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(54) Title: COFFEE GRINDER

(57) Abstract: This disclosure relates to an apparatus for grinding coffee beans. In one form, the apparatus comprises a hopper arranged to receive and dispense coffee beans. The coffee grinder also includes a conical burr arranged to grind the coffee beans dispensed by the hopper. The apparatus may be employed to grind roasted coffee beans for use in a coffee extraction (conventional coffee machines), for example in a cafe.

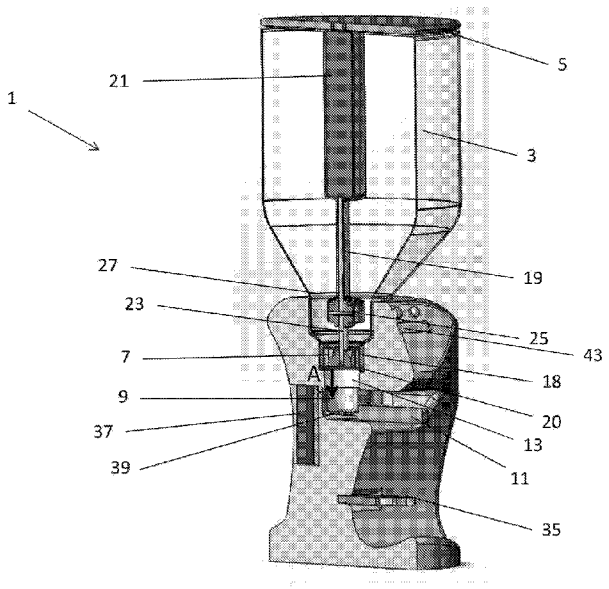

Fig. 1

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COFFEE GRINDER

TECHNICAL FIELD

This disclosure relates to an apparatus for grinding coffee beans. The apparatus comprises a hopper arranged to receive and dispense coffee beans. The coffee grinder also includes a conical burr arranged to grind the coffee beans dispensed by the hopper. The apparatus may be employed to grind roasted coffee beans for use in a coffee extraction (conventional coffee machines), for example in a cafe.

BACKGROUND ART

Processing coffee beans to produce a beverage includes the steps of roasting, grinding and extracting. The selected granule size (course or fine) of the ground coffee can depend on the method utilised to brew or extract the coffee. When extracting coffee (for example to produce espresso), a fine coffee grind can be produced immediately prior to extraction. The fineness of the ground coffee beans facilitates an increase in pressure during extraction and assists to produce a crema. The granule size of the ground coffee beans, freshness of the coffee beans, quantity of the ground coffee beans, the length of extraction and the pressure of water during an extraction all affect the flavour of the extracted coffee. Producing a good quality coffee extraction can be an art form that takes years to master.

Known coffee grinders designed to produce finely ground coffee beans for use with extraction machines include a hopper, blades (conical burrs or flat burrs), a timer and a support for a portafilter. Ground coffee travels from the blades through a passage to the portafilter. A disadvantage of known coffee grinders is that about 5 to 15 grams of ground coffee beans is retained in the coffee grinder between extractions. This is particularly problematic as ground coffee quickly loses its volatiles (flavour and aroma) once ground and, if left for too long, becomes stale. When the retained ground coffee beans mix with freshly ground beans this can greatly affect the extraction process and the resultant flavour of the extracted coffee. To avoid this problem, some baristas constantly purge the grinder to remove this stale coffee before filling the portafilter. This results in large quantities of wasted coffee beans.

A further problem of known coffee grinders is the inconsistency of the dose (the quantity of ground coffee beans produced). Once heated, ground coffee beans clump together and can become suspended in the grinder between the blades and the exit chute. This

retained ground coffee may be dislodged intermittently, thereby adding extra ground coffee to each dosage. The vibration of the grinder and the action of collapsing (knocking the grouphead to settle the ground coffee beans) also causes this retained coffee to drop into the portafilter. Given that tenths of a gram of ground coffee affects the extraction process, the retained coffee can also affect the flavour of the extracted coffee.

Known grinders use flat burr or conical burr blades. A problem with these blades is that they overheat with frequent use. The motor may also be located directly below the blades, which further accentuates the problem of overheating.

The above references to the background art do not constitute an admission that the art forms part of the common general knowledge of a person of ordinary skill in the art. The above references are also not intended to limit the application of the coffee grinder as disclosed herein.

SUMMARY

Disclosed herein is an apparatus for discharging ground coffee beans. The apparatus may comprise a first container arranged to receive and dispense coffee beans; and a grinder arranged to grind the coffee beans dispensed by the first container, the grinder being arranged such that it is able to vertically discharge the ground coffee beans. The apparatus, in the form of a coffee grinder, may be used in the café industry to accurately grind coffee beans for use in the coffee extraction process. The vertical discharge of coffee beans means that the amount coffee beans retained in the coffee grinder between grinds is significantly reduced or eliminated completely.

In some forms, the discharged ground coffee beans can be received by a second container. The second container may be in the form of a portafilter supported in a group handle, for use in the coffee extraction process.

In some forms, the second container can be supported by the apparatus at a position whereby the second container is able to receive a direct and unrestricted flow of the ground coffee beans. In some forms, the second container can be supported vertically below the grinder.

In some forms, the apparatus can further comprise a channel, the channel being arranged to receive the ground coffee beans discharged by the grinder and deliver the ground coffee beans to the second container.

In some forms, the grinder can comprise a conical burr that is rotatable to grind the dispensed coffee beans. Other blade types can also be used to grind the coffee (i.e. a flat burr).

In some forms, the conical burr can comprise two burrs that are adjustable to vary the distance between them, adjustment of the burrs causing the ground coffee beans to vary in fineness. As such, a user can manually calibrate the grinder to discharge a required particle size of coffee beans.

In some forms, the apparatus can further comprise a mechanically powered shaft arranged to rotate the conical burr. Rotation of the conical burr grinds the roasted coffee beans dispensed from the hopper.

In some forms, the apparatus can further comprise a motor arranged to rotate the mechanically powered shaft. In some forms, a shaft of the motor can be magnetically coupled to the mechanically powered shaft, whereby rotation of the motor shaft is translated to the mechanically powered shaft to inturn engage and rotate at least one of the conical burrs.

In some forms, the magnetically coupling can be such as to also allow the first container to be removable from the apparatus. In some forms, the motor can be located above the grinder in use. The motor may be located within the first container.

In some forms, a shaft of the motor can be mechanically coupled to the mechanically powered shaft, whereby rotation of the motor shaft is translated to the mechanically powered shaft to inturn engage and rotate at least one of the conical burrs. In some forms, the mechanical coupling can be such as to also allow the first container to be removable from the apparatus.

In some forms, the mechanical coupling can comprise a female portion mounted to the mechanically powered shaft that receives a male portion mounted to the motor shaft, the male and female portions having co-operating teeth that engage to rotate the conical burr upon rotation of the motor shaft.

In some forms, the apparatus can further comprise a worm gear assembly to vary the distance between the two burrs. This allows for minor adjustments of the conical burrs such that a user can adjust the size of the ground coffee beans.

In some forms, the worm gear assembly can comprise an elongate threaded stem that protrudes from the grinder such that a user can manually rotate the stem to cause the distance between the burrs to vary.

In some forms, the worm gear assembly can further comprise teeth disposed about a periphery of a component of the grinder, the teeth being arranged to co-operate with the threads of the elongate stem, which engagement causes the component to in turn act on the conical burr to vary the distance between the two burrs when the elongate stem is rotated.

In some forms, the apparatus can further comprise a slidable gate between the first container and the grinder, the slidable gate operable to allow the first container to dispense the coffee beans. The slidable gate allows a user to remove the first container with unground coffee beans inside.

