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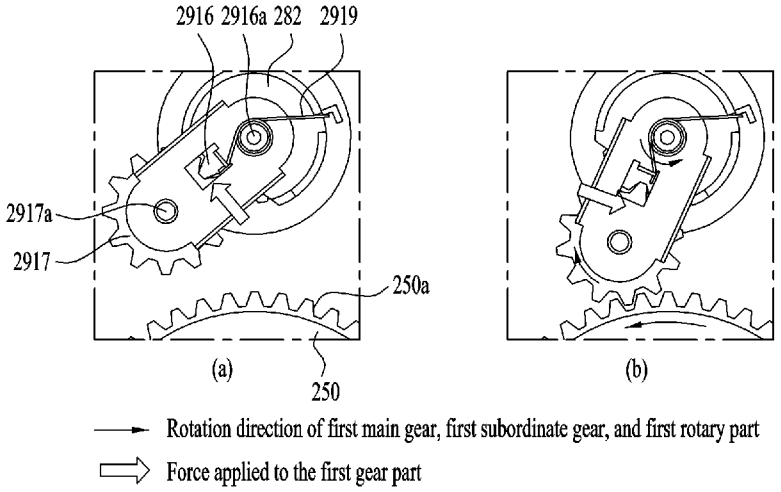

(57) Abstract: Disclosed herein is a coffee extraction apparatus including a first burr, a second burr, a first rotary part coupled to an outer surface of the first burr to rotate the first burr, a first power part configured to generate rotational power for rotation of the first rotary part, and a first gear part including a first main gear connected to the first power part to rotate at a fixed position and a first subordinate gear configured to rotate while moving in a circumferential direction of the first rotary part according to the rotation of the first main gear, wherein, when the first main gear rotates, the first subordinate gear is connected to the first rotary part.

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Description

Title of Invention: COFFEE EXTRACTION APPARATUS

Technical Field

[1] The present disclosure relates to a coffee extraction apparatus. More particularly, the present disclosure relates to a grinder included in the coffee extraction apparatus.

Background Art

[2] With recent increase in the number of consumers who make drip coffee at home, demand for automatic coffee machines that automatically extract espresso or drip coffee is increasing. In addition, as the period in which freshness of ground beans is maintained is 1 to 2 weeks, which is not long, and the needs for high-quality whole beans increase, there is a growing demand for grinders along with increase in the number of consumers who desire to purchase fresh whole beans and even grind the beans. To meet such needs and demands, automatic coffee machines with built-in grinders are being introduced into the markets.

[3] Burrs employed for grinders may be largely divided into three types: flat burr, conical burr, and roll-type burr. In general, flat burrs are used in places where a large amount of grinding is needed, such as coffee shops and cafes, whereas conical burrs are mostly used in households where a small amount of grinding is needed at a time. Roll-type burrs are widely used in factories that mass-produce coffee powder.

[4] Among the automatic coffee machines that include a grinder, MUJI's drip coffee machine whose model name is MJ-CM1 makes it easy to clean the grinder by allowing the grinder to be separated from the main body when the flat burr is vertically positioned and allowing the grinding blade to be separated. However, since the grinder employs a flat burr, in which ground beans are spread in the circumferential direction, a lot of beans are accumulated in the grinder. Further, the grinder lacks a means to absorb vibration by being directly connected to the drive gear that rotates the grinding blade. Accordingly, the grinder requires manual adjustment of the degree of grinding.

[5] Korean Patent Registration No. 10-2007932 discloses a coffee machine including a grinder. The type of the burr employed for the coffee machine is a conical burr, but the internal conical burr is configured to rotate. Accordingly, the driving unit is required to be connected to the internal conical burr, and coffee grounds are discharged and accumulated in the driving unit. In addition, the degree of grinding must be manually adjusted.

Disclosure of Invention

Technical Problem

[6] An object of the present disclosure is to maintain freshness by immediately grinding

and using whole beans.

[7] Another object of the present disclosure is to configure a grinder included in a coffee extraction apparatus so as to be easily removed and cleaned.

[8] Another object of the present disclosure is to simplify the movement path of coffee powder ground by a grinder and minimize internal contamination.

[9] Another object of the present disclosure is to reduce impact and vibration generated in grinding whole beans by a grinder.

[10] Another object of the present disclosure is to automatically adjust the degree of grinding of whole beans according to a user's preference.

Solution to Problem

[11] The present disclosure provides a driving force through a swing type idle gear between a driving unit including a motor and a grinder assembly to rotate a first burr, which is an outer burr, included in a conical burr arranged in a grinder. Thereby, it is intended to reduce the vibration and reduce the impact transmitted to the driving unit when whole beans are ground.

[12] The present disclosure is also directed to minimizing the path from the supply of whole beans to the discharge of the ground beans to minimize accumulation of the ground beans in an internal grinder. To this end, the ground beans are allowed to fall only in the vertical direction. In addition, an outer burr of a conical burr for grinding is rotated such that the path of the vertically falling ground coffee is not obstructed. In addition, the grinder is configured to be detached and disassembled for easy cleaning of the coffee grounds accumulated inside the grinder.

[13] In addition, the present disclosure uses a swing type idle gear to reduce the grinding impact when the grinder grinds whole beans, and allows the degree of grinding to be automatically adjusted for appropriate grinding of the supplied whole beans.

[14] The object of the present invention can be achieved by providing a coffee extraction apparatus including a first burr configured to rotate to grind supplied whole beans, a first burr through-hole formed through the first burr in an axial direction of the first burr, a first burr inlet disposed at one end of the first burr through-hole to allow the whole beans to be introduced thereinto, a first burr outlet disposed at an opposite end of the first burr through-hole to discharge the ground beans as coffee powder, a second burr inserted into the first burr through-hole through the first burr outlet to define a grinding space for grinding the whole beans together with the first burr, a first rotary part coupled to an outer surface of the first burr to rotate the first burr, a first power part configured to generate rotational power for rotation of the first rotary part, a first gear part including a first main gear connected to the first power part to rotate at a fixed position and a first subordinate gear configured to rotate while moving in a cir-

cumferential direction of the first rotary part according to rotation of the first main gear, an extractor opened on a side facing the first burr outlet to receive the coffee powder discharged through the first burr outlet, the extractor being configured to mix the coffee powder with water to extract coffee liquid, and a water supplier configured to supply water to the extractor, wherein, when the first main gear rotates, the first subordinate gear may be connected to the first rotary part.

[15] The first gear part may further include a gear connection arm rotatably coupled to the first main gear and configured to maintain a predetermined distance between the first main gear and the first subordinate gear, and an elastic member configured to transmit restoring force in a direction opposite to a rotation direction of the gear connection arm.

[16] When the first main gear rotates in a first rotation direction, the gear connection arm may rotate in the first rotation direction, and the first subordinate gear may be rotated in a second rotation direction opposite to the first rotation direction and connected to the first rotary part. When the first main gear is stopped, the gear connection arm may be rotated in the second rotation direction by the elastic member, and the first subordinate gear may be disconnected from the first rotary part.

[17] The elastic member may be a torsion spring.

[18] The coffee extraction apparatus may further include a first housing configured to accommodate and support the first rotary part, wherein the first housing may include a housing body defining a space to accommodate the first rotary part and having both ends open, a first opening provided in the housing body and having one end opened on a side close to the extractor, and a second opening provided in the housing body and having an opposite end opened on a side facing away from the extractor, wherein the whole beans may be ground into the coffee powder through the first burr inlet and the first burr outlet and then discharged through the first opening.

[19] The coffee extraction apparatus may further include a burr coupler coupled to one end of the second burr positioned on a side facing away from the first burr inlet to move the second burr in the axial direction of the first burr.

[20] The coffee extraction apparatus may further include a fixing shaft arranged through and coupled to the second burr and the burr coupler in the axial direction of the first burr.

[21] The coffee extraction apparatus may further include a second housing including a whole bean introduction hole allowing the whole beans to be introduced therethrough, the second housing being coupled to the first housing in the axial direction of the first burr to allow the first rotary part to rotate, wherein the whole beans introduced through the whole bean introduction hole may be ground into the coffee powder while moving from the first burr inlet to the first burr outlet, and then discharged to the extractor

through the first opening.

[22] The second housing may further include a fixing shaft support configured to support the fixing shaft inserted into the whole bean introduction hole, wherein the fixing shaft support may be connected to an inner surface of the whole bean introduction hole by at least one reinforcing rib arranged between the inner surface of the whole bean introduction hole and the fixing shaft support.

[23] The first housing may further include a first communication hole formed through the housing body in a radial direction of the first rotary part. The first rotary part may have a gear shape on an outer circumferential surface of the first rotary part, and the first rotary part and the first gear part may be rotatably connected to each other through the first communication hole.

[24] The coffee extraction apparatus may further include a second rotary part accommodated in the housing body so as to be positioned closer to the first opening than the first rotary part, the second rotary part being connected to the burr coupler to move the second burr inserted into the first burr in the axial direction of the first burr to adjust a size of the grinding space.

[25] The first rotary part and the second rotary part may rotate independently. The coffee extraction apparatus may further include a second gear part configured to transmit rotational power to the second rotary part, and a second power part configured to rotate the second gear part.

[26] The coffee extraction apparatus may further include a second communication hole formed through the housing body in a radial direction of the second rotary part. The first rotary part and the first gear part may be connected to each other through the first communication hole to rotate, and the second rotary part and the second gear part may be connected to each other through the second communication hole.

[27] The radial direction of the first rotary part having the first communication hole may be different from the radial direction of the second rotary part having the second communication hole.

[28] The first gear part may further include a first main gear shaft configured to rotate the first main gear, the first main gear shaft being connected to the gear connection arm; and a first subordinate gear shaft configured to support the first subordinate gear and connect the first subordinate gear to the gear connection arm. When the first subordinate gear rotates in the first rotation direction, the first subordinate gear shaft may rotate around the first main gear shaft in the first rotation direction, and the first subordinate gear may rotate in the second rotation direction opposite to the first rotation direction.

[29] The coffee extraction apparatus may further include a planetary gear part positioned between the first power part and the first main gear to reduce a rotational speed of the

first power part at a predetermined ratio to rotate the first main gear.

[30] The coffee extraction apparatus may further include a grinder fixing part providing a space allowing the housing body to be detachably coupled thereto, a gear cover coupled to a side surface of the grinder fixing part to protect the planetary gear part, and a gear fixing part coupled to an upper portion of the gear cover to support the first gear part, wherein the grinder fixing part, the gear cover, and the gear fixing part may be integrated with each other.

Advantageous Effects of Invention

[31] According to the present disclosure, freshness may be maintained by immediately grinding and using whole beans.

[32] According to the present disclosure, the grinder included in the coffee extraction apparatus may be easily removed and cleaned.

[33] According to the present disclosure, internal contamination may be minimized by simplifying the movement path of coffee grounds produced by grinding of the grinder.

[34] According to the present disclosure, the impact and vibration generated in grinding whole beans by the grinder may be reduced.

[35] According to the present disclosure, the grinding degree of whole beans may be automatically adjusted according to the user's preference

Brief Description of Drawings

[36] The accompanying drawings, which are included to provide a further understanding of the disclosure, illustrate embodiments of the disclosure and together with the description serve to explain the principle of the disclosure.

[37] FIG. 1 schematically shows an example of a coffee extraction apparatus.

[38] FIG. 2(a) schematically illustrates the grinding principle of a grinder included in the coffee extraction apparatus. FIG. 2(b) shows an example of the grinder included in the coffee extraction apparatus.

[39] FIG. 3(a) shows the assembled form of a conical burr included in the grinder. FIG. 3(b) shows an example of a first burr, which is an external burr of the conical burr. FIG. 3(c) shows an example of a second burr, which is a center burr of the conical burr.

[40] FIG. 4(a) is an exploded view of an example of the grinder included in the coffee extraction apparatus. FIG. 4(b) shows an example of a second grinder and a guide coupled to each other.

[41] FIG. 5 shows an example of a second rotary part, a second gear part, and a second grinder coupled to one another.

[42] FIG. 6(a) shows an example of a grinder assembly separated from a support assembly. FIG. 6(b) shows an example of the second grinder coupled to or separated

from a first grinder. FIG. 6(c) shows a cross section of a guide and a rotation ring of the second rotary part.

[43] FIG. 7 shows an example of a first gear part and a first rotary part.

[44] FIG. 8(a) illustrates an example of disengagement of the first gear part from the first rotary part when the first gear part is stopped. FIG. 8(b) illustrates an example of engagement of the first gear part with the first rotary part when the first gear part is driven.

[45] FIG. 9 shows an example of the second rotary part.

Mode for the Invention

[46] Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. The configuration or control method of an apparatus which will be described below is merely illustrative of the embodiments of the present disclosure, and is not intended to limit the scope of the present disclosure. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[47] Specific terms used in the present specification are merely for convenience of description and are not used as limitations of the illustrated embodiments. For example, expressions such as "same" and "is the same" not only indicate exactly the same state, but also indicate a state in which a tolerance or a difference allowing the same function to be obtained is present.

[48] As used herein, the term "whole bean" refers to roasted coffee beans, not the raw coffee beans harvested from a coffee tree. Roasted coffee beans may be divided into various types by the degree of roasting. For example, coffee ingredients of dark roasted coffee, which is obtained by roasting the beans for a long time, may dissolve in water more easily than those of light roasted coffee. In this specification, the term "whole bean" is used to refer to roasted coffee beans to be used for coffee extraction regardless of the degree of roasting.

[49] In addition, the coffee powder employed in the present specification is coffee powder of a preset size, which may be set differently according to preferences and types of beans. Thus, coffee powder of a preset size is not coffee powder having a specific size, but coffee powder having a size that can be changed according to preferences and types of beans.

[50] In this specification, a first temperature represents the room temperature or lower temperature, and a second temperature represents a temperature higher than the first temperature.

[51] Also, a coffee extraction apparatus refers to an apparatus configured to extract coffee liquid by dissolving coffee ingredients in water after mixing ground beans, that is,

coffee powder with water. The coffee liquid refers to water containing coffee ingredients extracted from coffee powder using water. Accordingly, in this specification, extracting coffee liquid means making water containing coffee ingredients extracted from coffee powder using water.

[52] Unless otherwise specified in the specification, coffee generally refers to coffee liquid. However, when coffee is used like coffee powder, it may refer to solid coffee.

[53] Table 1 below summarizes the types of burrs mainly used in conventional grinders configured to grind whole beans. The burr is a core part of a grinder that grinds whole beans and has two parts (an outer burr and a center burr) provided with blades for grinding of whole beans arranged to face each other to grind beans. One part is fixed and the other part rotates to grind the beans. The supplied whole beans are ground using the blades of the outer burr located outside and the center burr located inside while a certain distance is maintained between the outer burr and the inner bur. Flat burrs or conical burs are mainly used in cafes and homes except for factories where whole beans are ground on a large scale. Both the flat burr and the conical burr grind beans grind beans using two blades engaging with each other, but they are distinguished form each other by the shapes thereof. The flat burrs may be divided into a vertical burr and a horizontal burr according to the direction in which the rotation axis of the burr is arranged.

[54] In the case of the flat burr, the center burrs a1 and b1 are rotated by a driving unit located outside, and the outer burrs a2 and b2 are fixed. In the case of the vertical burr, the ground beans (or coffee powder) are not all discharged through a ground discharge portion, but are scattered and unintentionally piled up on both sides of the housing a3, b3. A large area may be contaminated by coffee powder, and the accumulated coffee powder may be unsanitary and has a risk of being mixed with newly ground beans and discharged, which may degrade the taste. In the case of the horizontal burr, the ground beans may be piled up, and it may be difficult to avoid contamination of a driving unit or a driving connection part configured to drive a vertical shaft because the driving unit or the driving connection part is arranged at a lower position. That is, in both the horizontal burr and the vertical burr, the entire interior of the housings a3 and b3 may be contaminated due to centrifugal force generated during grinding.

