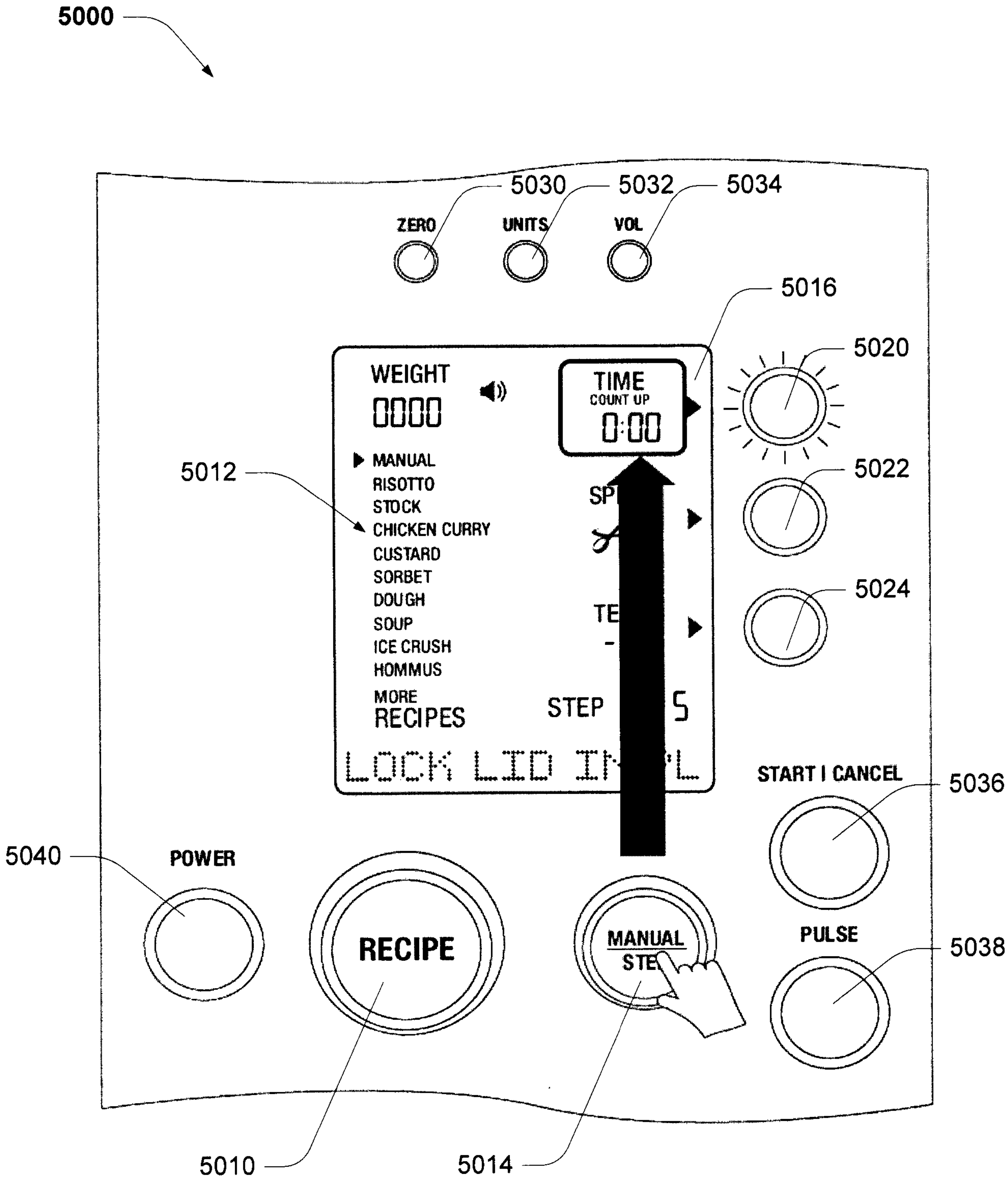

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
COUNT UP
0:00
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SP
TE
STEP
5
5022
5024
LOCK LID IN
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STE
PULSE
5038
5010
5014