In some forms, the apparatus can further comprise a scale arranged to weigh the discharged beans in the second container. The scale ensures that an accurate dose of ground coffee may be discharged from the coffee grinder.

In some forms, the scale can be positioned in the apparatus adjacent to where the beans are discharged into the container, whereby the beans discharged into the container are able to be weighed immediately following discharge.

In some forms, the apparatus can further comprise the scale being positioned in the apparatus: such that the second container is located on the scale as the beans are discharged into the second container; or laterally adjacent to the second container when the beans are being discharged into the container.

In some forms, the scale and the motor can be powered by the same power source.

In some forms, the scale can be positioned in the apparatus such that the second container locates thereon during discharge. The scale can be in the form of a ring, wherein the second container is supported by at least two tabs that are positioned on the ring in use.

In some forms, when the scale is positioned laterally adjacent to the second container, the second container can be supported by a collapsing fork arranged to releasably engage the second container.

In a second aspect, an apparatus for discharging ground coffee beans to a container is disclosed. The apparatus may comprise a scale arranged to weigh the discharged beans in the container. The scale means that an accurate quantity of ground coffee beans can be discharged from the apparatus. The scale and apparatus may be otherwise as described above.

In a third aspect, an apparatus for discharging ground coffee beans is disclosed. The apparatus may comprise a first container arranged to dispense coffee beans; a scale; and a grinder arranged to grind the coffee beans dispensed by the first container, the grinder being arranged such that it is able to discharge the ground beans to a second container; wherein the second container is able to be positioned on the scale when receiving the discharged ground beans to thereby weigh the discharged ground beans. Again, use of a scale means that an accurate quantity of ground coffee beans can be discharged from the apparatus. Also, providing the scale within the body of the apparatus allows for the steps of weighing and dispensing to be performed in a single step. The scale and apparatus may be otherwise as described above.

In a forth aspect, an apparatus for discharging ground coffee beans is disclosed. The apparatus may comprise a first container arranged to dispense coffee beans; a grinder arranged to grind the coffee beans dispensed by the first container; and a magnetic coupling arrangement arranged to couple the first container to the apparatus. The magnetic coupling allows for easy removal of the first container from the apparatus. The apparatus may be otherwise as described above.

In a fifth aspect, an apparatus for discharging ground coffee beans is disclosed. The apparatus may comprise a first container arranged to dispense coffee beans; a grinder arranged to grind the coffee beans dispensed by the first container; and a motor arranged to operate the grinder, the motor being positioned above the grinder in use. Positioning the motor above the grinder in use means that a shaft is not required below the grinder and also enables the motor heat to be isolated within the hopper. This allows for coffee beans to be directly dispensed from the grinder to another container located below the grinder. The apparatus may be otherwise as described above.

In a sixth aspect, an apparatus for discharging ground coffee beans is disclosed. The apparatus may comprise a first container arranged to retain and dispense coffee beans; and a grinder arranged to grind the coffee beans dispensed by the first container; wherein the first container has at least one indicia positioned thereat, the indicia able to provide a visual guide to ensure that a correct quantity of coffee beans is retained within the first container in use. This allows for the correct weight of coffee beans to be placed on the grinder in use and ensures a consistent particle size of ground coffee beans is discharged from the grinder. The apparatus may be otherwise as described above.

In a seventh aspect, an apparatus for discharging ground coffee beans including a heat extraction assembly is disclosed. The apparatus may comprise a first container arranged to receive and dispense coffee beans, a body defining an interior chamber and having a grinder disposed therein, the grinder being arranged to grind the coffee beans dispensed by the first container; and a heat extraction assembly for extracting heat from the body, the heat extraction assembly comprising an air inlet in the body that is arranged to direct air into the chamber and onto the grinder, and a fan that is arranged to discharge that air from the body. Advantageously, the heat extraction assembly assists to remove heat generated by the motor and burrs during the grinding process.

In some forms, the air inlet can be arranged such that the air is able to flow past and remove heat from the grinder, and the fan is arranged in the body to discharge the resultant heated air from the body. This arrangement advantageously allows heat to be removed efficiently from the grinder, where a large portion of the heat is produced in the grinding apparatus.

In some forms, the heat extraction assembly can further comprise heat exchange fins disposed radially around and in contact with an external surface of the grinder, the fins able to conduct heat from the grinder. This arrangement further enhances the ability of the heat extraction assembly to remove heat from the grinder.

In some forms, the air inlet can comprise opposing slots located in the body and adjacent to the grinder, the opposing slots allowing ambient air to flow into the chamber from opposite sides of the apparatus. This allows cool ambient air to be directed straight onto the grinder to increase the efficiency of the heat extraction assembly.

In some forms, the heat extraction assembly can further comprise an aperture in an external surface of a grinder support body that is arranged to support and surround the grinder, the aperture enabling air to flow from the chamber to an interior of the grinder support body, whereupon the air can be heated to remove heat from the grinder. This allows cool ambient air to be directed onto the external surface of the grinder to increase the efficiency of heat removal.

In some forms, the fan can be located in the chamber and adjacent to an air outlet disposed in a wall of the body, the fan able to exhaust the heated air through the air outlet.

In some forms, the fan can be controllable to vary its speed to increase or decrease airflow through the chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments will now be described by way of example only, with reference to the accompanying drawings in which

Fig. 1 shows a cross sectional view through an embodiment of the coffee grinder that includes an internal scale;

Fig. 2 shows a cross sectional view of the coffee grinder shown in Fig. 1;

Fig. 3 shows a cross sectional view through an embodiment of the coffee grinder that includes an external scale;

Fig. 4 shows a perspective view of a group head with a portafilter located therein;

Fig. 5 shows another cross sectional view through the coffee grinder shown in Fig. 3;

Fig. 6 shows a cross sectional view through an embodiment of the coffee grinder including a heat extraction assembly;

Fig. 7 shows a cross sectional view through the coffee grinder shown in Fig. 6;

Fig. 8 shows a view through the base of the coffee grinder shown in Fig. 6 showing the ventilation openings adjacent the grinder;

Fig. 9 shows a side view through the base of the coffee grinder shown in Fig. 6;

Fig. 10 shows an enlarged view of the grinder and connected internal mechanisms of the coffee grinder shown in Fig 6;

Fig. 11 shows another enlarged view of the grinder and connected internal mechanisms of the coffee grinder shown in Fig 6;

Fig. 12 shows a side view of a worm gear assembly for fine adjustment of the grinder;

Fig. 13 shows a side view through the hopper with the lid and motor fitted;

Fig. 14 shows a cross sectional view through the hopper shown in Fig. 13;

Fig. 15 shows a perspective view of the hopper shown in Fig. 13 with the cover removed;

Fig. 16 shows another side view of the hopper shown in Fig. 13 with the cover included; and

Fig. 17 shows a perspective view of a lid for use with the hopper shown in Fig. 13.

DETAILED DESCRIPTION

In the following detailed description, reference is made to accompanying drawings which form a part of the detailed description. The illustrative embodiments described in the detailed description, depicted in the drawings and defined in the claims, are not intended to be limiting. Other embodiments may be utilised and other changes may be made without departing from the spirit or scope of the subject matter presented. It will be readily understood that the aspects of the present disclosure, as generally described herein and illustrated in the drawings can be arranged, substituted, combined, separated and designed in a wide variety of different configurations, all of which are contemplated in this disclosure.