[55] In contrary, the conical burr, which is widely employed for household use, may reduce contaminated areas through vertical fall in the direction of gravity. However, in the case of the conventional conical burr, the center burr c2 is arranged to rotate and the outer burr c1 is fixed. Accordingly, the driving unit for rotation of the center burr is disposed under the center burr. Accordingly, there is a very high possibility that the driving unit is contaminated by falling coffee powder.

[56] In order to this issue, the present disclosure describes a coffee extraction apparatus

including a grinder that rotates the outer burr of the conical burr to minimize the grinding path and the contaminated area.

[57] **TABLE 1**

[58]

Structure	Flat Burr		Conical Burr
	Vertical	Horizontal	
Driving method	Direct shaft drive	Direct shaft drive	Direct shaft drive Rotating center burr, Fixed outer burr
Degree of contamination	Spread by centrifugal force → Entire interior contaminated		Grinding section and horizontal conveying path contaminated

[59] As shown in FIG. 1, a coffee extraction apparatus 1000 according to an embodiment of the present disclosure includes a grinder 200 configured to grinding whole beans into coffee powder having a size less than or equal to a preset size, a filter (not shown) arranged under the grinder 200 to receive the coffee powder and extract coffee liquid by rotating the coffee powder with water, an extractor 600 including an accommodation part 610 allowing the filter to be inserted thereinto, the accommodation part 610 being configured to store the coffee liquid extracted through the filter or supplied water, a driving unit (not shown) coupled to the filter to rotate the filter, a support part 910 configured to support the grinder 200 and the extractor 600 from the outside of the grinder 200 and the extractor 600, and a water supplier 400 configured to supply water to the extractor 600.

[60] The whole beans ground through the grinder 200 or the coffee powder may be accommodated in the extractor 600 through an extractor inlet 615 open toward the grinder 200. Then, the coffee powder may be mixed with water supplied through the water supplier 400 to extract the coffee liquid.

[61] The coffee extraction apparatus 1000 may further include a whole bean supplier 100 configured to supply whole beans to the grinder, and a base 920 arranged to support the support part 910, the base 920 including a controller (not shown).

[62] The whole bean supplier 100 may be manually opened by the user to supply whole beans, or may be configured in the form of a dispenser to store a lot of whole beans as

to be dispensed several times, such that the whole beans are supplied to the grinder whenever necessary. Alternatively, the whole bean supplier 100 may be provided in the form of a disposable whole bean storage capsule (not shown) containing whole beams enough to make a drink of coffee. Once the whole bean storage capsule is coupled to the whole bean supplier 100, the whole bean storage capsule may be automatically opened to discharge the whole beans to the grinder 200.

[63] In this case, an identification device (not shown) containing the type of whole beans and the like may be attached to the bean storage capsule. The identification device may contain the type of whole beans, the degree of roasting, and the date of roasting. After the identification is recognized, the degree of grinding in the grinder 200, the extraction time in the extractor, and the like may be adjusted.

[64] In one embodiment of the present disclosure, whole beans may fall from the whole bean supplier 100, and the falling beans may be ground into coffee powder having a predetermined size or less by the grinder 200, and then accommodated in the filter provided in the extractor 600.

[65] The grinder 200 grinds the supplied whole beans into coffee powder having a predetermined size or less. In the grinder, the grinding degree may vary depending on the kind of coffee and the degree of extraction may vary. Accordingly, the grinding degree may be set differently according to the user's selection or the kind of coffee. This is because the taste of coffee liquid may depend on the grinding degree, the degree of roasting, and the temperature of water.

[66] The grinding degree of whole beans refers to a surface area that may contact water. Accordingly, finely grinding beans may increase the surface area, and make it easier to extract compounds from coffee.

[67] In addition, the grinder 200 should also reduce the impact when the whole beans are ground, and should be convenient to be cleaned at home. To this end, the grinder may employ a conical burr (see FIG. 3(a)). Configuring the outer burr between the center burr and the outer burr of the conical burr to rotate may avoid positioning the driving unit in the drop zone of the coffee powder.

[68] The extractor 600 may include a filter configured to receive coffee powder falling from the grinder 200 and an accommodation part 610 into which the filter is inserted. The filter may rotate to rotate the coffee powder and supplied water to extract coffee liquid. Water temperature may increase through rotation of the filter. This is because the random motion of water molecules increases due to the rotation of the filter. However, since the water temperature increases very slightly, it is safe to assume that a first temperature is constantly maintained.

[69] The accommodation part 610 may store coffee liquid extracted through the filter or water which is at the first temperature. The filter is made of a mesh material and thus

allows water or coffee liquid to freely pass therethrough while not allowing solid coffee powder to pass therethrough. Accordingly, when the filter rotates, coffee powder, water, and coffee liquid will be rotated inside the filter, and water and coffee liquid will rotate between the outside of the filter and the accommodation part 610.

[70] A coffee server 800 capable of storing the extracted coffee liquid may be provided under the extractor 600. The coffee server 800 may be a pot having a kettle shape, or may have a typical cup shape. In addition, as the coffee cover is disposed under the extractor 600, it may store the discharged and dropping coffee liquid, or move the coffee liquid to another location through a discharge portion (not shown) provided to guide the coffee liquid to the outside.

[71] The extraction types may be divided into cold brew and hot brew by the temperature of water used for extraction in the extractor 600. When water at the first temperature, which is less than or equal to the room temperature, is used, the brewing type may be cold brew. When water at a second temperature higher than the first temperature is used, the brewing type may be hot brew. The extractor 600 may include a first extractor 6001 which uses water at the first temperature and a second extractor 6002 which uses water at the second temperature, and the user may detachably attach one of the extractors to the support part 910 according to a desired extraction method.

[72] Since the first extractor 6001 uses water at the first temperature, it is used to make cold brewed coffee. On the other hand, when water at the second temperature higher than the first temperature is used, the second extractor 6002 having a different structure from the first extractor may be used. In this case, the first extractor 6001 and the second extractor 6002 have similar structures to be coupled to the support part 910 and occupy similar spaces between the grinder 200 and the coffee server 800 in the coffee extraction apparatus 1000. Accordingly, they are replaceable with each other. Accordingly, the user may select the first extractor 6001 or the second extractor 6002 according to a desired extraction type. The water at the first temperature or the water at the second temperature may be supplied through the water supplier 400.

[73] The water supplier 400 may supply water of the first temperature or water of the second temperature to the first extractor 6001 or the second extractor 6002 through the water supply nozzle 410. The water supplier 400 may receive water of the first temperature or water of the second temperature from an external water supply source. The water supplier 400 may receive water of the first temperature through the external water supply source, heat the water using a heater (not shown), and then supply the water to the second extractor 6002.

[74] The extractor including the above-described filter relates to the first extractor 6001, and the second extractor 6002 may use a paper filter instead of the filter in the accommodation part 610 to drip and extract water of the second temperature.

[75] Water may not be supplied from an external water supply source, but may be pre-stored in a water supply tank (not shown) and then supplied through a water supply pipe connected to the water supply tank.

[76] The extractor 600 may be fixed to the support part 910, which is provided on the side, by the support arm 690. The base 920 may be obliquely or vertically coupled to the support part 910. The base fixes the support part 910 and supports a load applied to the support part 910. That is, the whole bean supplier 100, the grinder 200, the water supplier 400, and the extractor 600 are directly or indirectly connected to the support part 910, causing an eccentric load. Accordingly, a bending moment, shear force, and torsion may be applied to the support part 910. The base 920 may serve to fix and support the support part 910 so as to withstand the applied bending moment, shear force, and torsion.

[77] In addition, a controller (not shown) configured to control the coffee extraction apparatus 1000 may be included in the base 920. The controller (not shown) may controls each motor that may be used for the grinder 200, the whole bean supplier 100, the first extractor 6001, or the water supplier 400, and control the amount of water from the water supplier, opening/closing of the discharge portion 680, rotation of the grinder, and the grinding degree of the grinder. The controller (not shown) may be arranged in any other portion of the coffee extraction apparatus 1000.

[78] The first extractor 6001 is arranged under the grinder 200 to receive ground beans, that is, coffee powder, and mix the same with water to extract coffee liquid. In particular, for cold brew type extraction of coffee liquid, the first extractor 6001 may use water of a first temperature less than or equal to room temperature. The first extractor 6001 may include an accommodation part 610 and a filter.

[79] The filter may be arranged inside the accommodation part. The filter may accommodate coffee powder that is ground and dropped through the grinder 200. The coffee powder is mixed with supplied water and stirred through rotation of the filter to extract coffee liquid. The filter may allow only water or the extracted coffee liquid to pass therethrough and may not allow coffee powder to pass therethrough. Accordingly, the coffee powder may be obstructed from moving to the accommodation part 610 by the filter. That is, most of the external appearance of the filter is made of a mesh-type material to perform filtering.

[80] The accommodation part 610 provides a space for storing the extracted coffee liquid or water. Water of the first temperature (hereinafter, water having the first temperature is simply referred to as water unless otherwise specified) supplied through the water supplier 400 may be supplied to the accommodation part.

[81] FIG. 2(a) schematically illustrates the grinding principle of a grinder included in the coffee extraction apparatus. The grinder employs a conical burr, which has a simple

structure and is suitable for home use. It generates less heat and lower noise during grinding, and maintains the flavor of coffee better than the flat burr.

[82] Depending on the type of whole beans, the size of coffee powder for optimal coffee extraction may vary. In general, the finer the ground powder is, the larger the surface area in contact with water. However, since the surface area in contact with water also depends on the roasting degree of the whole beans, the grinding degree for the optimum coffee may vary among the whole beans.

[83] Taste of coffee is determined by many factors including freshness of coffee, temperature and type of water, and extraction method. Among such factors, grinding is one of the most important factors in the coffee extraction process. Grinding is a process to increase the area for coffee extraction by grinding beans. This is because when coffee is extracted through grinding, various coffee ingredients can dissolve in water more easily, affecting the coffee flavor. Accordingly, the operation of changing the particle size of individual coffee powder grains, that is, coffee particles through grinding may be referred to as adjustment of the grinding degree.

[84] In order to adjust the degree of grinding according to the supplied whole beans, a second burr 232, which will be described later, may be moved in the axial direction of the first burr to adjust the insertion depth thereof into the first burr through-hole 2313. The grinding degree may be adjusted automatically rather than manually. When the user inputs the type of whole beans, the controller (not shown) may control the driving unit to adjust the grinding degree. Alternatively, the controller (not shown) may read a barcode attached to a capsule supplied to the coffee bean supplier or a near field communication (NFC) based communication chip, and automatically set an appropriate grinding degree.

[85] The conical burr includes a first burr 231 positioned outside and a second burr 232 inserted into the first burr 231 to form, together with the first burr 231, a grinding space in which whole beans are ground. In the case of a conventional conical burr, the first burr 231 is fixed, and the second burr 232 rotates to grind the whole beans into coffee powder. This is because rotating the second burr 232 positioned inside makes it easy to align the rotation centers of the first burr 231 and the second burr 232. However, this structure may cause the coffee powder to be accumulated on the driving unit because the driving unit, which is configured to drive the second burr 232 must be connected to the second burr 232. In this case, the accumulated coffee powder may cause contamination and malfunction of the driving unit.

[86] On the other hand, in the case of the coffee extraction apparatus 1000 according to an embodiment of the present disclosure, the first burr 231 positioned outside may rotate and the second burr 232 may be fixed. The coffee extraction apparatus 1000 also includes components for aligning the rotation centers of the first burr 231 and the

second burr 232.

[87] FIG. 2(b) shows an example of the grinder 200 in the coffee extraction apparatus 1000. The grinder 200 may include a grinder assembly 210 configured to grind supplied whole beans, and a driving unit 290 configured to support the grinder assembly 210 and drive the grinder assembly 210.

[88] The grinder assembly 210 includes a first grinder 211 including the first burr 231 (see FIG. 3), and a second grinder 212 including the second burr 232 (see FIG. 3) inserted into the first burr 231, the second grinder 212 being coupled to the first grinder 211.

[89] A first grinder inlet 2111 may be provided on the side from which whole beans are supplied to the first grinder 211, and thus the first grinder 211 may receive the whole beans and transfer the same to the first burr 231 positioned therein. The first burr 231 and the second burr 232 may grind the supplied whole beans using blades and discharge the ground beans.

[90] The first grinder 211 may include a first housing 241 defining an outer shape of the first grinder 211 and a second housing 242 coupled to the first housing 241.

[91] The second grinder 212 may include the second burr 232 (see FIG. 3). The first grinder 211 and the second grinder 212 may be coupled to each other when the second burr 232 is inserted into the first burr 231.

[92] A support assembly 270 may be provided to support the grinder assembly 210 and transmit power to the grinder assembly 210. The support assembly 270 may include a first driving unit 291 and a second driving unit 292 (refer to FIG. 4), which transmit rotational force to the grinder assembly 210. The first driving unit 291 may include a first gear part 2915 and a first power part 2911 configured to rotate the first gear part 2915. The second driving unit 292 may include a second gear part 2925 (see FIG. 4) and a second power part 2921 (see FIG. 4) configured to transmit rotational power to the second gear part 2925 (see FIG. 4).

[93] In addition, a planetary gear part 2913 (see FIG. 4) may be further provided between the first gear part 2915 and the first power part 2911. The planetary gear part may be used to reduce the number of rotations of a motor provided in the first power part 2911 and increase torque.

[94] FIG. 2(b) shows an example in which a swing-type idle gear is employed for the first gear part 2915. The idle gear refers a subordinate gear arranged to connect gears. Here, the first gear part 2915 (see FIG. 4) may include a first main gear 2916 (see FIG. 4) and a first subordinate gear 2917. The first subordinate gear 2917 may be connected to a first rotary part 250 provided in the first grinder 211.

[95] The first gear part may further include a gear connection arm 2918 configured to connect and support the first main gear 2916 (see FIG. 4) and the first subordinate gear

2917, and an elastic member 2919 connected to the gear connection arm 2918 to provide elastic force. The elastic member may be fitted onto a first main gear shaft 2916a, which is a rotational shaft of the first main gear, and then fixed to a gear fixing part 283, which supports the first gear part 2915, to provide restoring force to the gear connection arm 2918.

[96] In addition, as a feature of the swing-type idle gear, the first main gear may be connected to the first main gear shaft 2916a and thus connected to the first power part 2911 via the planetary gear part 2913 (see FIG. 4). In addition, the first main gear shaft 2916a is connected to the planetary gear part, and is only allowed to rotate in position.

[97] On the other hand, the first subordinate gear 2917, which is connected to the first main gear 2916, may rotate while revolving around an axis. A first subordinate gear shaft 2917a may be supported by the gear connection arm 2918 and serve to support rotation of the first subordinate gear 2917. The first subordinate gear shaft 2917a may move in the circumferential direction of the first main gear 2916 while supporting the rotation of the first subordinate gear. That is, the first subordinate gear 2917 may revolve around the first main gear 2916.

[98] When the first main gear 2916 rotates in a first rotation direction, the first subordinate gear 2917 and the gear connection arm 2918 may be rotated in a second rotation direction and connected to the first rotary part 250 (see FIG. 4) to rotate the first rotary part in the first rotation direction. When the first main gear 2916 does not rotate, the gear connection arm 2918 and the first subordinate gear 2917 may be rotated in the first rotation direction and separated from the first rotary part by the restoring force of the elastic member 2919.