FIG. 18I

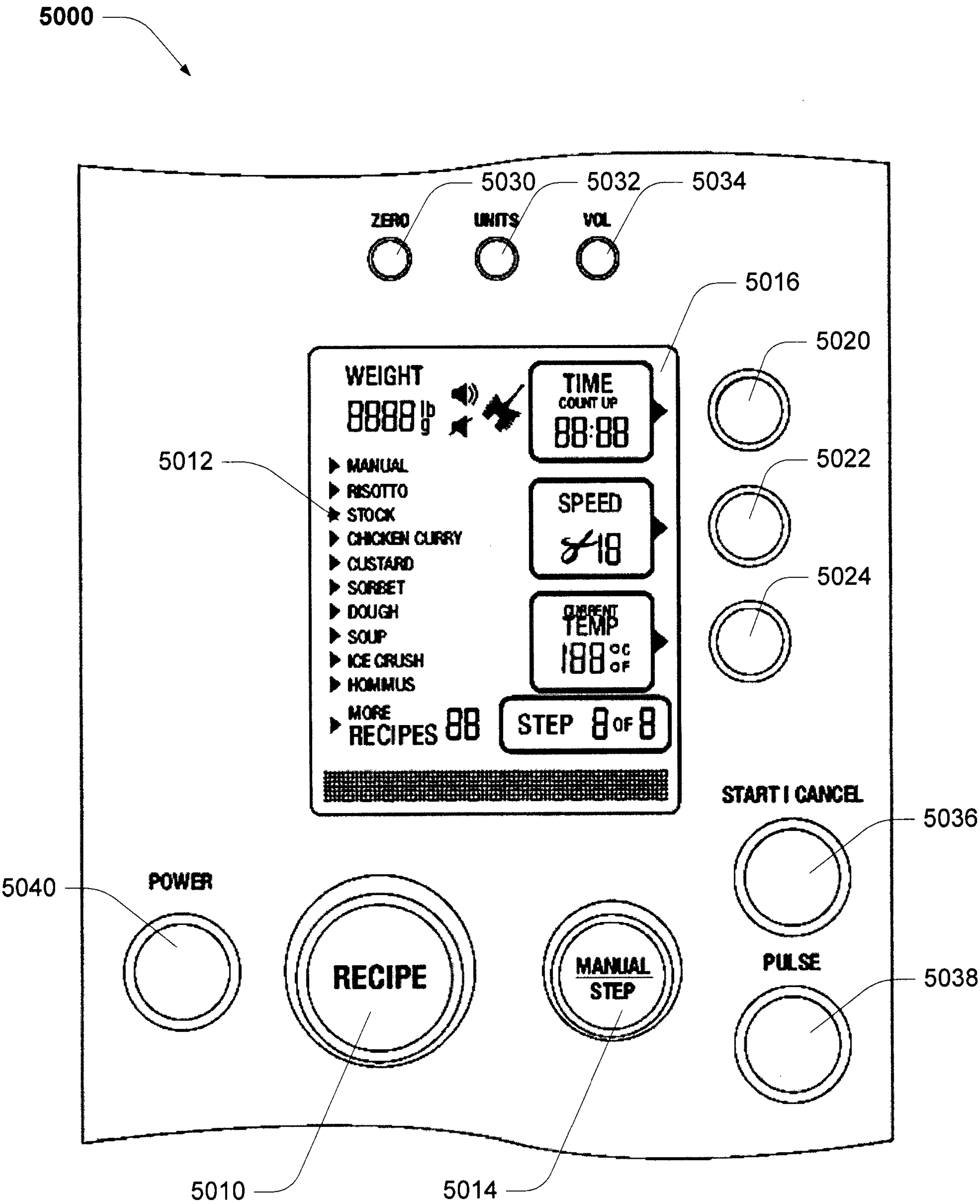

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
5022
5024
WEIGHT
8888 lb g
TIME
COUNT UP
88:88
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE RECIPES 88
SPEED
18
CURRENT TEMP
188 °C °F
STEP 8 OF 8
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18J