Referring firstly to Fig. 1, an apparatus for discharging ground coffee beans is shown. The apparatus, in the form of a coffee grinder 1, can be used to accurately grind coffee for use in a coffee extraction process. The coffee grinder comprises a first container, in the form of a hopper 3, arranged to receive and dispense coffee beans. The hopper 3 has a lid 5 that is removable to allow for roasted coffee beans to be received within the hopper. The coffee grinder further comprises a grinder, in the form of blades 7 and cassette 18, arranged to grind

the coffee beans dispensed by the hopper, the blades being arranged such that it is able to vertically discharge the ground coffee beans, as is indicated by the arrow A. The vertical discharge of coffee beans means that the amount coffee beans retained in the coffee grinder between grinds is significantly reduced or eliminated completely.

The discharged ground coffee beans are received by a second container, in the form of a portafilter 9 that locates in group handle 11 (see Fig. 4). The group handle 11 and portafilter 9 can be used with known coffee extraction equipment / machines. The portafilter 9 is supported by the coffee grinder 1 at a position whereby the portafilter 9 is able to receive a direct and unrestricted flow of the ground coffee beans. The portafilter 9 is supported vertically below the blades 7.

The coffee grinder 1 further comprises a channel 13, the channel 13 being arranged to receive the ground coffee beans discharged by the blades 7 and deliver the ground coffee beans directly to the portafilter 9. The detailed arrangement allows for the direct discharge of freshly ground coffee beans from the hopper 3, to the blades 7 and subsequently to portafilter 9. As will be further described, this allows for a consistent dosing of freshly ground coffee beans. Advantageously, no obstructions are present between the blades 7 and the portafilter 9, so ground coffee is not retained by the coffee grinder. The channel 13 includes a polymer with the appropriate load (% by weight) of an anti-static additive to eliminate static electricity. This polymer is also used to construct the hopper 3.

Referring now to Fig. 2, the grinder 7 will be described in further detail. Fig. 2 shows a cross sectional view of the coffee grinder shown in Fig. 1. The blades 7 comprise a set of conical burr blades, in the form of two burrs 15 and 17, that are rotatable to grind the dispensed coffee beans. In the described embodiment, the conical burr comprises an outer burr 15 and inner burr 17. In an alternative embodiment (not shown), flat burrs (or any other blade appropriate for grinding roasted coffee beans) can be used in lieu of conical burrs. The burrs 15 and 17 are adjustable to vary the distance between them. Adjustment of the burrs 15 and 17 causes the ground coffee beans to vary in fineness. The height adjustment of the outer burr is achieved via a threaded ring placed below a cassette holder 18. The ring is turned using a pin that is inserted in slots 20 (Fig. 1) that are placed on the side of the body of the coffee grinder 1. The conical burr assembly is located within the cassette holder 18. The cassette holder 18 is manufactured in two parts to allow the relative position between the outer and the inner burr to be varied. The two part cassette holder 18 permits a quick

extraction of the cassette holding the conical burrs from the main body of the coffee grinder 1. Once the cassette is extracted from the body of the coffee grinder 1, the cleaning of the grinder assembly is simple.

Returning to Fig. 1, the coffee grinder 1 further comprises a mechanically powered shaft 23 arranged to rotate the conical burrs 15,17. The coffee grinder 1 further comprises a motor 21 arranged to rotate the mechanically powered shaft 23. The conical burrs operate between 600 or 700 revolutions/minute. This advantageously minimises heat generation during the grinding process as the blades / burrs do no generate a significant amount heat. The motor is a direct current type motor with an integral planetary gearhead and sensor brake operating up to a torque of 30 Nm. The motor is configured such that at start up, it operates for ½ a second at high current, 30 Amp, and then at 5 Amp after start up. This high current utilised at start up overcomes the load created on the conical burrs by the coffee beans.

In the illustrated embodiment, the motor 21 is located within the hopper 3, however, in alternative embodiments the motor 21 can be located outside the hopper 3 or in any other suitable location internal / external of the coffee grinder 1. In the embodiment shown in Fig. 1, a motor shaft 19 is magnetically coupled 25 to the mechanically powered shaft 23, whereby rotation of the motor shaft 19 is translated to the mechanically powered shaft 23 to inturn engage and rotate at least one of the conical burrs 15/17. The magnetic coupling 25 is disclosed in the form of an electromagnetic docking station. Advantageously, the magnetically coupling 25 is such as to also allow the hopper to be removable from the coffee grinder 1. This connection type allows for effortless removal and insertion of the hopper. Furthermore, the power to the motor 21 and the connection with the programmable software module 37 is obtained using the electromagnetic docking system 25. The electromagnetic docking system 25 may also be powered by the same power source that powers the motor 21.

While not shown in the illustrated embodiment, a small groove may be present in the outer wall of the hopper 3. The groove holds a power cable for the motor 21 and is capped by a clip-on rigid label which can be used to display the trade mark associated with the coffee grinder 1. The power cable connects the motor to the power supply and to a programmable software module 37, located in the base of the unit.

In the illustrated embodiment, the motor 21 is located above the blades 7 in use, within the hopper 3. Having the motor 21 positioned inside the hopper 3 allows for the

placement of the vertical channel, in the form of a cone 13 optionally of a non-static material, in the base of the coffee grinder 1. This arrangement allows for the direct discharge of ground coffee beans from the blades 7 to the portafilter 9. Furthermore, roasted whole beans are able to withstand more heat than ground beans without affecting their flavour. As such, it is beneficial to locate the motor 21 away from the freshly ground coffee beans.

When using freshly roasted coffee beans for use in a coffee extraction process such as espresso, it is important to produce an extremely fine grind. To achieve this, the coffee grinder described in the illustrated embodiments allows for the weight of the whole coffee beans to be placed above and directly onto the blades 7. The weight of the coffee beans on the blades 7 affects the fineness of the ground coffee discharged from the grinder. To ensure that the appropriate weight of coffee beans is retained in the hopper 3 and therefore onto the blades 7, the hopper has indicia, in the form of markings, on the outside that signify the ideal amount of whole coffee beans that are to be retained within the hopper during grinding. Two markings are present on the outside of the hopper, a 'full' marking as well as a 'refill' marking. The consistent weight of beans on the blades 7 assists to achieve a consistent ground coffee particle size. In some circumstances, if there is not enough weight on the blades of the grinder, the beans bounce off the blades into the hopper, which results in an inconsistent dosage of ground coffee beans.

The coffee grinder 1 further comprises a slidable gate 27 (also shown in Fig. 10) between the hopper 3 and the blades 7. The slidable gate 27 is operable to allow the hopper to dispense the coffee beans. The slidable gate 27 is actuated manually via a lever placed on the outside of the coffee grinder 1. The slidable gate 27 is open when the coffee grinder 1 is operational (i.e. grinding coffee beans).

When extracting coffee, the extracted liquid should begin to flow from the group head after about seven seconds (from the moment the extraction is started). If this takes longer than ten seconds, the extraction is referred to as a false extraction. If it is faster than seven seconds, it indicates that the grind is too coarse or that the dose is too low. When liquid begins to be extracted from the portafiler it initially drips, before the drips become more constant and finally form into continuous flow. The time between the start of extraction, the formation of drips and the formation of a continuous flow are dependent on the quantity of coffee in the filter. To achieve a perfect and consistent flavour of coffee, the time between these events should be consistent for each separate extraction. A tenth of a gram difference in

the quantity of ground coffee affects the extraction process and therefore the flavour of the extracted beverage.