[99] That is, the restoring force of the elastic member may be designed to be less than the rotational power of the first main gear 2916 that rotates the rotational shaft of the first subordinate gear or he gear connection arm. Thus, only when the first main gear 2916 does not rotate, the restoring force may be transmitted to the first subordinate gear through the gear connection arm in the opposite direction to separate the first subordinate gear from the first rotary part.

[100] Thereby, it may be ensured that the first subordinate gear 2917 is always connected to the first rotary part when rotating. In other words, even when repulsive force or vibration caused by an impact occurring during grinding of the whole beans on the first rotary part is momentarily transmitted in the opposite direction to the first subordinate gear 2917, the gear connection arm 2918 may freely rotate, and the rotational power of the main gear 2916 may keep the first subordinate gear 2917 connected to the first rotary part 250.

[101] Thus, the impact transmitted from the first rotary part to the first main gear shaft 2916a or the first power part 2911 through the first main gear 2916 may be minimized,

and accordingly the impact transmitted to the first gear part 2915, the planetary gear part 2913 and the first power part 2911 may be alleviated.

[102] In other words, the first subordinate gear shaft 2917a may revolve around the first main gear shaft 2916a while being spaced apart from the first main gear shaft 2916a by a certain distance by the gear connection arm 2918.

[103] In general, when the first main gear 2916 rotates in a first rotation direction, the first subordinate gear 2917, the first subordinate gear shaft 2917a, and the gear connection arm 2918 may rotate in a second rotation direction opposite to the first direction.

[104] The first power part 2911 may include a first motor, which is a drive motor. In addition, the first power part 2911, the gear fixing part 283, a portion of the gear cover 282, and a portion of the first gear part 2915 may be disposed in an installation space 915 provided inside the support 910.

[105] Accordingly, a portion of the gear cover 282, a portion of the first gear part 2915, a grinder fixing part 281, and the grinder assembly 210 may be arranged outside the support 910 and thus be exposed to the user.

[106] The grinder assembly 210 may be coupled to a coupling space 2811 (see FIG. 4) of the support assembly. The grinder assembly 210 may further include a grinder fixing part 281 defining the coupling space to provide the coupling space for attachment/detachment of the first grinder 211, a gear cover 282 coupled to a lateral surface of the grinder fixing part 281 to protect the planetary gear part 2913 (see FIG. 4), and a gear fixing part 283 coupled to an upper portion of the gear cover portion 282 to support the first gear part 2915.

[107] The grinder fixing part 281, the gear cover 282, and the gear fixing part 283 may be integrated with each other. For example, these elements may be formed as a single plastic item by injection molding. In addition, they may be formed of a metal material by a press process, or may be formed into a single grinder case 280 by a method such as welding or riveting.

[108] In FIGS. 2(a) and 2(b), the direction of gravity is indicated by g. Although the figures illustrates that the whole beans supplied through the first grinder inlet 2111 fall vertically by gravity, the first grinder inlet 2111 may not necessarily be arranged in the direction of gravity. However, when the coffee powder falls according to gravity, a separate device for dropping of the coffee powder may not be required. In addition, since the direction of gravity is almost perpendicular to the bottom surface on which the coffee extraction apparatus is placed, the movement path of coffee powder from the grinder 200 to the extractor 600 may be straightened. This straightening may simplify and shorten the movement path of the coffee powder, thereby minimizing accumulation of coffee powder inside the grinder 200.

[109] In addition, when the first burr 231, which is an outer burr, rotates, the first rotary

part 250 (see FIG. 4) that rotates the first burr 231 is not located in the movement area of coffee powder, and accordingly contamination of the first rotary part may be minimized.

[110] FIG. 3(a) shows the first burr 231 for grinding the whole beans, the second burr 232 inserted into the first burr 231, and a grinding space 238 formed when the first burr 231 and the second burr 232 coupled to each other. The burrs are a kind of conical burrs. Unlike the conventional conical burr, the first burr 231 located on the outside rotates. On the other hand, after the second burr 232 is inserted into and coupled to the first burr, the second burr is allowed to move only in the axial direction of the first burr to adjust the grinding degree, and does not rotate. Adjusting the grinding degree refers to adjusting the size of the grinding space in order to adjust the size of ground coffee powder to a preset value. Regarding the size of the grinding space, the second burr 232 is formed in a conical shape. Accordingly, when the second burr 232 is inserted into the first burr 231 and moved along the first burr through-hole 2313, the separation distance between the first burr 231 and the second burr 232 may vary, and accordingly the size of the grinding space may be adjusted.

[111] In general, the first burr 231 may include a sharp blade for grinding whole beans provided on the inner circumferential surface of the first burr through-hole 2313. Accordingly, the first burr is referred to as an outer serrated burr. On the other hand, the second burr 232 is formed in a conical shape and is thus referred to as a cone-shaped center burr.

[112] Referring to FIG. 3(b), the first burr 231 may include a first burr through-hole 2313 penetrated in an axial direction for rotation of the first burr 231, and a first burr inlet 2318 positioned at one end of the first burr through-hole to allow whole beans to be introduced therethrough, and a first burr outlet 2319 positioned at an opposite end of the first burr through-hole to grind the whole beans and discharge coffee powder.

[113] The whole beans introduced through the first grinder inlet 2111 may be supplied through the first burr inlet 2318, ground in the grinding space, and then discharged through the first burr outlet 2319. The shape or the cross-section of a portion of the outer surface of the first burr that is closer to the first burr inlet 2318 than the first burr outlet 2319 has an angled shape, but the shape or the cross-section of a portion of the outer surface of the first burr that is closer to the first burr outlet 2319 than the first burr inlet 2318 has a circular shape. The first burr 231 may be coupled to the first rotary part 250 (see FIG. 4) at the side of the first burr inlet 2318 for rotation. The reason why the shape or the cross-section of a portion of the outer surface of the first burr that is closer to the first burr inlet 2318 than the first burr outlet 2319 has an angled shape is to prevent a slip effect between the first rotary part 250 (see FIG. 4) and the first burr when the first burr is coupled to the first rotary part 250 (see FIG. 4).

The angled shape or the angled cross-section may include a curved line and a straight line.

[114] On the other hand, the outer surface of the first burr outlet 2319 is rotatably inserted into a second rotary part 260 (see FIG. 4), and thus has a circular cross section. Accordingly, the outer surface of the first burr outlet may be referred to as a first burr outer circumferential surface 2317.

[115] The inner circumferential surface of the first burr through-hole 2313 may include a first burr inclined portion 2314 and a first burr blade 2316. A portion of the first burr through-hole close to the first burr inlet 2318 is provided with the first burr inclined portion 2314. The first burr inclined portion may include a plurality of guide protrusions 2315 for guiding the whole beans. The first burr inclined portion is inclined as it extends toward the first burr outlet 2319. In addition, the plurality of guide protrusions 2315 may have a tapered shape such that the size of the first burr through-hole 2313 decreases as the first burr through-hole extends toward the first burr blade 2316. This configuration is intended to reduce the gap between the first burr 231 and the second burr 232 to allow whole beans to be ground as they pass through the grinding space one after another.

[116] A first burr blade 2316 may be provided at the side of the first burr outlet 2319 to grind whole beans into coffee powder.

[117] FIG. 3(c) shows the second burr 232, which is inserted into the first burr through-hole 2313 through the first burr outlet to define a grinding space for grinding whole beans together with the first burr 232. The second burr 232 may include a second burr through-hole 2323 penetrated in the axial direction of the first burr, a second burr inclined portion 2324 formed on the outer circumferential surface of the second burr 232 to correspond to the first burr inclined portion 2314, a plurality of impellers 2325 corresponding to the plurality of guide protrusions 2315, and a second burr blade 2326 corresponding to the first burr blade 2316.

[118] Of a plurality of beans supplied at the same time, only one bean may be introduced into a space formed between one guide protrusion 2315 and an adjacent protrusion 2315 and between one impeller 2325 and an adjacent impeller 2325 by the guide protrusions 2315 and the impellers 2325 and may be ground into coffee powder by the first burr blade 2316 and the second burr blade 2326. The size of the grinding space of the first burr and the second burr may be adjusted by moving the second burr 232 along the axis of the first burr, thereby adjusting the grinding degree. Thereafter, the whole beans supplied and ground will be discharged as coffee powder having a size less than or equal to an expected size according to the grinding degree because the separation distance between the first burr 231 and the second burr 232 is fixed, that is, the size of the grinding space is fixed.

[119] FIG. 4(a) is an exploded view of an example of the grinder 200. The grinder 200 may include a grinder assembly 210 and a support assembly 270 configured to support the grinder assembly 210 and transmit power. The grinder assembly 210 may include a first grinder 211 and a second grinder 212 coupled to the first grinder 211.

[120] The first grinder 211 may include a first burr 231 configured to rotate, a first burr through-hole 2313 (see FIG. 3) formed through the first burr 231 in an axial direction, a first burr inlet 2318 (see FIG. 3) positioned at one end of the first burr through-hole 2313 to introduce the whole beans therethrough, and a first burr outlet 2319 (see FIG. 3) positioned at an opposite end of the first burr through-hole 2313 to grind the whole beans and discharge the same as coffee powder.

[121] The second grinder 212 may include a second burr 232 inserted into the first burr through-hole 2313 through the first burr outlet 2319 to form a grinding space for grinding of whole beans together with the first burr 231, and a burr coupler 2122 configured to support the second burr and couple the second burr to the first grinder 211.

[122] The burr coupler 2122 may be coupled to the first burr 231 in the axial direction of the first burr to support the second burr 232 and couple the second burr 232 to the first grinder 211. The outer circumferential surface of the burr coupler 2122 may be provided with a burr coupler thread 2122a, and may thus be coupled to a second rotary part 260, which will be described later, through the burr coupler thread 2122a.

[123] The second grinder 212 may further include a handle 2125 allowing a user to easily hold the burr coupler 2122. The outer circumferential surface of the handle 2125 is processed to have bumps. Accordingly, when the handle is held by the user, it may prevent the slipping effect, and allow the user to transmit appropriate rotational force to the second grinder 212. Accordingly, the second burr 232 and the burr coupler 2122 may be rotated by the handle 2125 so as to be screwed to the second rotary part 260.

[124] The first grinder 211 may further include a first rotary part 250 coupled to an outer surface of the first burr to rotate the first bur. The first rotary part 250 may be coupled to a first burr outer surface 2312 (see FIG. 3) located at the first burr inlet 2318. The first rotary part 250 may include a first rotary part through-hole 2501 formed therethrough in the axial direction of the first bur. The first rotary part through-hole 2501 and the first burr inlet 2318 may communicate with each other.

[125] In order to rotate the first rotary part 250, gear teeth are formed along a first rotary part outer circumferential surface 250a, which is the outer circumferential surface of the first rotary part 250. The first rotary part 250 may be connected to a first gear part 2915, which will be described later, through the gear teeth. A gear such as the first rotary part may be referred to as a ring gear. This means that the outer circumferential surface of the ring having a through-hole formed in the axial direction has a gear

shape.

[126] In order to rotate the first burr 231, the first rotary part 250 may have a diameter as large as to have a large rotational moment of inertia, and may be formed of a material having a large weight if necessary. Thereby, vibrations caused by impacts during grinding of whole beans may be reduced, and accordingly a uniform size of coffee powder may be obtained.

[127] Since the first burr 231 is rotated through the first rotary part 250 coupled to the outer surface of the first burr 231, the second burr 232 may be inserted into the first burr 231 without any driving device and may be only allowed to slightly move in the axial direction of the first burr 231 to adjust the size of the grinding space to adjusting the grinding degree. Thus, there is no concern about accumulation of coffee powder in the driving device of the second burr 232 when coffee powder is discharged. Accordingly, the effects of easy cleaning and contamination prevention may be obtained.

[128] The first rotary part 250 may be coupled to the first burr 231 and accommodated in the first housing. That is, the first grinder 211 may include a first housing 241 configured to accommodate the first rotary part 250. The first housing 241 may include a housing body 2412 defining a space to accommodate the first rotary part 250, a first opening 2411a provided in the housing body 2412 and opened toward the extractor 600, a second opening 2411b provided in the housing body 2412 and arranged on a side opposite to the first opening 2411a.

[129] Thus, the housing body 2412 has only a lateral surface, and openings may be formed in both one surface face of the housing body close to the extractor 600 and the opposite surface of the housing body on the side opposite to the one surface. The first burr 231 and the first rotary part 250 may be introduced into the housing body 2412 through the second opening 2411b and be coupled to each other. In this case, the supplied whole beans will be discharged through the first opening 2411a via the first rotary part through-hole, the first burr inlet, and the first burr outlet.

[130] A second housing 242 may be coupled to the second opening 2411b. The first rotary part 250 may be rotatably coupled to the second housing 242, and thus the second housing 242 may prevent the rotation center of the first rotary part 250 from shaking. In other words, the first burr 231 does not have a shaft at the center of rotation, and the first rotary part 250 coupled to the outer surface of the first burr 231 rotates. Accordingly, it may be more difficult to maintain the center of rotation than when a rotational shaft is used.

[131] The grinding space between the first burr 231 and the second burr 232 should be kept constant to produce coffee powder having a desired grinding degree. Therefore, it is very important to maintain a constant distance between the first burr 231 and the second burr 232 when the first burr 231 is rotated. In this regard, the first housing 241

and the second housing 242 may be coupled to each other to fix the position of the first rotary part 250.

[132] The first rotary part 250 may further include a first burr fixing part 251 to couple the first burr 231 and the first rotary part 250. The first burr fixing part 251 may be provided to the coupling portions of the first rotary part 250 and the first burr inlet 2318 to prevent the coffee powder from escaping through the gap, and allow the rotational power of the first rotary part to be transmitted to the first burr without slip.

[133] A first bearing 2119a and a second bearing 2119b (see FIG. 6(b)) may be provided at both ends of the first rotary part 250. The first bearing 2119a allows the first rotary part to rotate in the second housing, and the second bearing 2119b is accommodated in the first housing to allow the first rotary part 250 to rotate. The first bearing 2119a and the second bearing 2119b include a first bearing through-hole 2119c and a second bearing through-hole (not shown) formed in the axial direction of the first burr. Accordingly, the coffee powder discharged through the first rotary part through-hole, the first burr inlet 2318 and the first burr outlet 2319 will not be interfered with by the first bearing 2119a and the second bearing 2119b.

[134] The second housing 242 coupled to the first housing 241 and rotatably supporting the first rotary part 250 may include a whole bean introduction hole 2423 allowing whole beans to be introduced therethrough, and may further include a fixing shaft support 910 configured to support the fixing shaft inserted into the whole bean introduction hole 2423. In addition, the fixing shaft support 910 may be supported by at least one reinforcing rib 2422 connecting the inner surface of the whole bean introduction hole 2423 to the fixing shaft support 910.

[135] The fixing shaft support 910 may be coupled to a fixing shaft 2128 arranged through the second burr to support the second burr 232 so as not to shake when the first burr 231 rotates.

[136] Specifically, the fixing shaft support 910 may include a fixing shaft coupling groove 2423 (see FIG. 6(b)) into which the fixing shaft 2128 is inserted toward the first burr inlet 2318. When the second burr 232 is inserted into the grinding space 238 through the first burr outlet 2319, the fixing shaft 2128 may be inserted into the fixing shaft coupling groove 2421a through the first burr through-hole 2313.