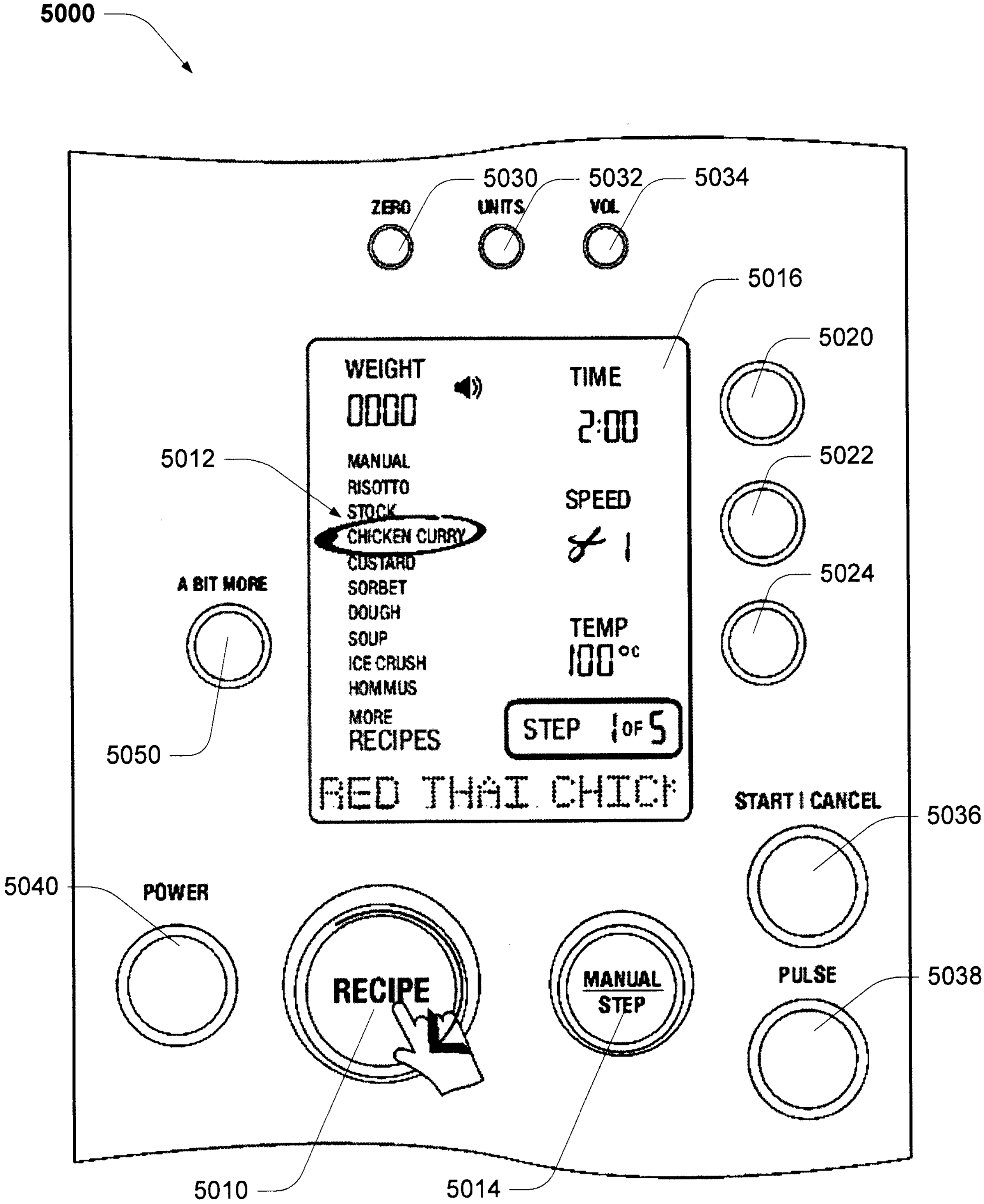

5000
ZERO
UNITS
VOL
5030
5032
5034
5016
5020
5022
5024
WEIGHT
0000
TIME
2:00
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
TEMP
100°C
STEP 1 OF 5
RED THAI CHICK
A BIT MORE
5050
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18K