To help ensure a consistent coffee extraction process, the coffee grinder 1 comprises a scale 29 arranged to weigh the discharged beans in the portafilter 9. The scale 29 is positioned in the coffee grinder 1 adjacent to where the beans are discharged into the portafilter 9, whereby the beans discharged into the portafilter 9 are able to be weighed immediately following discharge. The scale 29 is positioned in the coffee grinder 1 such that the portafilter 9 is located on the scale 29 as the beans are discharged into the portafilter 9. Alternatively, as shown in Figs. 3 and 5, the scale 29 is positioned laterally adjacent to the portafilter 9 when the beans are being discharged into the portafilter 9. In an alternate embodiment not shown in the drawings, the scale is positioned in the group handle 11 either under the outer peripheral lip of the portafilter 9 or suspended internally of the group handle.

The scale 29 and the motor 21 are powered by the same power source. The coffee grinder 1 is powered by mains power. When the scale 29 is positioned in the coffee grinder 1 such that the portafilter 9 locates thereon during discharge, the scale 29 is in the form of a ring, wherein portafilter 9 is supported by at least two tabs that are positioned on the ring in use. Referring now to Fig. 4, the tabs 31 are described in further detail. The tabs 31 are located on the outer diameter of the group handle 11 and are typically used to engage and retain the group handle 11 on the coffee extraction machine during the coffee extraction process.

Referring again to Figs. 1 and 2, the connection between the portafilter and the coffee grinder is described in further detail. A passage 39 in the body of the coffee grinder 1 allows for the group handle 11 and portafilter 9, located thereon, to be inserted into the coffee grinder 1 and onto the ring 29. The ring 29 connects directly to a digital scale 41. The weight of the ground coffee discharged into the portafilter 9 is displayed on the digital read out window 43 at the front of the coffee grinder 1. In this embodiment, a collapsing fork 35 is located at the base of the coffee grinder 1 (as shown in Fig. 1). Referring again to Fig. 3 and Fig. 5, when the external scale 30 is positioned laterally adjacent to the portafilter 9, the group handle 11 is supported by a collapsing fork 35 arranged to releasably hold / engage the group handle 9.

The programmable software module 37 allows for a timed grind. The vertical non-static cone 13 between the blades 7 and the portafilter 9 ensures that the timed ground produces an accurate quantity (dose) of freshly ground coffee. This arrangement prevents ground coffee from being retained within the coffee grinder 1, therefore meaning that there is not a requirement to purge the coffee grinder between doses, resulting in less to no wastage of coffee beans. When the scale 29 and vertical non-static cone 13 are used in combination, this allows for the dose to be weighed by the user to confirm that the quantity of freshly ground coffee beans is accurate. If it is not accurate, the user can manually adjust the quantity of coffee in the portafilter 9. Alternatively, the user can calibrate the quantity of ground coffee discharged from the grinder 7 by adjusting the grind time.

In another embodiment, the programmable software module 37 allows for the scale 29 and the motor 21 to communicate with one another. For example, the scale 29 and the motor 21 can be connected using closed-loop feedback control such that the motor 21 stops when the scale 29 reads a programmed quantity of coffee. In another embodiment, the user can manually control the coffee grinder 1, ceasing the grinding process when the digital read out window 43 displays the quantity of freshly ground coffee beans desired.

The programmable software module 37 has a programmable tare function, allowing the user to program each group head separately. This allows a barista to alternate between multiple blends (including single origin) coffee beans as well as taking into account the differences in group head and portafilter weight.

Another embodiment will now be described with reference to Figs. 6 to 18. In this embodiment, the coffee grinder 1 includes a heat extraction assembly. The heat extraction assembly assists to remove heat generated by the motor and burrs during the grinding process. The generated heat can burn and dramatically speed up the ageing of the ground coffee due to the Maillard reaction, thereby releasing excess amounts of carbon dioxide which causes the ground coffee to clump and stick to surfaces in the coffee grinder. This can also change the structure and flavour/aroma of the ground coffee. The heat extraction system described below assists to transfer heat from within the coffee grinder to the outside environment.

Figs. 6 and 7 show cross sections through the embodiment of coffee grinder that includes a heat extraction system. The coffee grinder 1 comprises a hopper 3 arranged to

receive and dispense coffee beans. The coffee grinder 1 also has a body, in the form of base 49, defining an interior chamber 48. The coffee grinder 1 includes a grinder, again in the form of blades 7 and cassette 18. The blades 7 are arranged to grind the coffee beans dispensed by the hopper 3. As shown in Figs. 8 and 9, the coffee grinder 1 also comprises a heat extraction assembly for extracting heat from the body, the heat extraction assembly comprising an air inlet, in the form of ventilation opening 51, in the body that is arranged to direct air into the chamber 48 and directly onto the cassette 18 that houses the blades 7, and a fan 47 that is arranged to discharge that air from the base 49.

The ventilation opening 51 is arranged such that the air is able to flow past and remove heat from the cassette 18, and the fan 47 is arranged in the base 49 to discharge the resultant heated air from the base 49. The heat extraction assembly further comprises heat exchange fins 45 disposed radially around and in contact with an external surface 50 of the cassette 18, the fins able to conduct heat from the cassette 18. The fins 45 are located about the periphery of the cassette holder 18. Heat, resulting from the grinding process, passes by conduction from the cassette 18 to the fins 45 and is extracted from the base 49 by forcing air through the base 49. Advantageously, the fins 45 provide more cooling area and aid in directing air flow. The cassette 18 housing the blades 7 is supported by a grinder support body, in the form of a cassette support 46, which forms a support body that surrounds the cassette 18 and blades 7.

The air inlet comprises a pair of opposing slots, in the form of ventilation openings 51, located in the base and adjacent to the blades 7, the opposing slots allowing ambient air to flow into the chamber 48 from opposite sides of the coffee grinder 1 and directly onto the cassette 18 that houses the blades 7.

The heat extraction assembly further comprises at least one aperture 53 in an external surface of the cassette support 46 to enable air to flow from the chamber 48 to an interior of the cassette support 46 and onto the cassette holder 18, whereupon the air can be heated to remove heat from the blades 7 and cassette 18. During operation, the fan 47 installed at the lower rear end of the grinder continuously pulls the air from the inside of the coffee grinder body at speed and discharges it to the outside at the rear of the coffee grinder. The incoming fresh air, from the surrounding environment, enters the inside of the coffee grinder body via the air intakes 51 placed on the two sides of the body on the upper end and optionally at lower front port 54 (Fig. 9) of the body. The inner section of the body that supports a gear

system, the conical burr magazine (cassette holder 18), the conical coffee discharge (vertical non-static cone 13), the coffee filter and the scale may all have air intakes to ensure an adequate air circulation around the grinder 7 is achieved.

The fan 47 is located in the chamber 48 and adjacent to an air outlet 61 disposed in a wall 63 of the base 49, the fan 47 able to exhaust the heated air through the air outlet 61. Air outlet 61 and air inlets 51 and 54 are in the form of colourful removable grills that can be alternated to change the appearance of the apparatus. The area of the apertures through the grill 61, and therefore the pressure drop produced by the grill 61, can be sized to suit the fans capabilities to ensure that hot air is expelled quickly from the inner body of the coffee grinder. The fan 47 is controllable to vary its speed to increase or decrease airflow through the chamber 48. Controlling the air flow and the shape of the fins achieves efficient cooling of the coffee grinder 1.

Locating the motor in the hopper allows for the heat extraction assembly to be directed towards extracting heat directly from the grinder in the base. It also allows for the ventilation openings to be adjacent the cassette magazine that houses the blades such that ambient air can be directed straight onto the cassette magazine that houses the blades before being exhausted from the base.

In an alternate embodiment not detailed in the drawings, the cassette holder 18 is to be water cooled, using a pump system in lieu of fan 47 and a piping system that directs cooling water through the cassette 18. In one embodiment, the pump that forms part of a coffee extraction machine operates as the water pump for the grinder body 49.