[137] The fixing shaft 2128 inserted into the fixing shaft coupling groove 2421a may be moved within the fixing shaft coupling groove 2421a in the axial direction of the first burr 231. Thereby, the distance between the first burr 231 and the second burr 232 may be adjusted to adjust the grinding degree.

[138] The first grinder 211 may further include a second rotary part 260 accommodated in the housing body 2412 so as to be arranged closer to the first opening 2411a than the first rotary part 250, the second rotary part being connected to the burr coupler 2122 to

move the second burr 232 inserted into the first burr 231 in the axial direction of the first burr to adjust the size of the grinding space 238.

[139] The second rotary part 260 may convert force causing rotational motion into movement in the axial direction of the first bur. The second rotary part 260 may include elements capable of converting rotational motion into linear motion, such as a rack and a pinion or a bevel gear.

[140] An example of the second rotary part 260 shown in FIG. 4(a) may include a ring-shaped rotating ring 261 configured to rotate, a rotating ring through-hole 2613 formed by penetrating the rotating ring 261 in the axial direction of the first burr 231, and a cylindrical guide 262 disposed in the rotating ring through-hole 2613, the cylindrical guide 262 having an accommodation space 2622 formed therein to be coupled to the burr coupler 2122.

[141] The guide 262 may include accommodation space threads (not shown) formed on an inner circumferential surface of the guide 262. As the burr coupler 2122 has the burr coupler thread 2122a formed on the outer surface thereof, the burr coupler 2122 may be screwed to the guide 262.

[142] The grinder assembly 210 may be coupled to the coupling space 2811 of the support assembly 270. The support assembly 270 defining the coupling space 2811 may further include a grinder fixing part 281 providing an attachable coupling space for the first grinder 211, a gear cover 282 coupled to a side surface of the grinder fixing part 281 to protect the planetary gear part 2913 (see FIG. 4(a)), and a gear fixing part 283 connected to an upper portion of the gear cover 282 to support the first gear part 2915.

[143] The grinder fixing part 281, the gear cover 282, and the gear fixing part 283 may be integrated with one another. For example, these elements may be formed as a single plastic item by injection molding. In addition, they may be formed of a metal material by a press process, or may be formed into a single grinder case 280 by a method such as welding or riveting.

[144] The support assembly 270 may further include a driving unit 290 configured to transmit driving force to the grinder assembly 210. The driving unit 290 may be installed in the installation space 915 (see FIG. 1) of the support 910 (see FIG. 1) and thus may not be exposed to the outside.

[145] The driving unit 290 may include a first driving unit 291 configured to rotate the first rotary part 250 and a second driving unit 292 configured to drive the second rotary part 260. The first driving unit 291 may include a first gear part 2915 connected to the first rotary part 250 to rotate the first rotary part 250, and a first power part 2911 configured to transmit rotational power to the first gear part. A planetary gear part 2913 may be disposed between the first power part 2911 and the first gear part 2915 to transmit rotation of the first power part 2911 to the first gear part 2915 by reducing the ro-

tational speed of the first power part 2911 to an appropriate speed.

[146] The second driving unit 292 may include a second gear part 2925 connected to the second rotary part 260 to rotate the second rotary part 260, and a second power part 2921 configured to transmit rotational power to the second gear part 2925.

[147] The controller (not shown) may be provided in the support 910 (see FIG. 1) or the base 920 (see FIG. 1). However, this is merely an embodiment. The controller may be arranged anywhere as long as the control can control the water supplier 400, the extractor 600, and the grinder 200 of the coffee extraction apparatus. When the whole bean supplier 100 configured to supply whole beans in the form of bean capsules is further provided, the controller (not shown) will also control the whole bean supplier 100. The controller (not shown) independently controls the first power part 2911 and the second power part 2921 to control the grinder 200. That is, the rotation of the first gear part 2915 is independent from the rotation of the second gear part 2925.

[148] The first gear part 2915 may rotate the first rotary part 250, thereby rotating the first burr 231. In other words, it serves to transmit the power required to grind whole beans. On the other hand, the second gear part 2925 may rotate the second rotary part 260 to move the second grinder 212 in the axial direction of the first burr 231.

[149] Accordingly, after the second burr 232 is coupled to the second rotary part 260 by the burr coupler 2122 and inserted into the first burr 231, the second burr 232 may be finely adjusted inside the first burr 231 in the axial direction of the first burr 231 by rotation of the second rotary part 260 to adjust the grinding degree.

[150] Accordingly, there is a large difference in power required for the first rotary part 250 for grinding beans and the second rotary part 260 for adjusting the grinding degree, and therefore the scale of the first power part 2911 to transmit power to the first rotary part 250 may be larger than the scale of the second power part 2921. Here, the scale of the first power part 2911 means that the torque or power of a first motor provided in the first power part 2911 is greater than that of a second motor provided in the second power part 2921.

[151] As illustrated in FIG. 4(a), the second driving unit 292 may be arranged on a lateral surface of the first driving unit 291. The second driving unit 292 may be fixed to a portion of the coupling space 2811 to rotate the second rotary part 260 (see FIG. 6(a))

[152] The first gear part 2915 may include a first main gear 2916 and a first subordinate gear 2917. The first subordinate gear 2917 may be connected to the first rotary part 250 provided in the first grinder 211.

[153] The first gear part may further include a gear connection arm 2918 configured to connect and support the first main gear 2916 and the first subordinate gear 2917, and an elastic member 2919 connected to the gear connection arm 2918 to provide elastic force. The elastic member 2919 is may be fitted onto a first main gear shaft 2916a,

which is a rotational shaft of the first main gear, and then fixed to the gear fixing part 283, which supports the first gear part 2915, to provide restoring force to the gear connection arm 2918.

[154] In addition, as a feature of the swing-type idle gear, the first main gear may be connected to the first main gear shaft 2916a and thus connected to the first power part 2911 via the planetary gear part 2913. In addition, the first main gear shaft 2916a is connected to the planetary gear part, and is only allowed to rotate in position.

[155] On the other hand, the first subordinate gear 2917, which is connected to the first main gear 2916, may rotate while revolving around an axis. A first subordinate gear shaft 2917a may be supported by the gear connection arm 2918 and serve to support rotation of the first subordinate gear 2917. The first subordinate gear shaft 2917a may move in the circumferential direction of the first main gear 2916 while supporting the rotation of the first subordinate gear. That is, the first subordinate gear 2917 may revolve around the first main gear 2916.

[156] When the first main gear 2916 rotates in a first rotation direction, the first subordinate gear 2917 and the gear connection arm 2918 may be rotated in a second rotation direction and connected to the first rotary part 250 to rotate the first rotary part in the first rotation direction. When the first main gear 2916 does not rotate, the gear connection arm 2918 and the first subordinate gear 2917 may be rotated in the first rotation direction and separated from the first rotary part by the restoring force of the elastic member 2919 (see FIG. 2(b)).

[157] That is, the restoring force of the elastic member 2919 may be designed to be less than the rotational power of the first main gear 2916 that rotates the rotational shaft of the first subordinate gear or he gear connection arm. Thus, only when the first main gear 2916 does not rotate, the restoring force may be transmitted to the first subordinate gear through the gear connection arm in the opposite direction to separate the first subordinate gear from the first rotary part.

[158] The elastic member 2919 may be a torsion spring coupled to the first main gear shaft 2916a and fixed to the gear fixing part 283. The torsion spring is a spring that works by twisting its end along its axis; that is, a flexible elastic member that stores mechanical energy when the torsion spring is twisted. When the torsion spring is twisted, the torsion spring exerts a torque in the opposite direction, proportional to the amount (angle) the torsion spring is twisted. Any element capable of connecting the first subordinate gear 2917 to the first rotary part when the first main gear 2916 rotates and separating the first subordinate gear 2917 from the first rotary part 250 when the first main gear 2916 stops may be provided in place of the elastic member. For example, the same function may be performed using an actuator in place of the elastic member.

[159] Thereby, it may be ensured that the first subordinate gear 2917 is always connected

to the first rotary part when rotating. In other words, even when repulsive force or vibration caused by an impact occurring during grinding of the whole beans on the first rotary part is momentarily transmitted in the opposite direction to the first subordinate gear 2917, the gear connection arm 2918 may freely rotate, and the rotational power of the main gear 2916 may keep the first subordinate gear 2917 connected to the first rotary part 250.

[160] Thus, the impact transmitted from the first rotary part 250 to the first main gear shaft 2916a or the first power part 2911 through the first main gear 2916 may be minimized, and accordingly the impact transmitted to the first gear part 2915, the planetary gear part 2913 and the first power part 2911 may be alleviated.

[161] In other words, the first subordinate gear shaft 2917a may revolve around the first main gear shaft 2916a while being spaced apart from the first main gear shaft 2916a by a certain distance by the gear connection arm 2918.

[162] In general, when the first main gear 2916 rotates in a first rotation direction, the first subordinate gear 2917, the first subordinate gear shaft 2917a, and the gear connection arm 2918 may rotate in a second rotation direction opposite to the first direction.

[163] The first grinder 211 may further include a first housing 241 configured to accommodate the first rotary part 250 and support the first rotary part. As described above, the first housing 241 may include a housing body 2412 defining a space to accommodate the first rotary part 250, a first opening 2411a provided in the housing body 2412 and opened at one end facing the extractor 600, a second opening provided in the housing body 2412 and opened an opposite end facing away from the extractor 600, a first communication hole 2413a formed through the housing body 2412 in a radial direction of the first rotary part 250, and a second communication hole 2413b formed through the housing body 2412 in a radial direction of the second rotary part 260.

[164] The first rotary part 250 may be rotatably connected to the first gear part 2915 through the first communication hole 2413a. Similarly, the second rotary part 260 may be rotatably connected to the second gear part 2925 through the second communication hole 2413b.

[165] Accordingly, as shown in FIG. 4(a), the first communication hole 2413a is positioned at a different height from the second communication hole 2413b. This is because the first rotary part 250 and the second rotary part 260 are arranged at different heights. In addition, the second driving unit is arranged biased to one side of the coupling space 2811 (see FIG. 6(a)), and accordingly the radial direction of the first rotary part 250 provided with the first communication hole 2413a may differ from the radial direction of the second rotary part 260 provided with the communication hole 2413b. In other words, even when it is assumed that the first communication hole 2413a and the

second communication hole 2413b are in the same plane, a straight line formed by the first communication hole 2413a around the first burr, and a straight line formed by the second communication hole 2413b may form a certain angle.

[166] Accordingly, since the first and second rotary parts 250 and 260 are installed at different positions, and the first gear part 2915 and the second gear part 2925 are installed at different positions, the first communication hole 2413a and the second communication hole 2413b may be formed at different positions in the housing body 2412. The sizes of the first communication hole 2413a and the second communication hole 2413b may also be different from each other. The directions in which the first communication hole 2413a and the second communication hole 2413b faces the outside from the housing body may also be different from each other.

[167] FIG. 4(b) shows an example of the second grinder 212 and the guide 262 coupled to each other. The guide 262 may include a first through-hole 2601 and a second through-hole 2602 formed to define an accommodation space 2622 to accommodate a portion of the second grinder 212 and connected to the accommodation space 2622. The first through-hole 2601 may be positioned on the side close to the first burr 231, and the second through-hole 2602 may be positioned on the side opposite to the first through-hole 2601. A portion of the second grinder 212 may be inserted through the second through-hole 2602, and be inserted into the first burr 231 through the first through-hole 2601.

[168] The inner circumferential surface of the guide 262 defining the accommodation space 2622 may be provided with an accommodation space thread 2262a having a thread shape to couple the burr coupler 2122 to the accommodation space 2622. The outer circumferential surface of the burr coupler may also be provided with a burr coupler thread 2122a having a thread shape. Thus, the burr coupler thread 2122a and the accommodation space thread 2262a may be screw-coupled to each other. Of course, not using by the user, it is possible to separate by the screw coupling between the burr coupler thread 2122a and the accommodation space thread 2262a may be loosened to separate the guide from the burr coupler when the apparatus is not in use or needs to be cleaned.

[169] Accordingly, the first grinder 211 and the second grinder 212 are separable from each other. Specifically, the first burr 231 and the second burr 232 are separable from each other. In other words, the first grinder 211 and the burr coupler 2122 are separable from each other. Accordingly, the first grinder 211 and the second burr 232 may be coupled when in use and may be separated when they are not in use or when they need to be cleaned. That is, the first grinder and the second burr 232 may be selectively separated.

[170] The guide 262 may include a plurality of guide protrusions 2621 extending from one

end thereof including the first through-hole 2601. The plurality of guide protrusions 2621 may be provided on an arc including the first through-hole 2601 at constant intervals. The guide protrusions 2621 may be provided as a single integrated guide protrusion. The plurality of guide protrusions 2621 may couple the guide 262 to the rotating ring 261 through a rotating ring thread 2612a provided on the rotating ring inner circumferential surface 2612.

[171] The guide protrusions 2621 may be provided with a protrusion stopper 2621a to reinforce the guide protrusions 2621 and prevent the guide from rotating. The protrusion stopper 2621a has a rib shape extending from the guide protrusion 2621 toward the extractor 600. When the second rotary part 260 rotates, the protrusion stopper 2621a may cause the rotating ring 261 to rotate. At this time, however, the guide 262, which is screwed to the inner circumferential surface of the rotating ring, may move in place in the axial direction of the first bur.

[172] The second burr 232 may include a second burr through-hole 2323 formed through the second burr 232. A fixing shaft 2128 may be coupled to the second burr through-hole 2323 in a penetrating manner.

[173] The burr coupler 2122, which supports the second burr 232 and couples the second burr 232 to the first grinder, may be partially accommodated in the accommodation space 2622 together with the second burr 232.

[174] The burr coupler 2122 may include an installation hole 2122c formed therethrough in the axial direction of the first burr. The second burr 232 may be installed in the second burr installation hole 2122c. The second burr 232 may further include a burr coupler support rib 2122b connected to the inner circumferential surface of the second burr installation hole 2122c to support the second burr 232. The installation hole is provided because the coffee powder discharged through the first burr outlet falls into the accommodation space of the guide, and a portion of the coffee powder may be discharged to the extractor 600 through the installation hole 2122c. Accordingly, the handle 2125 may also have a ring shape.

[175] Thus, the movement path of the discharged coffee powder has only through-holes and some ribs, and therefore coffee powder accumulated in an area other than the extractor may be minimized.

[176] The present disclosure is directed to a coffee extraction apparatus 1000 in which the path of the ground beans passing through the grinder 200 is simplified and minimized. The grinder 200, employs a conical burr, allows the outer burr (the first bur), not the center burr, to rotate, and thus does not position the driving unit in the discharge area of the coffee powder. Thus, when gravity acts on the coffee extraction apparatus 1000, the coffee powder may be discharged directly to the extractor 600 without interference because there is no driving device except multiple holes in the path through which the

coffee powder is discharged. Accordingly, the coffee powder wasted or accumulated in the grinder 200 to cause contamination may be minimized.

[177] FIG. 5 shows an example of the second rotary part, the second grinder 212, and the second driving unit 292 coupled to one another. The second driving unit 292 may include a second gear part 2925 and a second power part 2921. When a second gear shaft 2929 is rotated by rotation of the second power part 2921, a second gear 2927 coupled to the second gear shaft 2929 may rotate. When the second gear 2927 rotates, the rotating ring 261 of the second rotary part 260 will finally rotate.