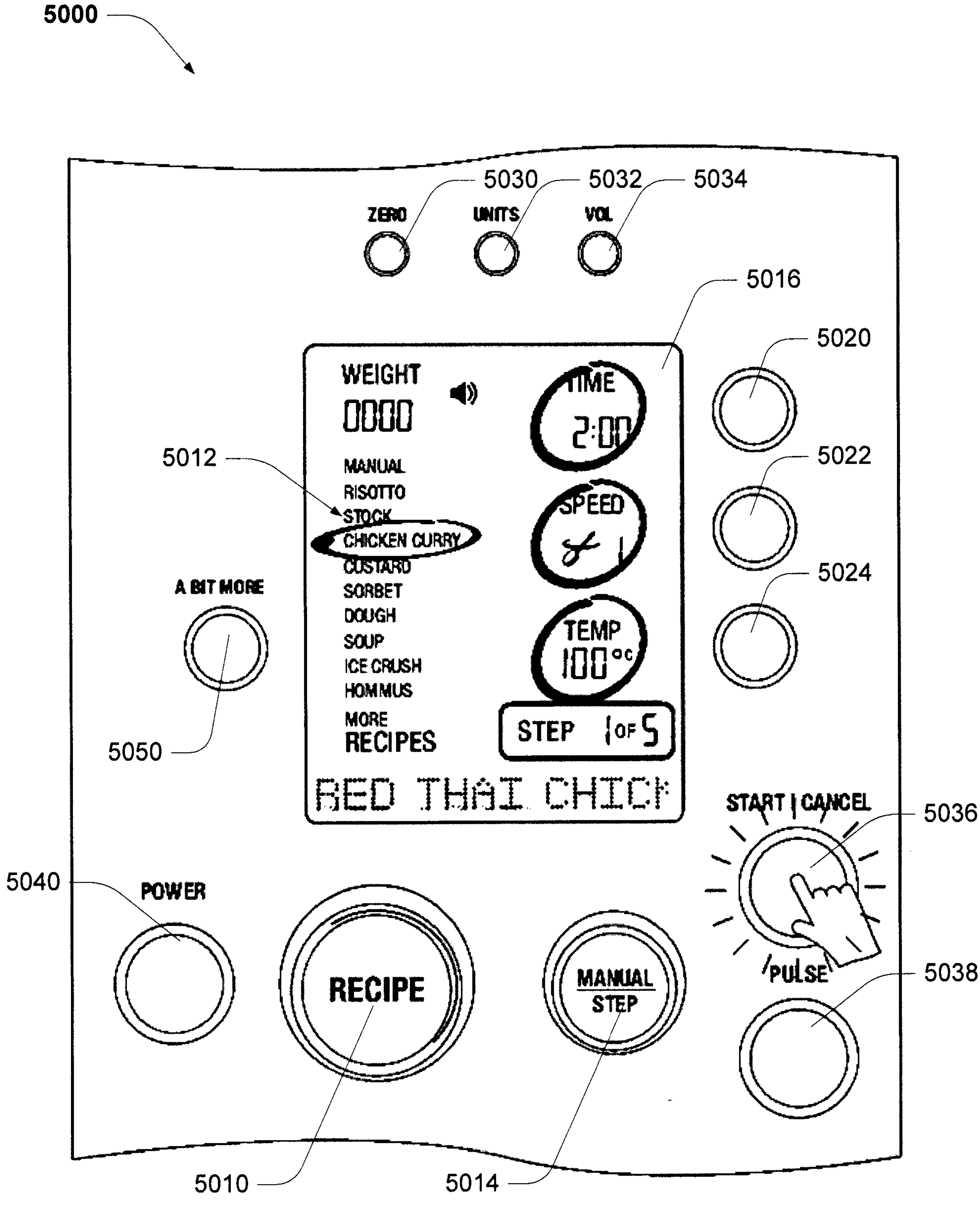

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
2:00
5022
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
TEMP
100°C
STEP 1 OF 5
5024
A BIT MORE
5050
RED THAI CHICK
START | CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18L