Another embodiment will now be described with reference to Figs. 10 and 11. The coffee grinder 1 includes a mechanical coupling system 65. A shaft of the motor 67 is mechanically coupled to the mechanically powered shaft 69, whereby rotation of the motor shaft 67 is translated to the mechanically powered shaft 69 to inturn engage and rotate at least one of the conical burrs 15,17. The mechanical coupling 65 is such as to also allow the first container to be removable from the apparatus. The mechanical coupling 65 comprises a female portion 71 mounted to the mechanically powered shaft 69 that receives a male portion 73 mounted to the motor shaft 67, the male 73 and female 71 portions having co-operating teeth 75 that engage to rotate the burrs 15, 17 upon rotation of the motor shaft 67. The hopper 3, motor 21, motor shafts, grinder (15, 17) and cone 13 are axially aligned along the

longitudinal axis (B) of the grinder. This allows for the direct discharge of ground coffee beans from the hopper to the portafilter.

Fig. 12 shows an embodiment of the coffee grinder that includes a worm gear assembly. The worm gear assembly allows for a micrometric adjustment of the conical burr. This allows for fine adjustment of the conical burrs which allows a user to vary the size of the ground coffee beans. The worm gear assembly 57 comprises an elongate threaded stem 60 that protrudes from the grinder such that a user can manually rotate the stem to cause the distance between the burrs to vary. The worm gear assembly 57 further comprises teeth 59 disposed about a periphery of a component, in the form of gear 58, the teeth 59 being arranged to co-operate with the threads 64 of the elongate stem 60, which engagement causes the gear 58 to in turn act on the conical burr 15, 17 to vary the distance between the two burrs 15, 17 when the elongate stem 60 is rotated. The gear 58 rotates when a user turns the worm gear 57 clockwise or anti clockwise. The gear system engages with the cassette holder 18 via a spring 66 located at the lower end of the gear system. Once the gear is rotated clockwise or anti clockwise the spring 66 is compressed or expanded to lower or raise the cassette holder 18. This makes it possible for the user to alter the sizes of the grind. In this embodiment, the teeth 64 project radially from the elongate stem 60 and are perpendicular to the longitudinal axis (C) of the elongate stem 60. The longitudinal axis (C) is substantially perpendicular to the longitudinal axis B of the grinder. The teeth 59 are cut into the outer surface of the cassette holder 18 and are substantially perpendicular to the longitudinal axis A of the elongate stem 60.

In one embodiment, the base 49 of the grinder is to be manufactured in two halves, like a shell, to allow the assembly of all the components, including the power source, the programmable software module 37, heat extraction fan 47 and a weight 70 located at the bottom of the base 49.

In an embodiment shown in Figs. 13 to 16, the hopper 3 is formed from a single body, in the form of casing 77. In an alternate embodiment, the hopper 3 can be formed from two casings that are mirror images of one another and clip together to form a single body. In the illustrated embodiment, the casing 77 of the hopper 3 includes a motor support portion, in the form of motor receptacle 79, that forms a motor support cylinder 81 to support the motor 21 within the hopper 3. The motor support separates the motor 21 from the coffee beans stored within the hopper 3. This enables the heat generated by the motor to be separated from the

coffee beans contained within the hopper, thus inhibiting or preventing the beans from being heated prior to being ground. The motor receptacle 79 includes a projecting portion that forms a collar 83 at the end proximal to the grinder (burrs) to support the weight of the motor 21. The motor 21 can be mechanically fastened to the collar 83 to inhibit the motor 21 from vibrating within the hopper 3. Support struts 85 extend between the outer shell of the hopper 3 and the motor receptacle 79 to support the cylinder within the hopper 3. The hopper 3 includes a recess 87 in its outer wall. In this embodiment, the power source, programmable software module and associated wiring can be contained within the recess of the hopper 3. As shown in Fig. 16, a cover 89 can be clipped over the recess 87 to hide the components contained within the recess. The hopper also includes a slot 91 that is configured to receive the slidable gate 27 that allows for coffee beans to be released from the hopper.

Fig. 17 shows a perspective view of a lid 93 for use with the hopper 3 shown in Figs. 13 to 16. The lid 93 includes a plurality of radial slots 95 that allow for the lid 93 to be gripped by a user and removed from the hopper 3. In addition, the lid 93 includes a plurality of ventilation apertures 97 that align with the cylinder 81 of the hopper 3 and allow for ventilation of the motor 21. This enables heat generated by the motor to be removed from the hopper. In an alternate embodiment, the ventilation apertures 97, or the cylinder 81 itself, is connected to a fan to force heat generated by the motor from the hopper.

In the claims which follow and in the preceding summary except where the context requires otherwise due to express language or necessary implication, the word “comprising” is used in the sense of “including”, that is, the features as above may be associated with further features in various embodiments. Variations and modifications may be made to the parts previously described without departing from the spirit or ambit of the disclosure.

CLAIMS

1. Apparatus for discharging ground coffee beans comprising:

a first container arranged to receive and dispense coffee beans; and

a grinder arranged to grind the coffee beans dispensed by the first container, the grinder being arranged such that it is able to vertically discharge the ground coffee beans.

2. Apparatus as claimed in claim 1, wherein the discharged ground coffee beans are received by a second container.

3. Apparatus as claimed in claim 2, wherein the second container is supported by the apparatus at a position whereby the second container is able to receive a direct and unrestricted flow of the ground coffee beans.

4. Apparatus as claimed in claims 2 or 3, wherein the second container is supported vertically below the grinder.

5. Apparatus as claimed in any one of claims 2 to 4 further comprising a channel, the channel being arranged to receive the ground coffee beans discharged by the grinder and deliver the ground coffee beans to the second container.

7. Apparatus as claimed in any one of the preceding claims, wherein the grinder comprises a conical burr that is rotatable to grind the dispensed coffee beans.

8. Apparatus as claimed in claim 7, wherein the conical burr comprises two burrs that are adjustable to vary the distance between them, adjustment of the burrs causing the ground coffee beans to vary in fineness.

9. Apparatus as claimed in claims 7 or 8 further comprising a mechanically powered shaft arranged to rotate the conical burr.

10. Apparatus as claimed in claim 9 further comprising a motor arranged to rotate the mechanically powered shaft.

11. Apparatus as claimed in claim 9 or 10, wherein a shaft of the motor is magnetically coupled to the mechanically powered shaft, whereby rotation of the motor shaft is translated to the mechanically powered shaft to inturn engage and rotate at least one of the conical burrs.

12. Apparatus as claimed in claim 11, wherein the magnetically coupling is such as to also allow the first container to be removable from the apparatus.

13. Apparatus as claimed in claim 9 or 10, wherein a shaft of the motor is mechanically coupled to the mechanically powered shaft, whereby rotation of the motor shaft is translated to the mechanically powered shaft to inturn engage and rotate at least one of the conical burrs.

14. Apparatus as claimed in claim 13, wherein the mechanical coupling is such as to also allow the first container to be removable from the apparatus.

15. Apparatus as claimed in claim 14, wherein the mechanical coupling comprises a female portion mounted to the mechanically powered shaft that receives a male portion mounted to the motor shaft, the male and female portions having co-operating teeth that engage to rotate the conical burr upon rotation of the motor shaft.

16. Apparatus as claimed in any one of claims 10 to 15, wherein the motor is located above the grinder in use.

17. Apparatus as claimed in any one of claims 10 to 16, wherein the motor is located within the first container.

18. Apparatus as claimed in any one of claims 8 to 17, further comprising a worm gear assembly to vary the distance between the two burrs.

19. Apparatus as claimed in claim 18, wherein the worm gear assembly comprises an elongate threaded stem that protrudes from the grinder such that a user can manually rotate the stem to cause the distance between the burrs to vary.