[178] The rotating ring 261 may include a rotating ring through-hole 2613 formed therethrough in a ring shape in the axial direction of the first burr. Gear teeth may be provide on a rotating ring outer circumferential surface 2611, which is the outer circumferential surface of the rotating ring 261, at a position corresponding to the second gear 2927, and thus the rotating ring 261 may engage with the second gear 2927. A rotating ring inner circumferential surface 2612, which is the inner circumferential surface of the rotating ring 261, may be provided with a rotating ring thread 2612a in the form of a screw thread, and thus the guide protrusion 2621 may be screwed thereto.

[179] The rotating ring 261 and the guide 262 may be fixed by a plurality of second rotary part supports 2415 (see FIG. 9) and a plurality of guide fixing parts 2416 (see FIG. 9) extending from the housing body 2412, respectively. When the rotating ring 261 is rotated by the protrusion stopper 2621a shown in FIG. 4(b), the guide 262 may not rotate along the rotating ring thread 2612a, but may move in the axial direction of the first burr. Accordingly, using this operation, the distance between the first burr 231 and the second burr 232 may be adjusted, that is, the size of the grinding space may be adjusted to adjust the size of the ground coffee powder.

[180] The second driving unit 292 may be coupled to one side of the coupling space 2811 through a driving coupler 2923 and a driving fastener 2924.

[181] FIG. 6(a) shows the grinder assembly 210 separated from the support assembly 270. That is, when used, the grinder assembly 210 is coupled to the coupling space 2811. When it is not in use or needs to be cleaned, the grinder assembly 210 may be separated. After the separation, the first burr 231 and the second burr 232 may be exposed, respectively, and may thus be easily cleaned using a cleaning brush.

[182] When the grinder assembly 210 is coupled to the coupling space 2811 defined in the grinder fixing part 281, it may be engaged with the gear teeth of the first gear part 2915, the first rotary part, the second gear part, and the second rotary part. To this end, the first rotary part 250 and the second rotary part 260 may be connected to the first gear part 2915 and the second gear part 2925 through the first communication hole 2413a and the second communication hole 2413b, respectively.

[183] FIG. 6(b) shows the first grinder 211 and the second grinder 212 separated from each

other. The second grinder 212 may include a second burr 232, a burr coupler 2122 coupled to the second burr 232, a fixing shaft 2128 arranged through the second burr 232 and the burr coupler 2122 in the axial direction of the first burr, and a handle 2125 coupled to the burr coupler 2122 to provide a gripping portion.

[184] The first grinder 211 may include a first burr 231, a first rotary part 250 configured to rotate the first burr, a first bearing 2119a and a second bearing 2119b rotatably coupled to the first rotary part, a guide 262 coupled to the burr coupler 2122, and a rotating ring 261 configured to move the guide in the axial direction of the first burr to adjust the grinding degree. The second rotary part 260 may be located closer to the first burr outlet 2319 than the first rotary part 250.

[185] The first grinder 211 may include a first housing 241 configured to accommodate the first burr 231, the first rotary part 250 including the bearing part, and the second rotary part 260, and a second housing 242 coupled to the first housing 241. The second grinder 212 may be inserted through the first opening 2411a and the second through-hole 2602, and thus the second burr 232 may be inserted into the first burr through-hole 2313. An example of the inserted second burr is shown in FIG. 6(c).

[186] FIG. 6(c) illustrates that the second burr 232 is inserted into the first burr through-hole 2313, and the fixing shaft 2128 is inserted into and supported by the fixing shaft coupling groove 2421a. The distal groove end of the fixing shaft coupling groove 2421a may be spaced apart from the inserted end of the fixing shaft 2128 by a distance of h. This is because the groove does not completely fix the fixing shaft 2128, but supports the circumferential surface of the fixing shaft 2128. In addition, the gap space may be changed as the guide 262 moves in the axial direction (indicated by an arrow) of the first burr when the second rotary part 260 rotates. That is, in order to set the grinding degree, the depth by which the fixing shaft 2128 is inserted may be adjusted. Thereby, the size of the grinding space 238 may be adjusted. That is, the gap distance between the first burr 231 and the second burr 232 may be adjusted. Specifically, the gap between the first burr blade 2316 (see FIG. 3) and the second burr blade 2326 (see FIG. 3) may be adjusted.

[187] FIG. 7 shows an example of the first gear part 2915 and the first rotary part 250. The first driving unit 291 may include the first gear part 2915 and the first power part 2911. The rotational power of the first power part 2911 will be transmitted to the first main gear 2916 through the planetary gear part 2913 and the first main gear shaft 2916a connected to the planetary gear part 2913. The first subordinate gear 2917 is positioned between the first main gear 2916 and the first rotary part 250. The first subordinate gear 2917 may engage with the first main gear 2916 and rotate in a direction opposite to the rotation direction of the first main gear 2916.

[188] The first main gear shaft 2916a may rotate the first main gear 2916. The first main

gear 2916 may be included in the gear fixing part 283. The first main gear shaft 2916a may be arranged through the gear fixing part 283 such that a portion of the first main gear shaft 2916a may be exposed to the outside. A gear connection arm 2918 connecting the first main gear 2916 and the first subordinate gear 2917 may be rotatably coupled to the portion of the first main gear shaft 2916a exposed to the outside. In addition, an elastic member may be coupled to the first main gear shaft 2916a.

[189] The first subordinate gear shaft 2917a may be connected to the gear connection arm 2918 at a position on the side opposite to the side at which the gear connection arm 2918 and the first main gear shaft 2916a are connected. Unlike the first gear shaft 2916a, the first subordinate gear shaft 2917a is connected only to the gear connection arm 2918, and thus the first subordinate gear shaft 2917a is supported by the gear connection arm 2918. That is, the first main gear 2916 may be supported at both ends of the first main gear shaft 2916a, while the first subordinate gear 2917 may be supported only at one end of the first subordinate gear shaft 2917a to which the gear connection arm 2918 is connected.

[190] Accordingly, the first main gear 2916 may rotate only at a fixed position where the first main gear shaft 2916a is fixed, while the first subordinate gear shaft 2917a may rotate around the first main gear shaft 2916a as the first subordinate gear 2917 is connected to the gear connection arm 2918. In other words, while the first subordinate gear 2917 is rotated by the rotation of the first main gear 2916 through gear teeth engagement, the first subordinate gear shaft 2917a may move (revolve) around the first main gear 2016 in the circumferential direction of the first main gear 2016.

[191] Accordingly, when the first main gear 2916 rotates, both the gear connection arm 2918 and the first subordinate gear rotate to engage with the first rotary part to transmit rotational power. When the first main gear 2916 rotates in a first rotation direction opposite to the clockwise direction, the first subordinate gear 2917 will rotate in a second rotation direction opposite to the first rotation direction. In this case, the gear connection arm will rotate in the first rotation direction due to the revolution of the first subordinate gear, and be engaged with gear teeth that may be provided on the first rotary part outer circumferential surface 250a. Then, the first rotary part 250 will rotate.

[192] That is, the first main gear 2916 is only allowed to rotate on its own axis, and the first subordinate gear 2917 may perform both rotation and revolution.

[193] The first rotary part 250 may be rotatably accommodated in the housing body 2412. As described above, the first rotary part through-hole 2501 formed through the first rotary part 250 in the axial direction may be coupled to communicate with the first burr through-hole 2313. The first rotary part outer circumferential surface 250a may have

gear teeth. The gear teeth may engage with the first subordinate gear 2917. As shown in the figure, the first rotary part 250 may be coupled to the first burr 231 to rotate the first burr 231. In FIG. 7, the first rotary part 250 may be positioned closer to the second opening 2411b than the first burr 231.

[194] In addition, the second burr 232 may be inserted into the first burr 231 and the fixing shaft 2128 may be inserted into the second burr through-hole 2323.

[195] The elastic member 2919 may be rotatably coupled to the first main gear shaft 2916a. One end of the elastic member 2919 may be fixed to the gear fixing part 283, the opposite end of the elastic member 2919 may be connected to the gear connection arm 2918. When the first main gear 2916 rotates in the first rotation, the elastic member 2919 fixed to the gear fixing part 283 may provide elastic force in the second rotation direction, which is the opposite direction. Accordingly, when the first main gear 2916 does not rotate, the first gear part 2915 will be separated from the first rotary part 250 due to the restoring force applied by the elastic member 2919.

[196] On the other hand, when the first main gear 2916 rotates in the first rotation direction, the first subordinate gear shaft 2917a will move around the first main gear shaft 2916a along the circumference of the first main gear 2916 in the first rotation direction such that the first subordinate gear 2917 engage with the first rotary part 250, overcoming elastic force.

[197] In other words, when the first main gear 2916 rotates in the first rotation direction, the gear connection arm 2918 may rotate in the first rotation direction, and the first subordinate gear 2917 may rotate in the second rotation direction to be connected to the first rotary part 250. When the first main gear 2916 is stopped, the gear connection arm 2918 may be rotated in the second rotation direction by the elastic member 2919, thereby releasing the connection between the first subordinate gear 2917 and the first rotary part 250.

[198] FIGS. 8(a) and 8(b) show an operation mechanism of the first gear part 2915. FIG. 8(a) shows the state and position of the first gear part 2915 and the force applied by the elastic member when the first driving unit 291 is not driven. When the first power part 2911 is not driven, the first main gear 2916, the first subordinate gear 2917, and the first rotary part 250 will not rotate. That is, the first subordinate gear 2917 may be at the initial position of the first subordinate gear, which is spaced apart from the first rotary part 250 by a predetermined distance.

[199] After the first gear part 2915 is rotated, that is, when grinding is completed through rotation of the first rotary part 250, the first subordinate gear shaft 2917a supported by the gear connection arm 2918 will be moved away from the first rotary part 250 by the elastic member 2919 in the circumferential direction of the first main gear 2916. Accordingly, the first subordinate gear shaft 2917a may rotate away from the first rotary

part 250 along the first main gear shaft 2916a.

[200] FIG. 8(b) shows the first main gear 2916, the first subordinate gear 2917, the gear connection arm, the rotation direction of the first rotary part, and the force applied by the elastic member when the first driving unit 291 rotates in the first rotation direction, for example, counterclockwise. Unlike FIG. 8(a), when the first power part 2911 operates, the first main gear 2916 will rotate. For example, when the first main gear 2916 rotates in the first rotation direction, for example, a counterclockwise direction indicated by an arrow above the first main gear in the figure, the first subordinate gear 2917 will engage with the first main gear 2916, and accordingly rotate in the second rotation direction opposite to the first rotation direction, e.g., clockwise. This rotational motion is caused by the rotation of the first subordinate gear 2917.

[201] On the other hand, when the first subordinate gear 2917 rotates, the first subordinate gear shaft 2917a supported by the gear connection arm 2918 may rotate in the same rotation direction as the first main gear 2916. Because the gear connection arm 2918 only supports the first subordinate gear shaft 2917a to rotate, while the first subordinate gear 2917 rotates in the second rotation direction, the gear connection arm 2918 may rotate in the direction opposite to the rotation direction of the first subordinate gear 2917. Accordingly, when the first main gear 2916 rotates in the first rotation direction, the first subordinate gear 2917 may rotate (on its own axis) in the second rotation direction, while the first subordinate gear shaft 2917a may move (revolve) in the first rotation direction. Accordingly, the gear connection arm will also rotate in the first rotation direction. The rotational power of the gear connection arm 2918 according to the first main gear 2916 and the first subordinate gear 2917 should be greater than the restoring force applied by the elastic member 2919. This is because the gear connection arm 2918 should overcome the restoring force applied by the elastic member 2919 and rotate such that the first subordinate gear 2917 is connected to the first rotary part 250.

[202] The first rotary part 250 may engage with gear teeth provided on the first rotary part outer circumferential surface 250a. Thereby, the rotational power of the first power part 2911 may be transmitted through the planetary gear part 2913, the first main gear 2916 and the first subordinate gear 2917.

[203] This structure may reduce the impact and vibration transmitted when whole beans are ground. If the first gear part 2915 is directly coupled to the first rotary part 250 without the first subordinate gear 2917, the impact generated when the whole beans are ground will be transmitted to the first gear part 2915 through the first rotary part 250. Accordingly, the first subordinate gear 2917, which serves as an idle gear, is required to perform a function of reducing the impact to the first main gear 2916. In addition, since the first subordinate gear 2917 is allowed to revolve by the gear connection arm

2918, the impact on the first subordinate gear 2917 may be absorbed through the gear connection arm 2918. That is, the grinding impact may not be transmitted to the first main gear 2916 through the gear connection arm, but may be absorbed by the gear connection arm 2918 rotating in the opposite direction, for example, the second rotation direction. As a result, the impact may be relieved and vibration may be attenuated.

[204] In other words, when the driving force of the first power part 2911 is transmitted to the first rotary part 250 through a swing type idle gear as in the embodiment shown in FIG. 7, the impact according to grinding of the whole beans may be alleviated. Thereby, vibration may be reduced. The impact according to grinding of the whole beans will be generated in the grinder assembly 210 and transmitted to the first power part 2911 through the first gear part 2915. However, because the shaft of the idle gear is in a unrestricted state, the impact may be absorbed by the swing of the idle gear. Unlike the first main gear shaft 2916a, the first subordinate gear shaft 2917a is not fixed to a frame such as the gear fixing part 283. Accordingly, large impacts generated from the grinder assembly 210 may be prevented from being directly transmitted to cause vibration.

[205] When the first rotary part 250 is directly connected to the first main gear 2916 without the first subordinate gear 2917, an issue related to positional accuracy may be raised. In the coffee extraction apparatus 1000, the first grinder 211 and the second grinder 212, more specifically, the first burr 231 and the second burr 232 are configure to be separated from each other to improve cleaning performance. To this end, the grinder assembly 210 must be detachable from the support assembly 270.

[206] Accordingly, if the first rotary part 250 and the first main gear 2916 are directly connected, the gear teeth provided on the first rotary part outer circumferential surface 250a and the gear teeth of the first main gear 2916 are likely to hit each other to be damaged every time they are attached and detached. In order to prevent such damage, the first gear part 2915 may include the first subordinate gear 2917, the gear connection arm 2918, and the elastic member 2919 in addition to the first main gear 2916. Accordingly, when the gear part 2915 does not rotate, the first gear part 2915 may be separated from the first rotary part 250 to prevent collision between the gear teeth as described above.

[207] For this purpose, the elastic member 2919 may employ a torsion spring or the like. Here, the restoring force of the torsion spring should not obstruct the first subordinate gear 2917 from being connected to the first rotary part 250 when the whole beans are ground, and should be sufficient to separate the first subordinate gear 2917 from the first rotary part 250 when the whole beans are not ground.

[208] Of course, any mechanical connection capable of connecting and releasing the first

gear part 2915 to and from the first rotary part 250 may be used in place of the elastic member 2919. For example, before the grinder assembly 210 is separated, the first gear part 2915 may be manually separated from the first rotary part 250.

[209] FIG. 9 shows an example of the second rotary part 260. Taste of coffee is determined by many factors including freshness of coffee, temperature and type of water, and extraction method. Among such factors, grinding is one of the most important factors in the coffee extraction process. Grinding is a process to increase the area for coffee extraction by grinding beans. This is because when coffee is extracted through grinding, various coffee ingredients can dissolve in water more easily, affecting the coffee flavor. Accordingly, the operation of changing the particle size of individual coffee powder grains, that is, coffee particles, through grinding may be referred to as adjustment of the grinding degree.

[210] The second rotary part 260 is configured to adjust the grinding degree. Specifically, the second rotary part 260 may be connected to the burr coupler 2122 and may rotate to move the burr coupler 2122 in the axial direction of the first burr 231 to adjust the depth by which the second burr 232 is inserted into the first burr 231.