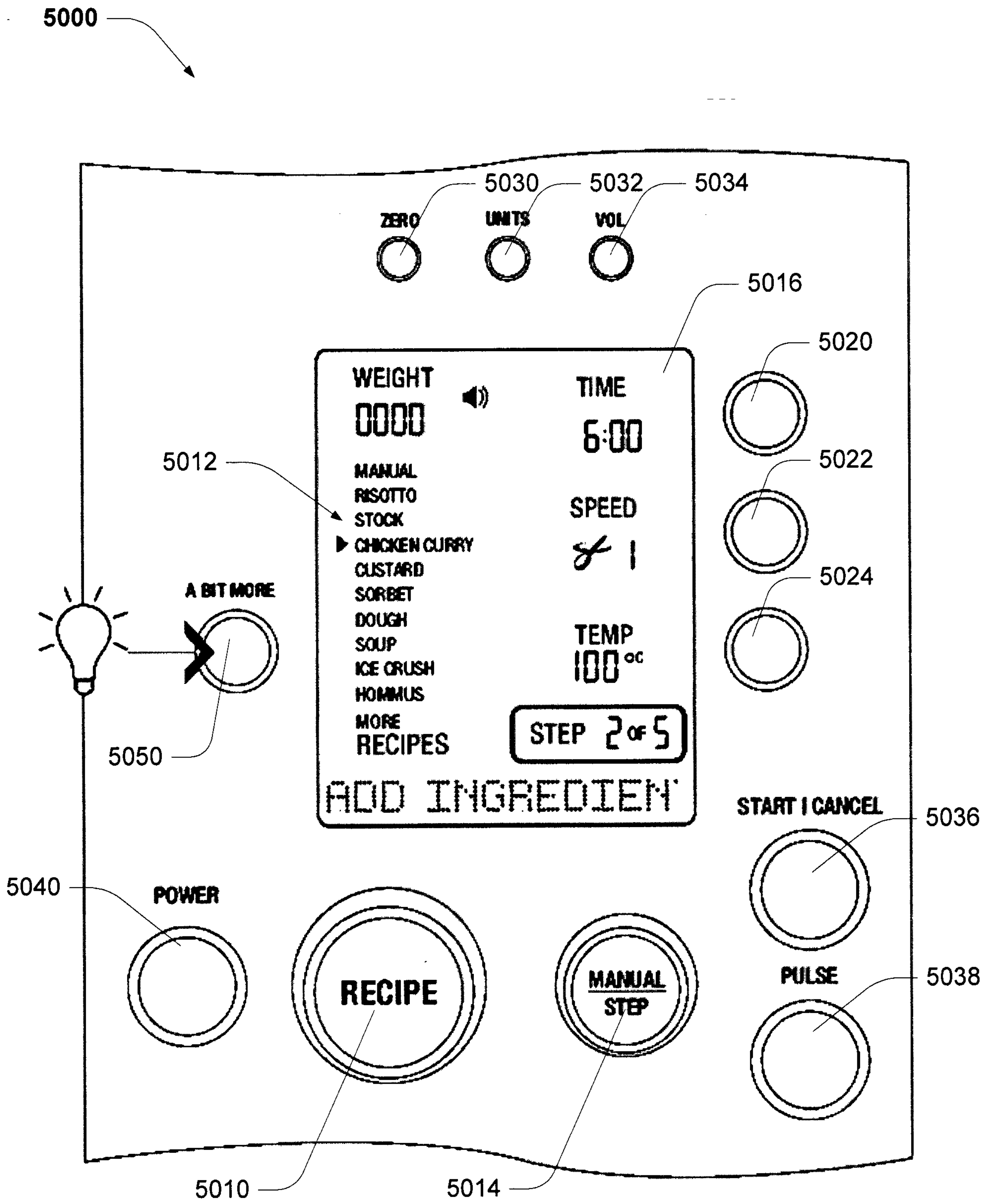

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
WEIGHT
0000
TIME
6:00
5022
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE RECIPES
SPEED
1
5024
A BIT MORE
TEMP
100 °C
STEP 2 OF 5
5050
ADD INGREDIEN
START I CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18M