20. Apparatus as claimed in claim 19, wherein the worm gear assembly further comprises teeth disposed about a periphery of a component of the grinder, the teeth

being arranged to co-operate with the threads of the elongate stem, which engagement causes the component to in turn act on the conical burr to vary the distance between the two burrs when the elongate stem is rotated.

21. Apparatus as claimed in any one of the preceding claims further comprising a slidable gate between the first container and the grinder, the slidable gate operable to allow the first container to dispense the coffee beans.

22. Apparatus as claimed in any one of claims 2 to 21 further comprising a scale arranged to weigh the discharged beans in the second container.

23. Apparatus as claimed in claim 22, wherein the scale is positioned in the apparatus adjacent to where the beans are discharged into the container, whereby the beans discharged into the container are able to be weighed immediately following discharge.

24. Apparatus as claimed in claims 22 or 23, wherein the scale is positioned in the apparatus:

such that the second container is located on the scale as the beans are discharged into the second container; or

laterally adjacent to the second container when the beans are being discharged into the container.

25. Apparatus as claimed in any one of claims 22 to 24, wherein the scale and the motor are powered by the same power source.

26. Apparatus as claimed in claim 24 or 25, wherein when the scale is positioned in the apparatus such that the second container locates thereon during discharge, the scale is in the form of a ring, wherein the second container is supported by at least two tabs that are positioned on the ring in use.

27. Apparatus as claimed in claim 24 or 25, wherein when the scale is positioned laterally adjacent to the second container, the second container is supported by a collapsing fork arranged to releasably engage the second container.

28. Apparatus for discharging ground coffee beans to a container, the apparatus comprising a scale arranged to weigh the discharged beans in the container.

29. Apparatus as claimed in claim 28, the scale being otherwise as defined in any one of claims 23 to 27.

30. Apparatus as claimed in claim 28 or 29, the apparatus being otherwise as defined in any one of claims 1 to 21.

31. Apparatus according to any one of the preceding claims, wherein the first container has at least one indicia positioned thereat, the indicia able to provide a visual guide to ensure that a correct quantity of coffee beans is retained within the first container in use.

32. Apparatus according to any one of the preceding claims further comprising a body defining an interior chamber and having the grinder disposed therein, the grinder being arranged to grind the coffee beans dispensed by the first container; and

a heat extraction assembly for extracting heat from the body, the heat extraction assembly comprising an air inlet in the body that is arranged to direct air into the chamber and onto the grinder, and a fan that is arranged to discharge that air from the body.

33. Apparatus as claimed in claim 32, wherein the air inlet is arranged such that the air is able to flow past and remove heat from the grinder, and the fan is arranged in the body to discharge the resultant heated air from the body.

34. Apparatus as claimed in claim 32 or 33, wherein the heat extraction assembly further comprises heat exchange fins disposed radially around and in contact with an external surface of the grinder, the fins able to conduct heat from the grinder.

35. Apparatus as claimed in any one of claims 32 to 34, wherein the air inlet comprises opposing slots located in the body and adjacent to the grinder, the opposing slots allowing ambient air to flow into the chamber from opposite sides of the apparatus.

36. Apparatus as claimed in claim 34 or 35 when dependent on claim 34, wherein the heat extraction assembly further comprises an aperture in an external surface of a grinder support body that is arranged to support and surround the grinder, the aperture

enabling air to flow from the chamber to an interior of the grinder support body, whereupon the air can be heated to remove heat from the grinder.

37. Apparatus as claimed in any one of claims 32 to 36, wherein the fan is located in the chamber and adjacent to an air outlet disposed in a wall of the body, the fan able to exhaust the heated air through the air outlet.

38. Apparatus as claimed in any one of claims 32 to 37, wherein the fan is controllable to vary its speed to increase or decrease airflow through the chamber.