[211] The second rotary part 260 may be any structure capable of performing linear motion through rotation, such as a bevel gear, a linear motor, or a pinion. That is, when the second rotary part 260 rotates, the second burr 232 may move in the axial direction of the first burr 231 within the grinding space 238 to adjust the size of the grinding space 238. The movement of the second burr 232 means the movement of the burr coupler 2122, which in turn means the movement of the second grinder 212. Accordingly, by adjusting the distance between the first burr blade 2316 and the second burr blade 2326, the size which the whole beans are ground to have may be adjusted.

[212] In other words, the second burr 232 inserted into the first burr 231 may adjust the depth L by which the fixing shaft 2128 (see FIG. 6(b)) is inserted into the fixed-shaft coupling groove 2421a (see FIG. 6(b)).

[213] FIG. 9 shows a second rotary part 260 having a double ring structure as an example of the second rotary part 260. First, the second rotary part 260 may be accommodated in the housing body 2412, and be positioned closer to the first opening 2411a than the first rotary part 250.

[214] In the housing body 2412, the second opening 2411b is larger than the first opening 2411a. This is because the outer diameter of the first rotary part 250 is larger than the outer diameter of the second rotary part 260. Because the first rotary part 250 configured to rotate the first burr 231 needs a much greater torque, the outer diameter of the first rotary part 250 must be as large as possible. On the other hand, the second rotary part 260 does not require a large force because it is only necessary to adjust the grinding degree by moving the inserted second burr 232 slightly in the axial direction

of the first burr 231. Accordingly, the housing body 2412 may have a curved shape according to a space accommodating the first rotary part 250 and the second rotary part 260.

[215] The second rotary part 260 accommodated as above may further include a rotating ring 261 connected to the second driving unit 292 so as to rotate, a rotating ring through-hole 2613 through the rotating ring 261 in an axial direction of the first burr 231, a cylindrical guide 262 arranged in the rotating ring through-hole 2613 and having an accommodation space 2622 defined therein to be coupled with the burr coupler 2122, and a first through-hole 2601 formed through one surface of the guide 262 on the side close to the first burr inlet 2318 to communicate with the accommodation space 2622. The second burr 232 may be inserted into the first burr 231 through the first through-hole 2601.

[216] That is, the second rotary part 260 has a dual structure, and may include the rotating ring 261 rotatably connected to the second gear 2927, and the guide 262 inserted into the rotating ring to move in the axial direction of the first burr 231. The rotating ring 261 may include the rotating ring through-hole 2613 formed through the rotating ring in the axial direction of the first burr 231. The guide 262 may be inserted into the rotating ring through-hole 2613.

[217] Gear teeth may be provide on the rotating ring outer circumferential surface 2611, which is the outer circumferential surface of the rotating ring 261, at a position corresponding to the second gear 2927, and the rotating ring 261 may engage with the second gear 2927 through the second communication hole 2413b. The rotating ring inner circumferential surface 2612, which is the inner circumferential surface of the rotating ring 261, may be provided with a rotating ring thread 2612a in the form of a screw thread, and thus may be screw-coupled to the guide 262.

[218] The guide 262 may be inserted into the rotating ring through-hole 2613. As described above, in order to be coupled with the rotating ring thread 2612a, the guide 262 may include a plurality of guide protrusions 2621 formed on the outer circumferential surface of the guide to extend away from the center thereof in a radial direction. When the plurality of guide protrusions 2621 is coupled to the rotating ring screw thread 2612a, and the rotating ring 261 rotates, the plurality of guide protrusions 2621 may move the guide 262 a in the axial direction of the first bur.

[219] The plurality of guide protrusions 2621 may be provided on an arc including the first through-hole 2601 at constant intervals. The guide protrusions 2621 may be provided as a single integrated guide protrusion. The plurality of guide protrusions 2621 may couple the guide 262 to the rotating ring 261 through a rotating ring thread 2612a provided on the rotating ring inner circumferential surface 2612.

[220] The second rotary part 260 may further include formed through one surface of the

guide 262 on the side facing away from the first burr inlet 2318 to communicate with the accommodation space 2622. The coffee powder discharged through the first burr outlet 2319 will be discharged to the extractor 600 through the second through-hole 2602.

[221] In other words, the guide 262 may include a first through-hole 2601 and a second through-hole 2602 formed to define an accommodation space 2622 to accommodate a portion of the second grinder 212 and connected to the accommodation space 2622. The first through-hole 2601 is positioned closer to the first burr 231 than the second through-hole 2602, and the second through-hole 2602 is positioned on the side opposite to the first through-hole 2601. A portion of the second grinder 212 may be inserted through the second through-hole 2602, and be inserted into the first burr 231 through the first through-hole 2601.

[222] A portion of the second burr 232 and one end of the fixing shaft 2128 may protrude through the first through-hole 2601, and the burr coupler may not protrude through the first through-hole. This is intended to ensure efficient installation in a narrow space in consideration of the sizes of the first through-hole 2601 and the first burr through-hole 2313.

[223] The guide 262 may include an accommodation space thread 2262a, and the burr coupler 2122 may include a burr coupler thread 2122a formed on the outer surface of the burr coupler 2122. Thus, the burr coupler 2122 may be screwed to the guide 262.

[224] Specifically, the inner circumferential surface of the guide 262 defining the accommodation space may be provided with an accommodation space thread 2262a having a thread shape to couple the burr coupler 2122 to the accommodation space 2622. The outer circumferential surface of the burr coupler 2122 may also be provided with a burr coupler thread 2122a having a thread shape. Thus, the burr coupler thread 2122a and the accommodation space thread 2262a may be screw-coupled to each other. Of course, not using by the user, it is possible to separate by the screw coupling between the burr coupler thread 2122a and the accommodation space thread 2262a may be loosened to separate the guide from the burr coupler when the apparatus is not in use or needs to be cleaned.

[225] Accordingly, the first grinder 211 and the second grinder 212 are separable from each other. Specifically, the first burr 231 and the second burr 232 are separable from each other. In other words, the first grinder 211 and the burr coupler 2122 are separable from each other. Accordingly, the first grinder 211 and the second burr 232 may be coupled when in use and may be separated when they are not in use or when they need to be cleaned. That is, the first grinder and the second burr 232 may be selectively separated.

[226] The guide protrusions 2621 may be provided with a protrusion stopper 2621a (see

FIG. 4(b)) to reinforce the guide protrusions 2621 and prevent the guide from rotating. The protrusion stopper 2621a (see FIG. 4(b)) has a rib shape extending from the guide protrusion 2621 toward the extractor 600. When the second rotary part 260 rotates, the protrusion stopper 2621a (see FIG. 4(b)) may cause the rotating ring 261 to rotate. At this time, however, the guide 262, which is screwed to the inner circumferential surface of the rotating ring, may be obstructed from rotating by the protrusion stopper 2621a and move in place only in the axial direction of the first bur.

[227] To this end, the rotating ring 261 and the guide 262 may be supported by a second rotary part support 2415 extending from the housing body 2412, respectively. The second rotary part support 2415 may include a rotating ring support 2415a configured to support the rotating ring and a guide support 2415b configured to support the guide.

[228] Specifically, the second rotary part 260 may further include a rotating ring support 2415a extending from a portion of a portion of the housing body 2412 in a direction from the first opening 2411a toward the second opening 2411b to rotatably support the rotating ring 261 on the housing body 2412, and a guide support 2415b configured to support the guide 262.

[229] The second rotary part 260 may further include a guide fixing part 2416 formed by extending a portion of the housing body 2412 in a direction from the first opening 2411a toward the second opening 2411b to prevent rotation the guide 262 and guide movement of the guide 262 in the axial direction of the first burr 231.

[230] When necessary, a plurality of rotating ring support 2415a, a plurality of guide supports 2415b, and a plurality of guide fixing parts 2416 may be provided. The rotating ring supports 2415a, the guide supports 2415b, and the guide fixing parts 2416 may be arranged in a space between the rotating ring through-hole 2613 and the outer circumferential surface of the guide 262.

[231] Strictly speaking, the extended length of the guide protrusion 2621 extending from a portion of the outer circumferential surface of the guide 262 may screw-couple the guide 262 to the rotating ring thread 2612a, but the outer circumferential surface of the guide 262 is smaller than the diameter of the rotating ring through-hole 2613. Accordingly, a predetermined gap is present between the rotating ring through-hole 2613 and the outer circumferential surfaces of the guide 262 except for positions where the plurality of guide protrusions 2621. The rotating ring support 2415a, the guide support 2415b, and the guide fixing part 2416 may be arranged in the gap.

[232] The rotating ring support 2415a and the guide support 2415b may be hook-coupled to the guide 262 and the rotating ring 261, respectively. For hook coupling, the hook direction of the rotating ring support 2415a may be opposite to the hook direction of the guide support 2416b. The rotating ring support 2415a supports the rotating ring 261 by pushing the rotating ring 261 inside and out, while the guide support 2415b

pushes and fix the outer circumferential surface of the guide 262 toward the first through-hole 2601, i.e., inwardly. However, this is merely an embodiment. The rotating ring 261 and the guide 262 may be supported in a different manner.

[233] The guide fixing part 2416 may be positioned adjacent to the plurality of guide protrusions 2621. That is, one guide protrusion 2621 may be positioned between the guide fixing parts 2416. Accordingly, when the rotating ring 261 rotates, the guide 262 is obstructed from rotating. Accordingly, when the rotating ring 261 is rotated, the guide protrusions 2621 screw-coupled to the rotating ring thread 2612a may be moved in the axial direction of the first burr according to rotation of the rotating ring.

[234] In other words, when the rotating ring 261 is rotated by the rotation of the second gear, the guide 262 may move along the rotating ring thread 2612a in the axial direction of the first burr instead of rotating. Thus, the movement of the guide 262 may mean moving the burr coupler 2122 coupled through the accommodation space thread 2622a, and the movement of the burr coupler 2122 may mean moving the second burr 232 and the fixing shaft 2128. Accordingly, the size of the ground coffee powder may be adjusted by adjusting the size of the grinding space, i.e., the depth of insertion between the first burr 231 and the second burr 232 or the depth of insertion of the fixing shaft 2128 into the fixing shaft coupling groove 2421a.

[235] Adjusting the insertion depth between the first burr 231 and the second burr 232 means that the distance between the first burr blade 2316 and the second burr blade 2326 may be adjusted.

[236] Various embodiments have been described in the best mode for carrying out the invention.

[237] It will be apparent to those skilled in the art that various modifications and variations may be made in the present disclosure without departing from the spirit and scope of the disclosure. Thus, it is intended that the present disclosure cover the modifications and variations of this disclosure provided they come within the scope of the appended claims and their equivalents.

Claims

[Claim 1] A coffee extraction apparatus comprising:
a first burr configured to rotate to grind supplied whole beans;
a first burr through-hole formed through the first burr in an axial direction of the first burr;
a first burr inlet disposed at one end of the first burr through-hole to allow the whole beans to be introduced thereinto;
a first burr outlet disposed at an opposite end of the first burr through-hole to discharge the ground beans as coffee powder;
a second burr inserted into the first burr through-hole through the first burr outlet to define a grinding space for grinding the whole beans together with the first burr;
a first rotary part coupled to an outer surface of the first burr to rotate the first bur;
a first power part configured to generate rotational power for rotation of the first rotary part;
a first gear part including a first main gear connected to the first power part to rotate at a fixed position; and a first subordinate gear configured to rotate while moving in a circumferential direction of the first rotary part according to rotation of the first main gear;
an extractor opened on a side facing the first burr outlet to receive the coffee powder discharged through the first burr outlet; the extractor being configured to mix the coffee powder with water to extract coffee liquid; and
a water supplier configured to supply water to the extractor,
wherein, when the first main gear rotates, the first subordinate gear is connected to the first rotary part.

[Claim 2] The coffee extraction apparatus of claim 1, wherein the first gear part further includes:
a gear connection arm rotatably coupled to the first main gear and configured to maintain a predetermined distance between the first main gear and the first subordinate gear; and
an elastic member configured to transmit restoring force in a direction opposite to a rotation direction of the gear connection arm.

[Claim 3] The coffee extraction apparatus of claim 2, wherein, when the first main gear rotates in a first rotation direction, the gear connection arm may rotate in the first rotation direction, and the first subordinate gear

is rotated in a second rotation direction opposite to the first rotation direction and connected to the first rotary part, and
wherein, when the first main gear is stopped, the gear connection arm is rotated in the second rotation direction by the elastic member, and the first subordinate gear is disconnected from the first rotary part.

[Claim 4] The coffee extraction apparatus of claim 2, wherein the elastic member is a torsion spring.

[Claim 5] The coffee extraction apparatus of claim 1, further comprising:
a first housing configured to accommodate and support the first rotary part,
wherein the first housing comprises:
a housing body defining a space to accommodate the first rotary part and having both ends open;
a first opening provided in the housing body and having one end opened on a side close to the extractor; and
a second opening provided in the housing body and having an opposite end opened on a side facing away from the extractor,
wherein the whole beans are ground into the coffee powder through the first burr inlet and the first burr outlet and then discharged through the first opening.

[Claim 6] The coffee extraction apparatus of claim 5, further comprising:
a burr coupler coupled to one end of the second burr positioned on a side facing away from the first burr inlet to move the second burr in the axial direction of the first burr.

[Claim 7] The coffee extraction apparatus of claim 6, further comprising:
a fixing shaft arranged through and coupled to the second burr and the burr coupler in the axial direction of the first burr.

[Claim 8] The coffee extraction apparatus of claim 7, further comprising:
a second housing comprising a whole bean introduction hole allowing the whole beans to be introduced therethrough, the second housing being coupled to the first housing in the axial direction of the first burr to allow the first rotary part to rotate,
wherein the whole beans introduced through the whole bean introduction hole are ground into the coffee powder while moving from the first burr inlet to the first burr outlet, and then discharged to the extractor through the first opening.

[Claim 9] The coffee extraction apparatus of claim 8, wherein the second housing further comprises:

a fixing shaft support configured to support the fixing shaft inserted into the whole bean introduction hole,
wherein the fixing shaft support is connected to an inner surface of the whole bean introduction hole by at least one reinforcing rib arranged between the inner surface of the whole bean introduction hole and the fixing shaft support.

[Claim 10] The coffee extraction apparatus of claim 9, wherein the first housing further comprises:
a first communication hole formed through the housing body in a radial direction of the first rotary part,
wherein the first rotary part has a gear shape on an outer circumferential surface of the first rotary part,
wherein the first rotary part and the first gear part are rotatably connected to each other through the first communication hole.

[Claim 11] The coffee extraction apparatus of claim 10, further comprising:
a second rotary part accommodated in the housing body so as to be positioned closer to the first opening than the first rotary part, the second rotary part being connected to the burr coupler to move the second burr inserted into the first burr in the axial direction of the first burr to adjust a size of the grinding space.

[Claim 12] The coffee extraction apparatus of claim 11, wherein the first rotary part and the second rotary part rotate independently.

[Claim 13] The coffee extraction apparatus of claim 12, further comprising:
a second gear part configured to transmit rotational power to the second rotary part; and
a second power part configured to rotate the second gear part.

[Claim 14] The coffee extraction apparatus of claim 13, further comprising:
a second communication hole formed through the housing body in a radial direction of the second rotary part,
wherein the first rotary part and the first gear part are connected to each other through the first communication hole to rotate, and
wherein the second rotary part and the second gear part are connected to each other through the second communication hole.

[Claim 15] The coffee extraction apparatus of claim 14, wherein the radial direction of the first rotary part having the first communication hole is different from the radial direction of the second rotary part having the second communication hole.