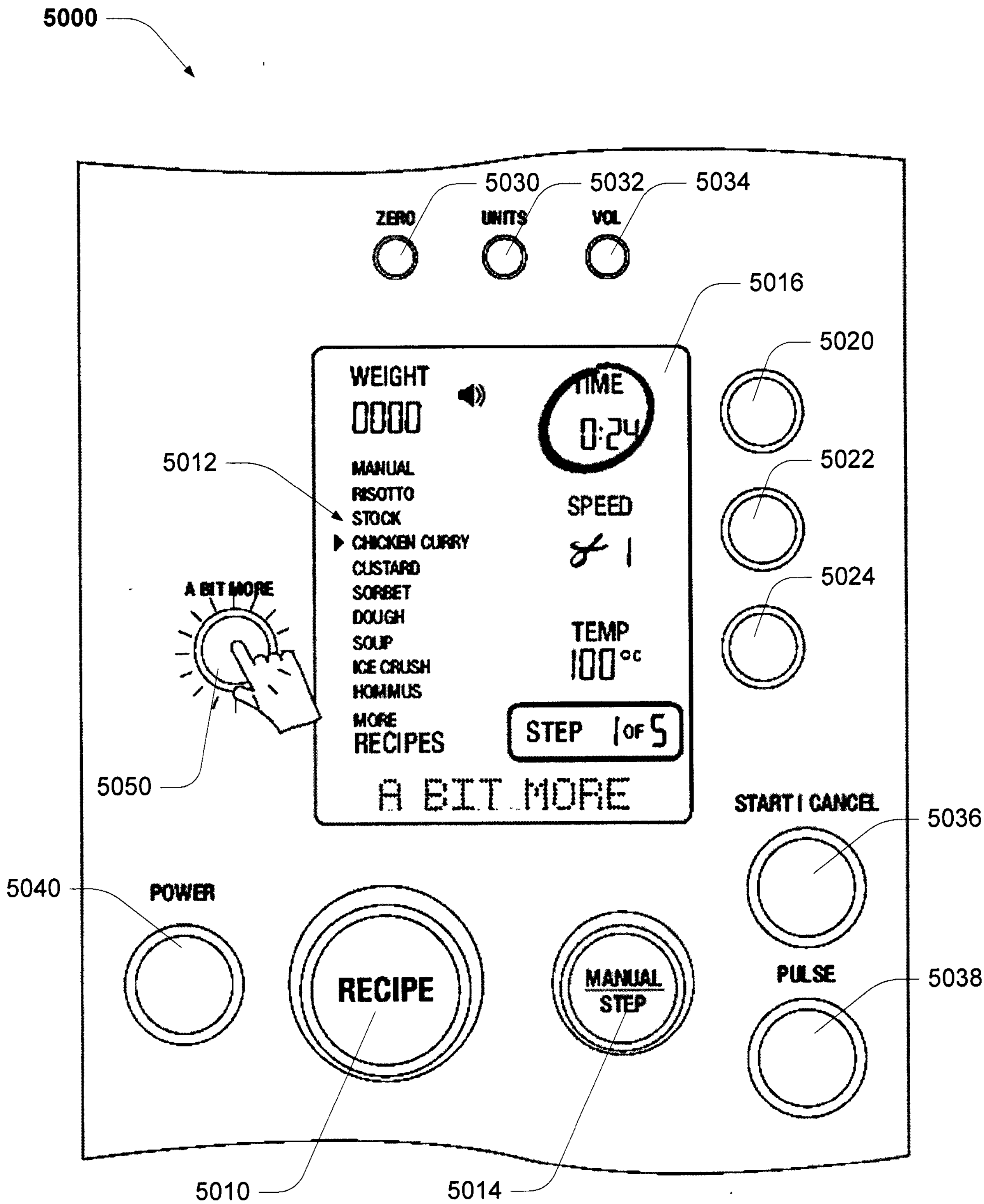

5000
5030
5032
5034
ZERO
UNITS
VOL
5016
5020
5022
5024
WEIGHT
0000
TIME
0:24
5012
MANUAL
RISOTTO
STOCK
CHICKEN CURRY
CUSTARD
SORBET
DOUGH
SOUP
ICE CRUSH
HOMMUS
MORE
RECIPES
SPEED
1
TEMP
100°C
A BIT MORE
STEP 1 OF 5
A BIT MORE
5050
START / CANCEL
5036
5040
POWER
RECIPE
MANUAL
STEP
PULSE
5038
5010
5014