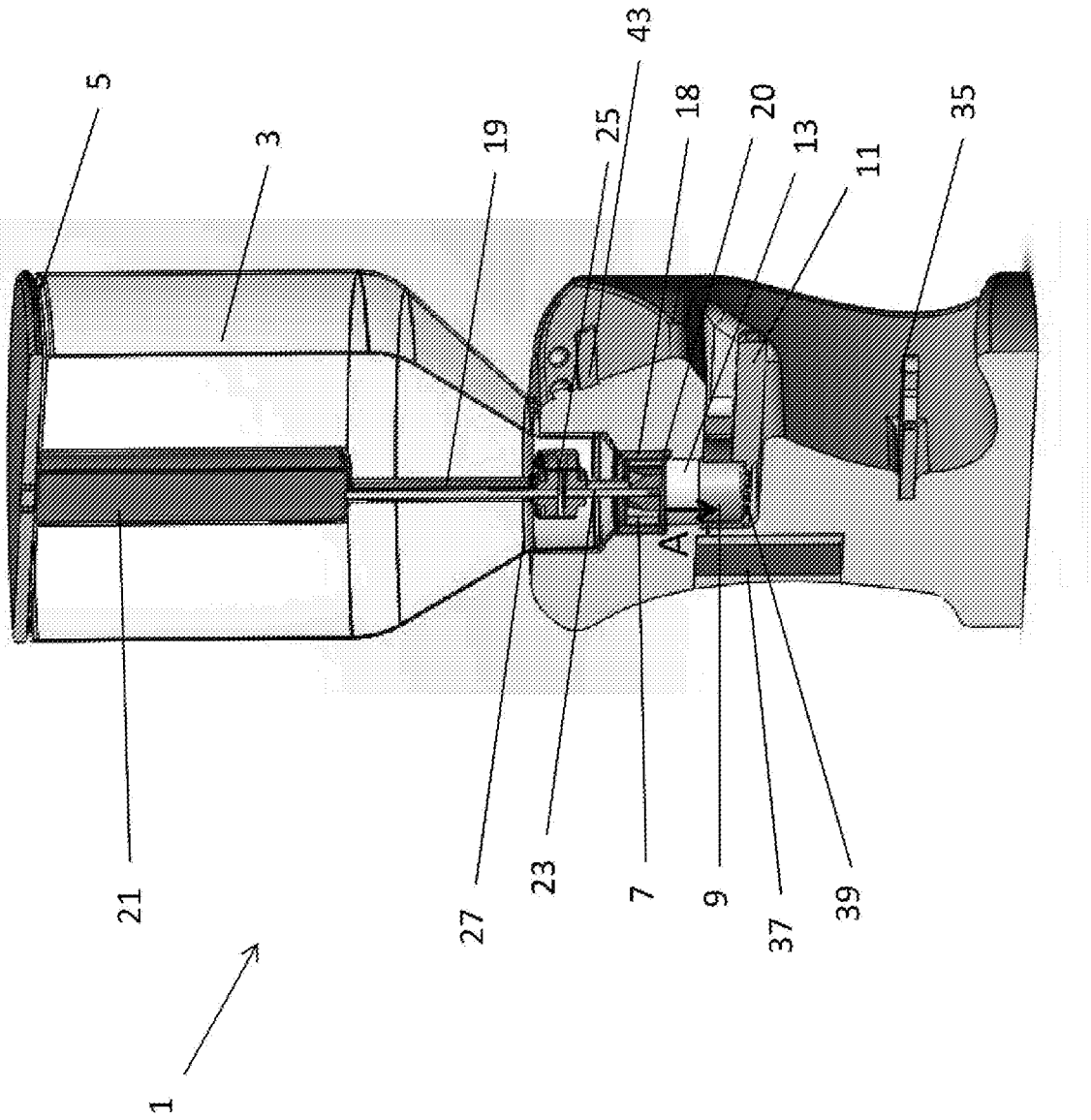

Fig. 1

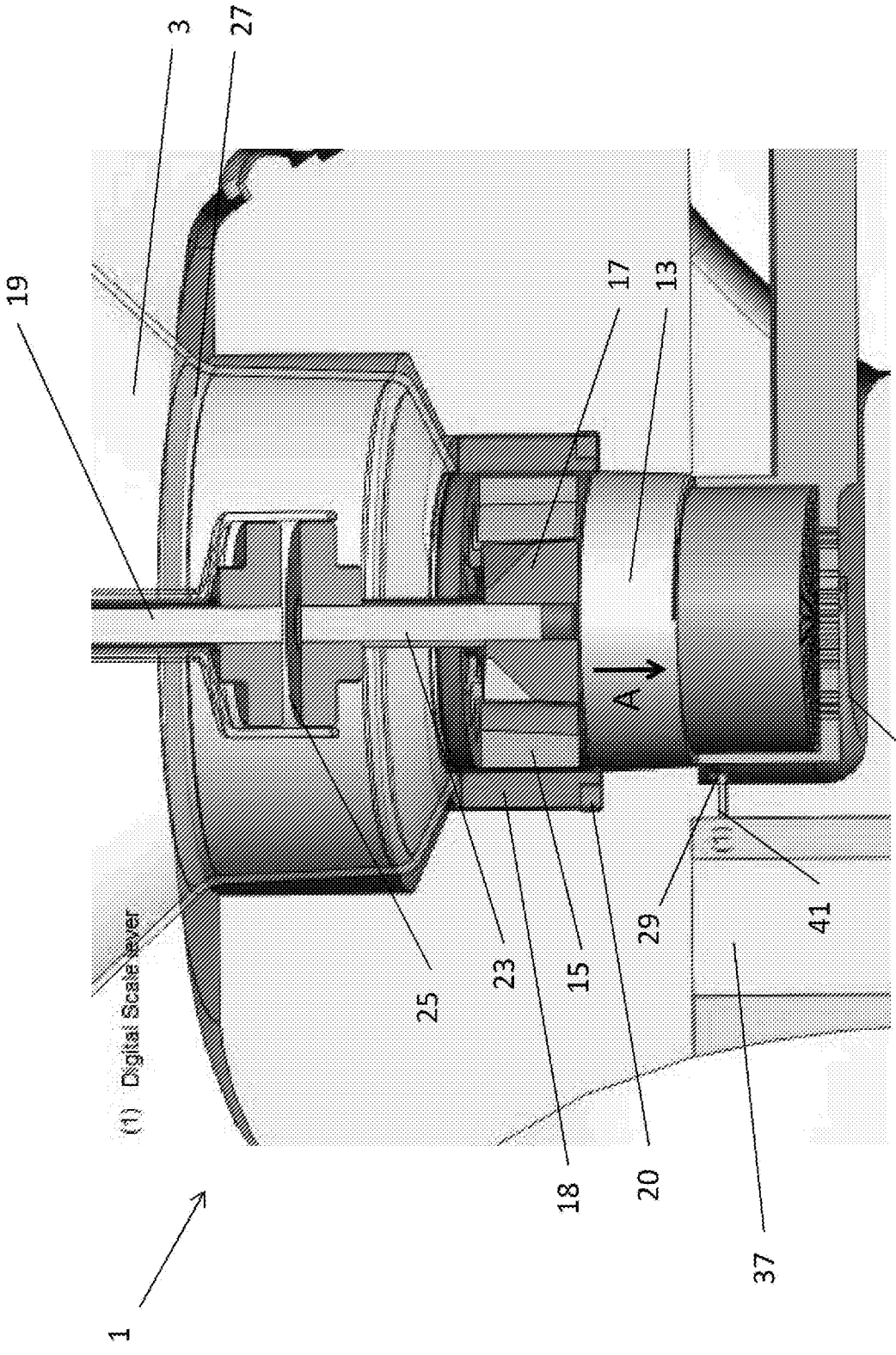

Fig. 2

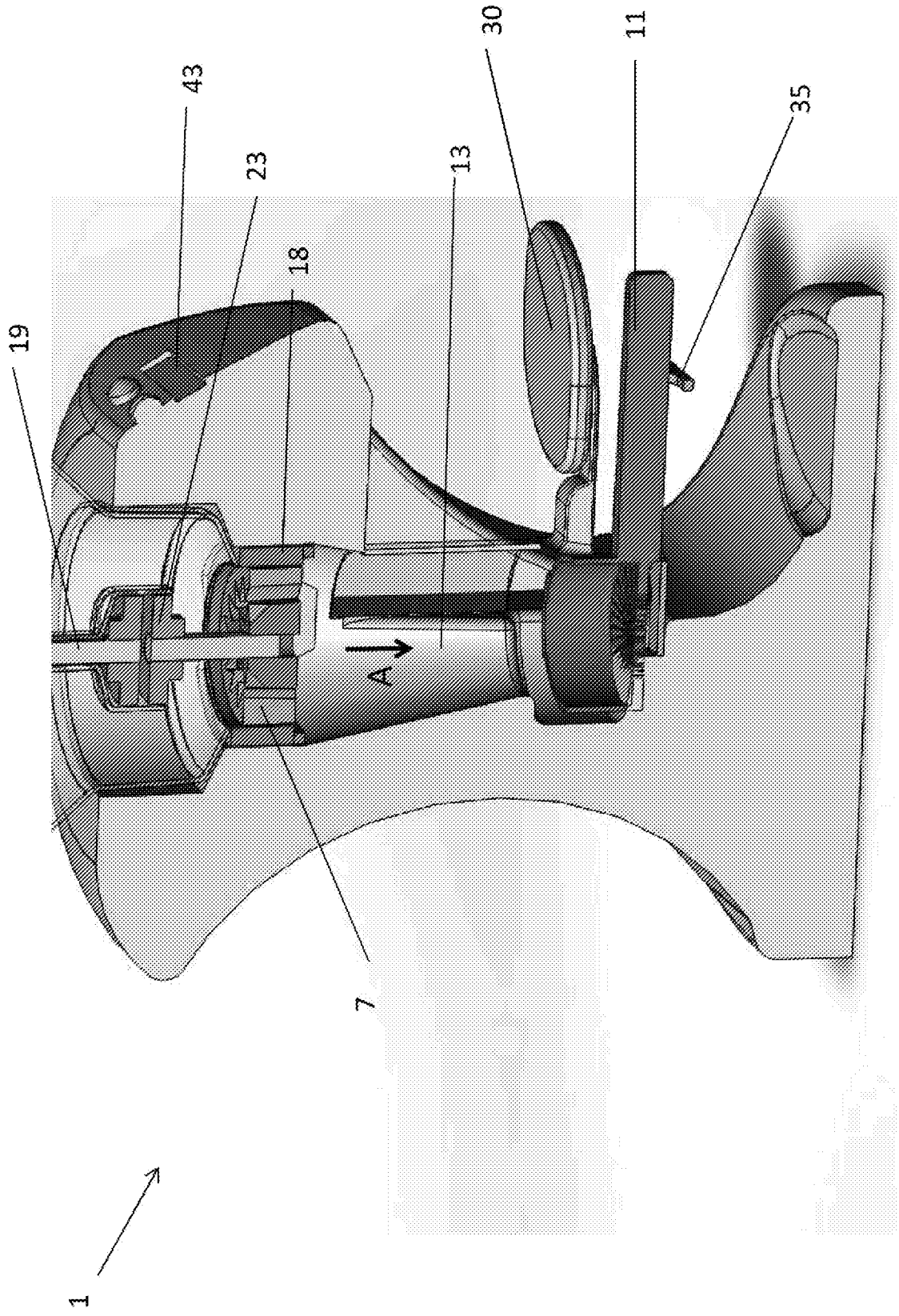