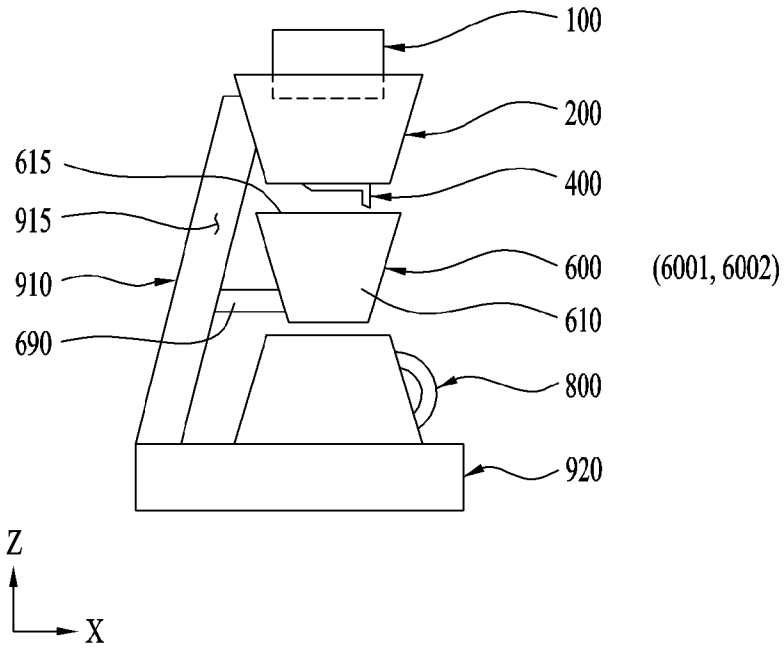
[Claim 16] The coffee extraction apparatus of claim 2, wherein the first gear part

further includes:
a first main gear shaft configured to rotate the first main gear, the first main gear shaft being connected to the gear connection arm; and
a first subordinate gear shaft configured to support the first subordinate gear and connect the first subordinate gear to the gear connection arm,
wherein, when the first subordinate gear rotates in a first rotation direction, the first subordinate gear shaft rotates around the first main gear shaft in the first rotation direction, and the first subordinate gear rotates in a second rotation direction opposite to the first rotation direction.

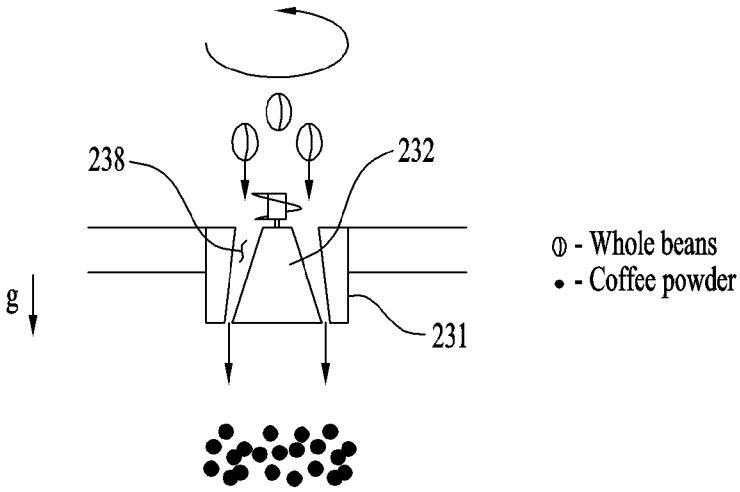
[Claim 17] The coffee extraction apparatus of claim 5, further comprising:
a planetary gear part positioned between the first power part and the first main gear to reduce a rotational speed of the first power part at a predetermined ratio to rotate the first main gear.

[Claim 18] The coffee extraction apparatus of claim 17, further comprising:
a grinder fixing part providing a space allowing the housing body to be detachably coupled thereto;
a gear cover coupled to a side surface of the grinder fixing part to protect the planetary gear part; and
a gear fixing part coupled to an upper portion of the gear cover to support the first gear part,
wherein the grinder fixing part, the gear cover, and the gear fixing part is integrated with each other.

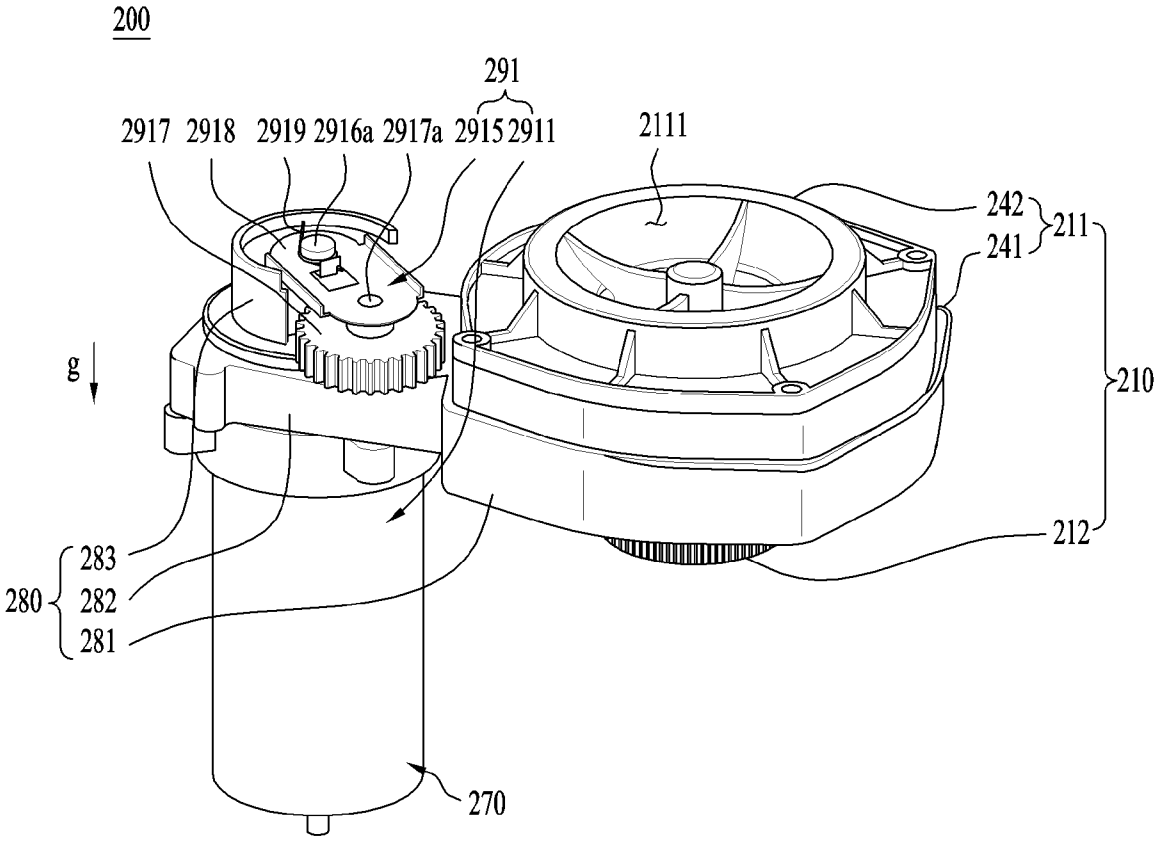
[Fig. 1]



[Fig. 2]


238
232
231
g
- Whole beans
- Coffee powder

(a)


200
291
2917
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2916a
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g
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282
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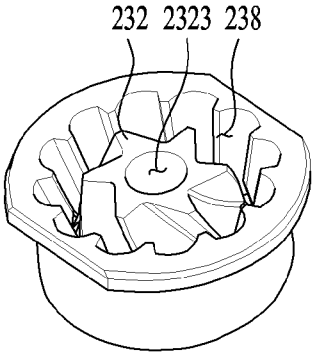
280
270

(b)

[Fig. 3]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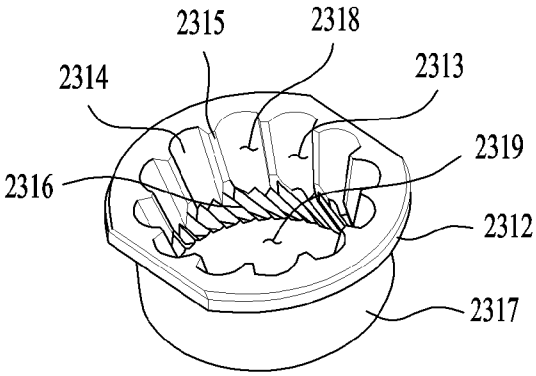
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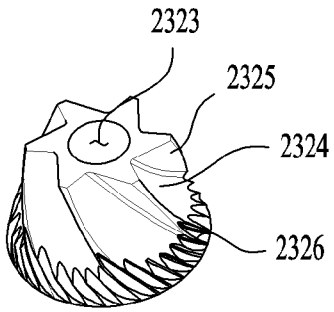
(b)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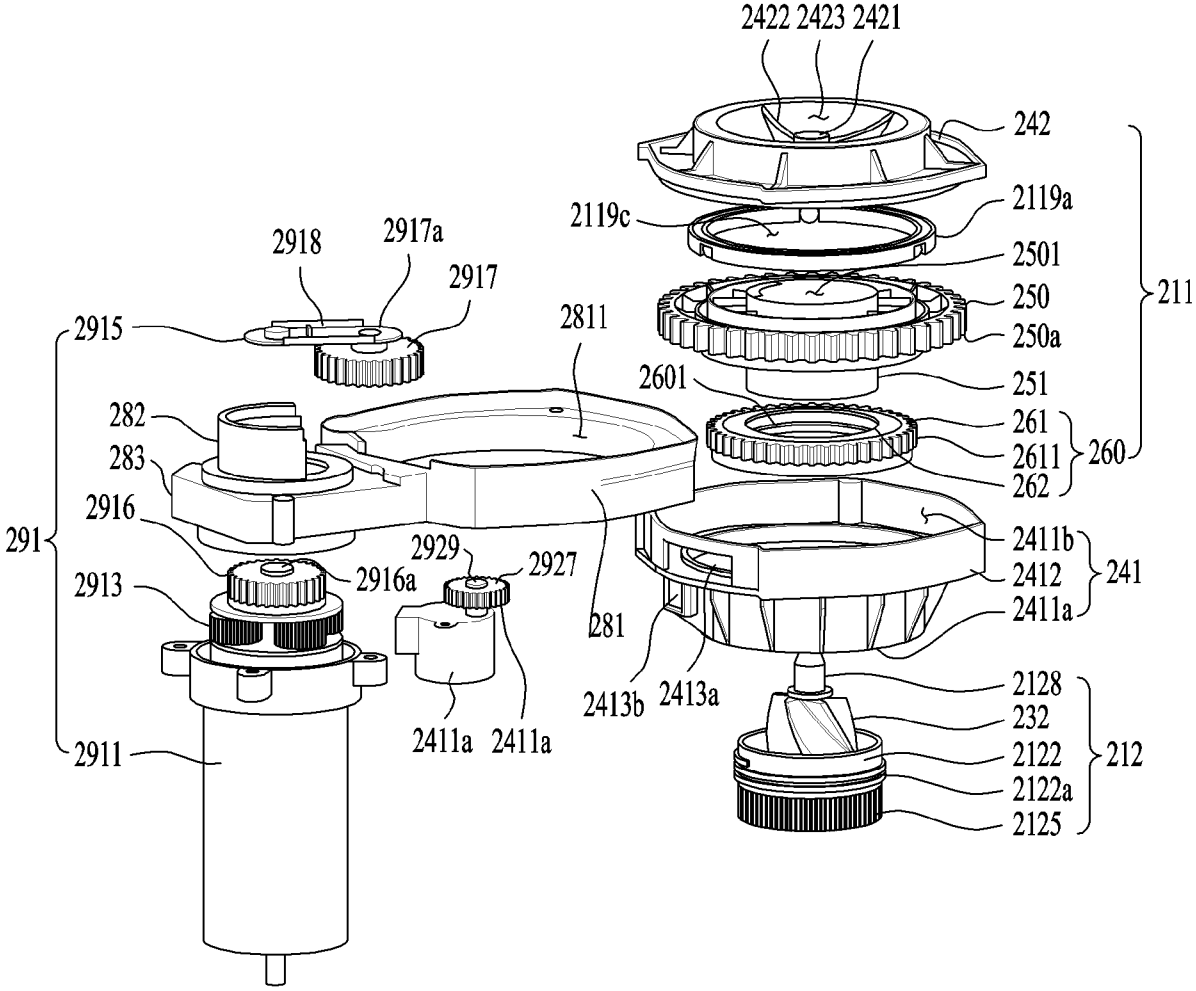
2326

(c)

[Fig. 4]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2119c
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250a
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2601
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2611
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2917a
2917
2915
282
283
2916
291
2913
2916a
2929
2927
2411b
2412
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2122a
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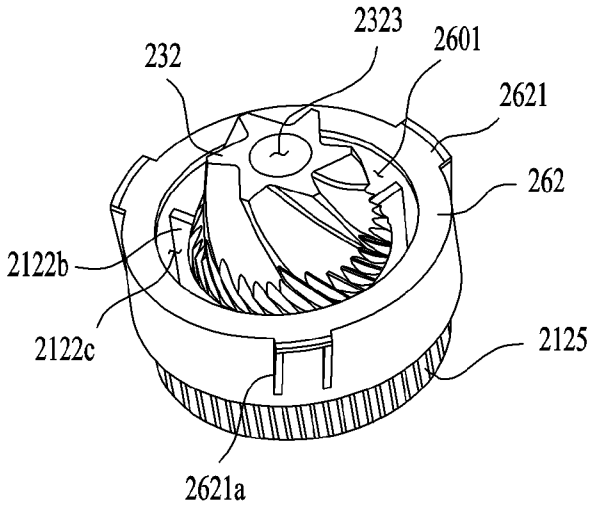
2911
2411a
2411a

(a)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2621
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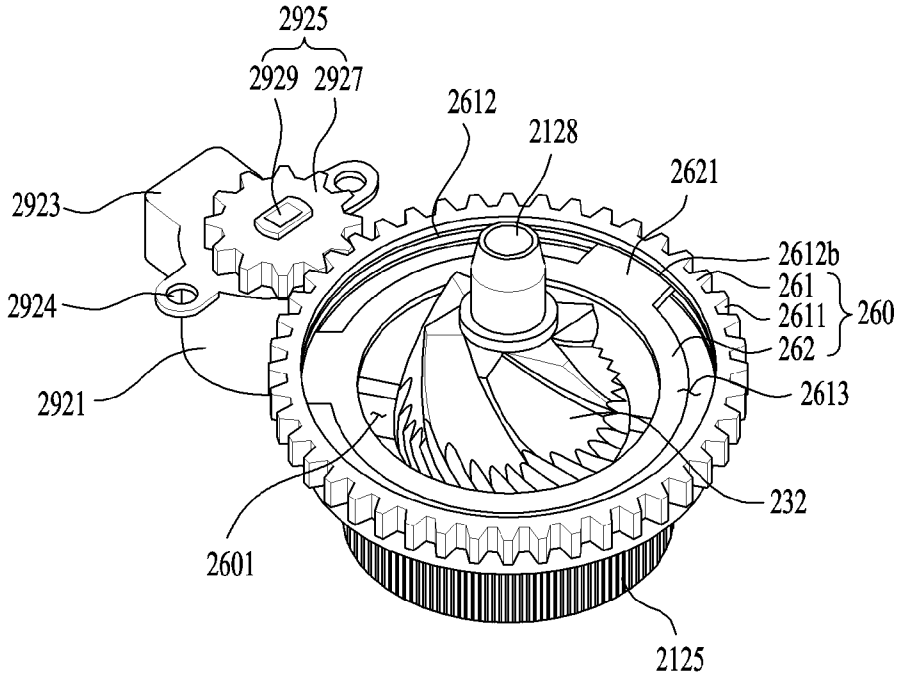
2122b
2122c
2125
2621a