FIG. 18N

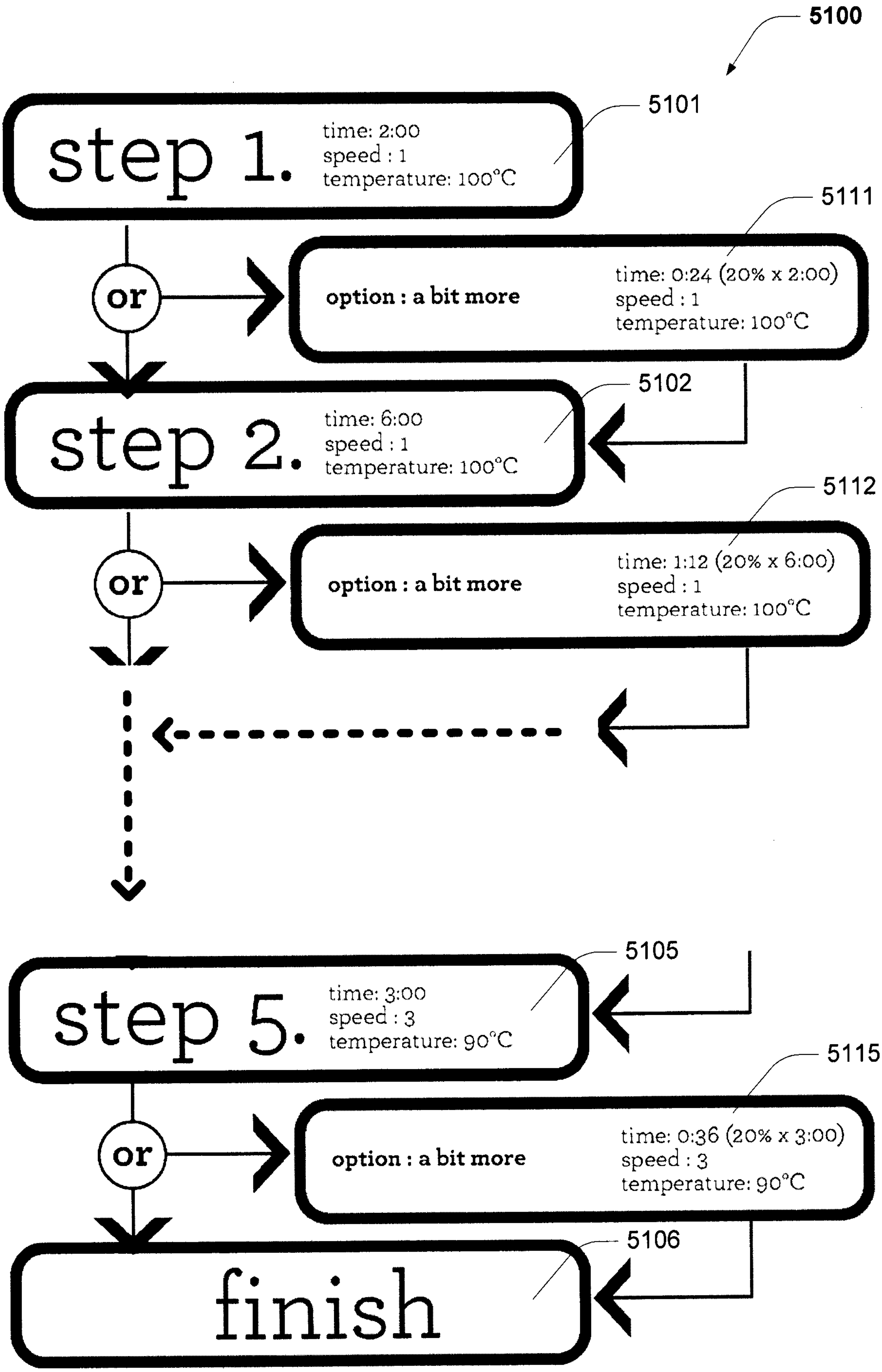

5100
5101
step 1.
time: 2:00
speed : 1
temperature: 100°C
5111
or
option : a bit more
time: 0:24 (20% x 2:00)
speed : 1
temperature: 100°C
5102
step 2.
time: 6:00
speed : 1
temperature: 100°C
5112
or
option : a bit more
time: 1:12 (20% x 6:00)
speed : 1
temperature: 100°C
5105
step 5.
time: 3:00
speed : 3
temperature: 90°C
5115
or
option : a bit more
time: 0:36 (20% x 3:00)
speed : 3
temperature: 90°C
5106
finish

FIG. 19

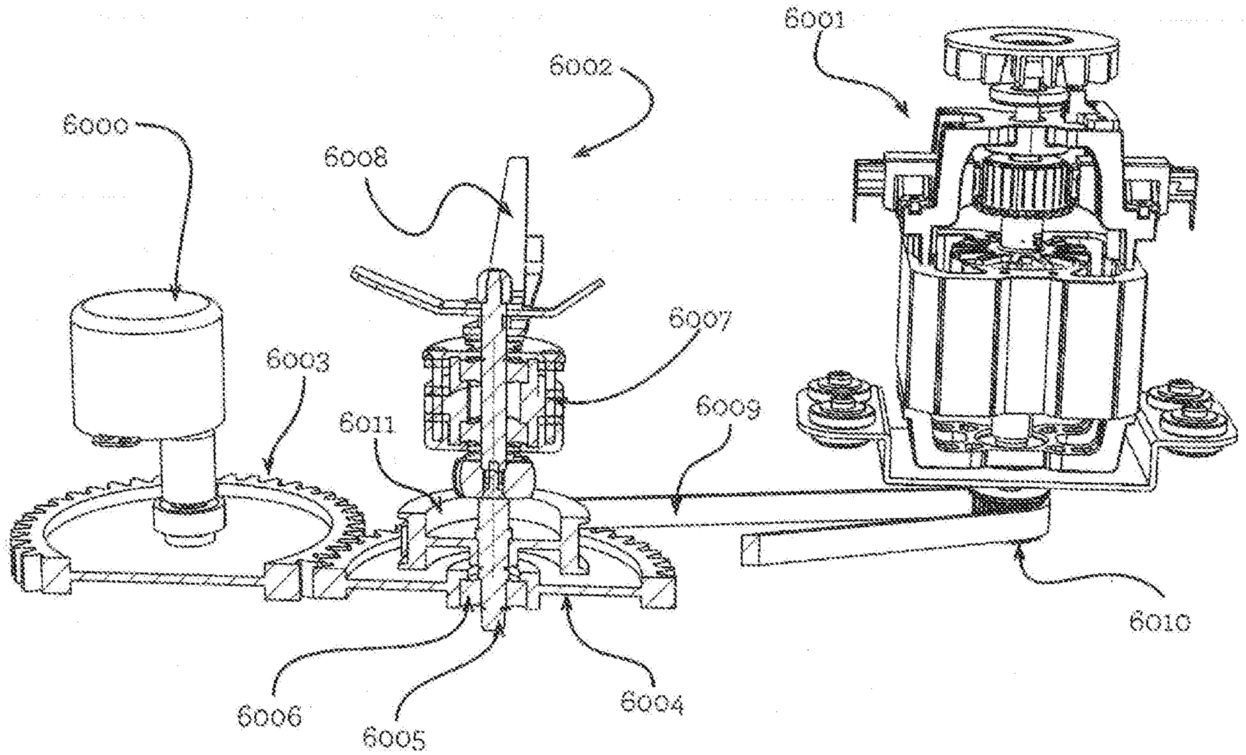


Fig. 20

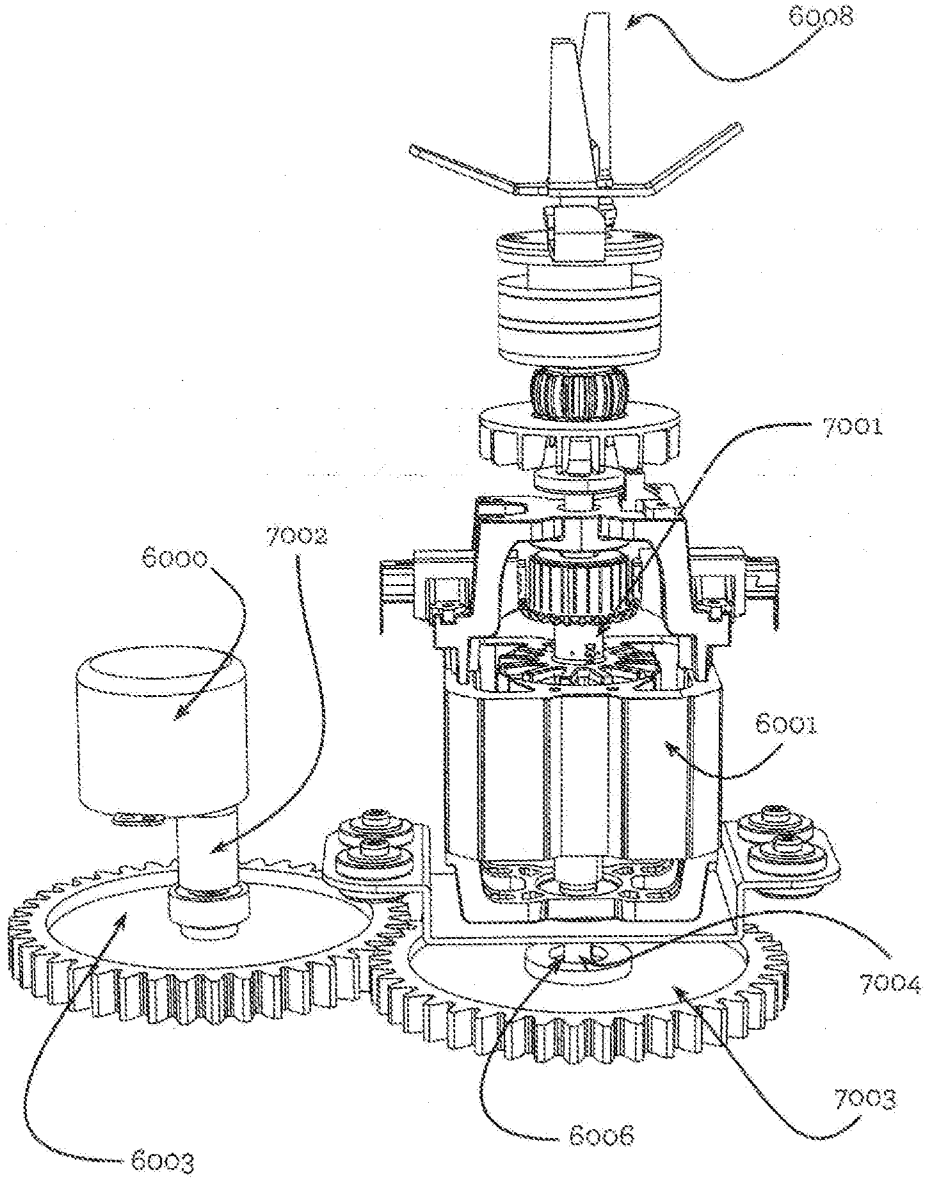


Fig. 21