(b)

[Fig. 5]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2612b
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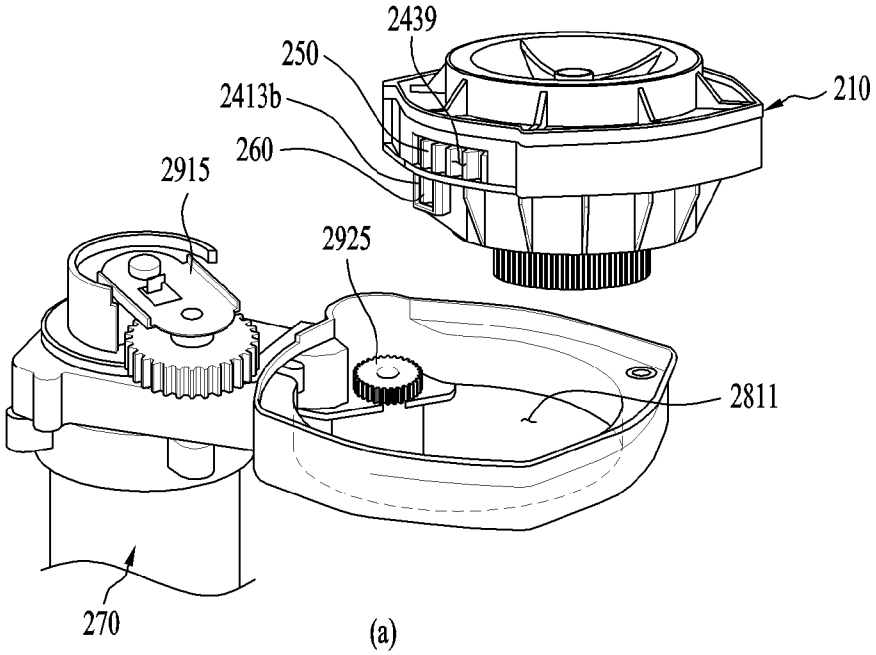
2601
2125

[Fig. 6]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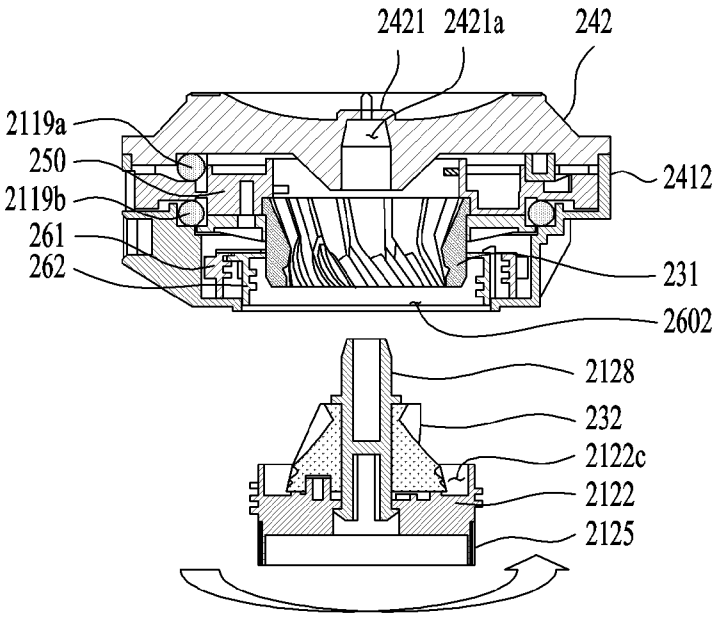
270

(a)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2119b
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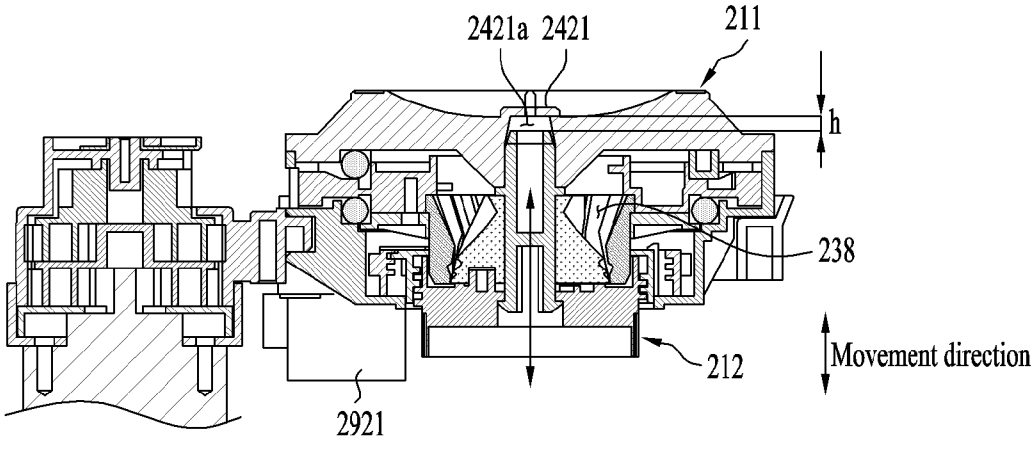
2122c
2122
2125

(b)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h
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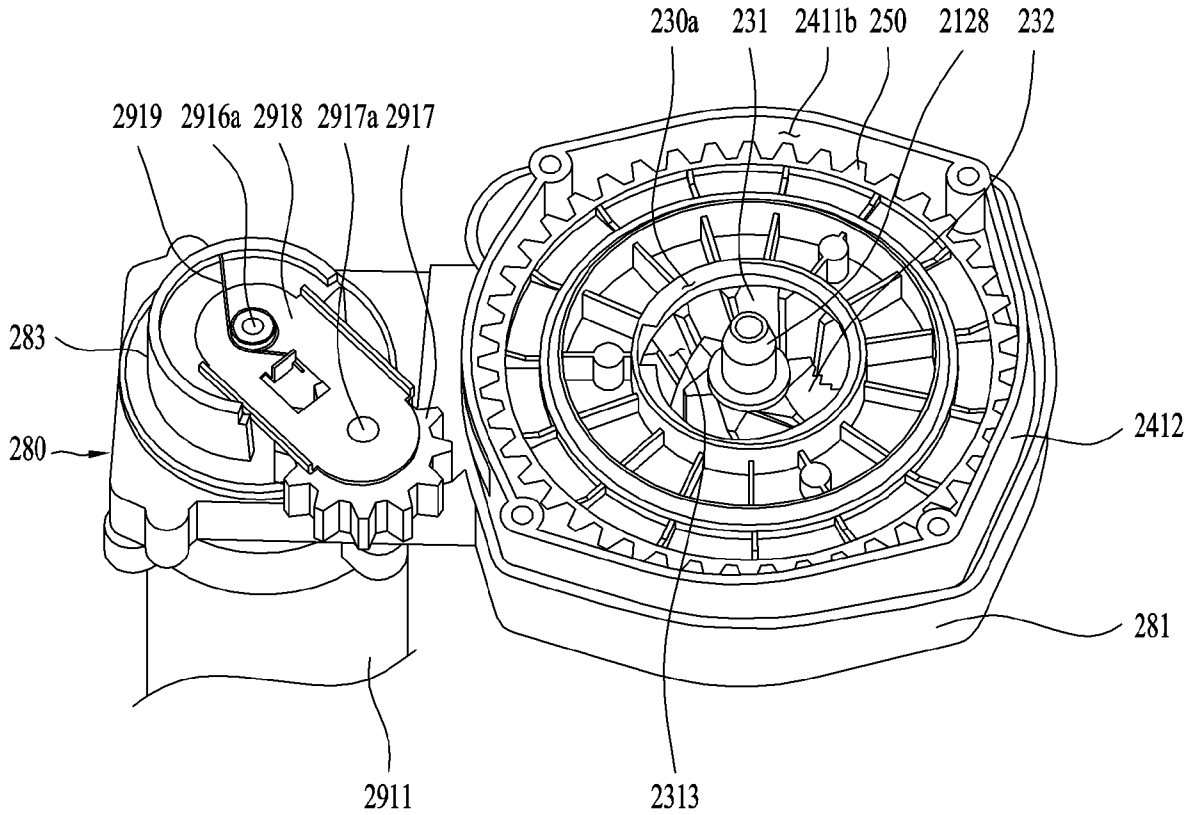
Movement direction
2921

(c)

[Fig. 7]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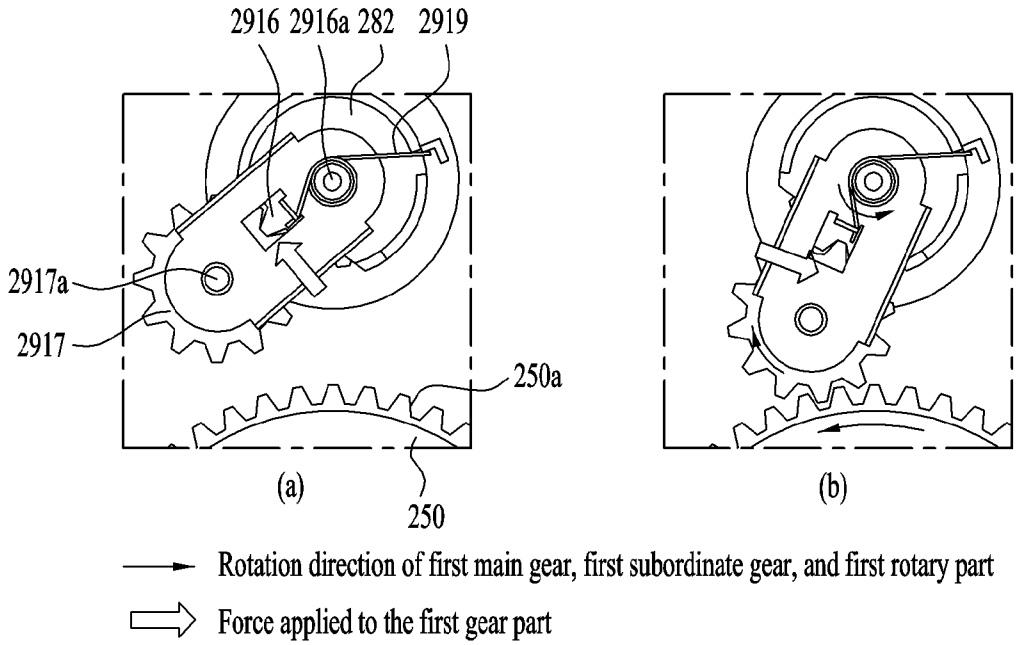
2313

[Fig. 8]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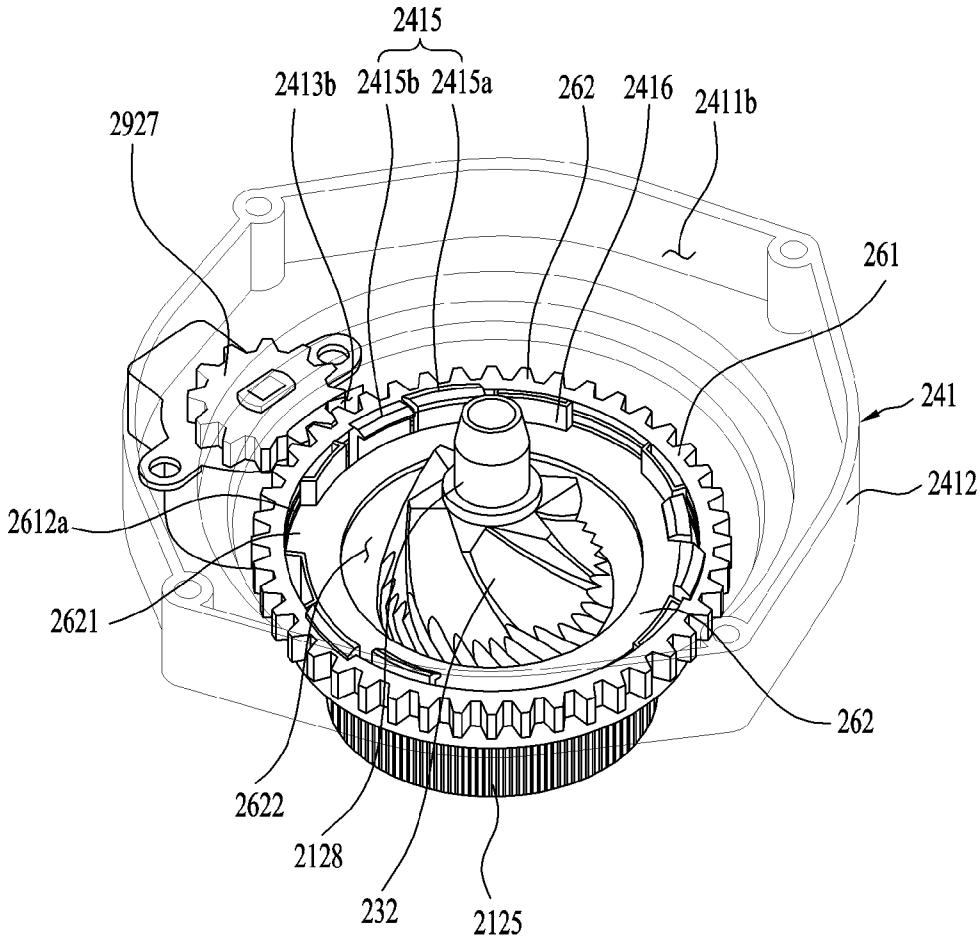
250a
(a)
250
(b)
Rotation direction of first main gear, first subordinate gear, and first rotary part
Force applied to the first gear part

[Fig. 9]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2125

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/001545

A. CLASSIFICATION OF SUBJECT MATTER

A47J 31/42(2006.01)i; **A47J 31/057**(2006.01)i; **A47J 42/10**(2006.01)i; **A47J 42/06**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47J 31/42(2006.01); A47J 31/057(2006.01); A47J 31/24(2006.01); A47J 42/06(2006.01); A47J 42/08(2006.01); A47J 42/44(2006.01); A47J 42/46(2006.01); B02C 13/14(2006.01)

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

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: coffee, bean, grinder, conical burr, rotate, water supplier and gear

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 05-184467 A (HITACHI HOME TEC LTD.) 27 July 1993 (1993-07-27) paragraphs [0006]-[0020] and figures 1-3	1-18
A	US 2015-0102149 A1 (HSIAO, CHUNG-MIN) 16 April 2015 (2015-04-16) paragraphs [0016]-[0019] and figures 2-5	1-18
A	US 2016-0220067 A1 (TEAHAN, MICHAEL) 04 August 2016 (2016-08-04) paragraphs [0017]-[0028] and figures 1-2	1-18
A	WO 2019-142758 A1 (THREE PEACE CO., LTD. et al.) 25 July 2019 (2019-07-25) paragraphs [0031]-[0046] and figures 1-6	1-18
A	KR 10-2012-0128179 A (NABORN CO., LTD.) 27 November 2012 (2012-11-27) paragraphs [0012]-[0028] and figures 1-5	1-18

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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 May 2021	**28 May 2021**

Name and mailing address of the ISA/KR	Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2021/001545

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				US	9545174	B2	17 January 2017
US	2016-0220067	A1	04 August 2016	US	10105009	B2	23 October 2018
WO	2019-142758	A1	25 July 2019	EP	3741271	A1	25 November 2020
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