Fig. 3

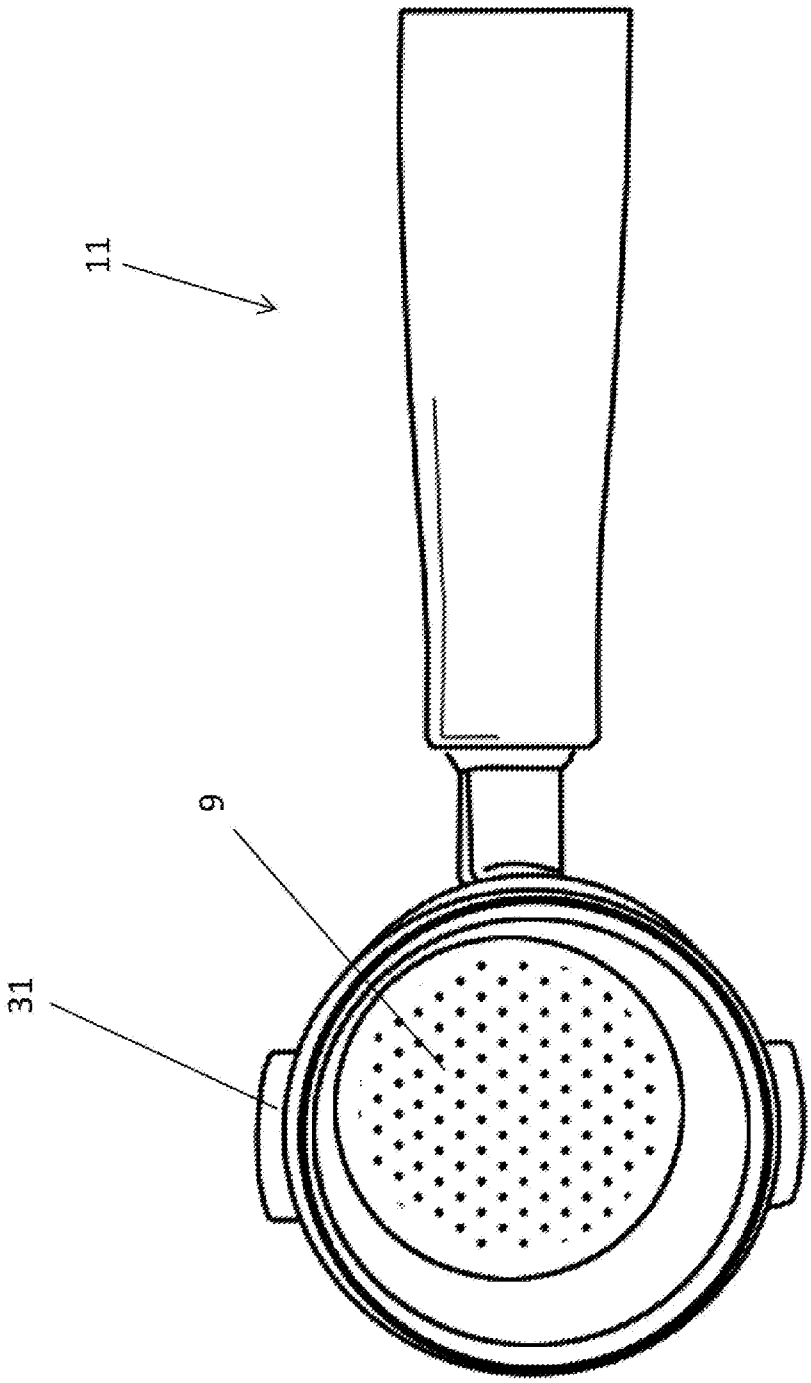

Fig. 4

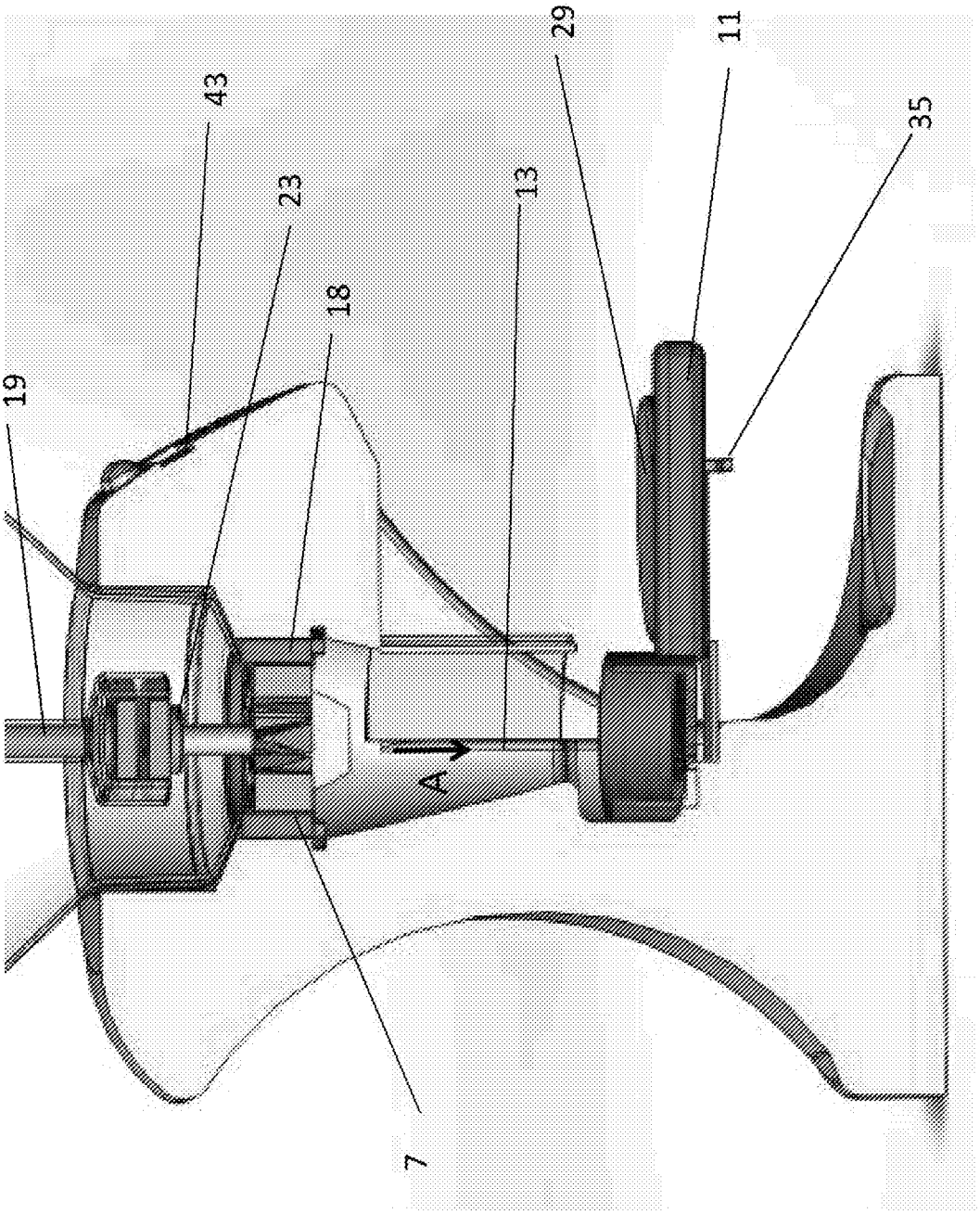

Fig. 5

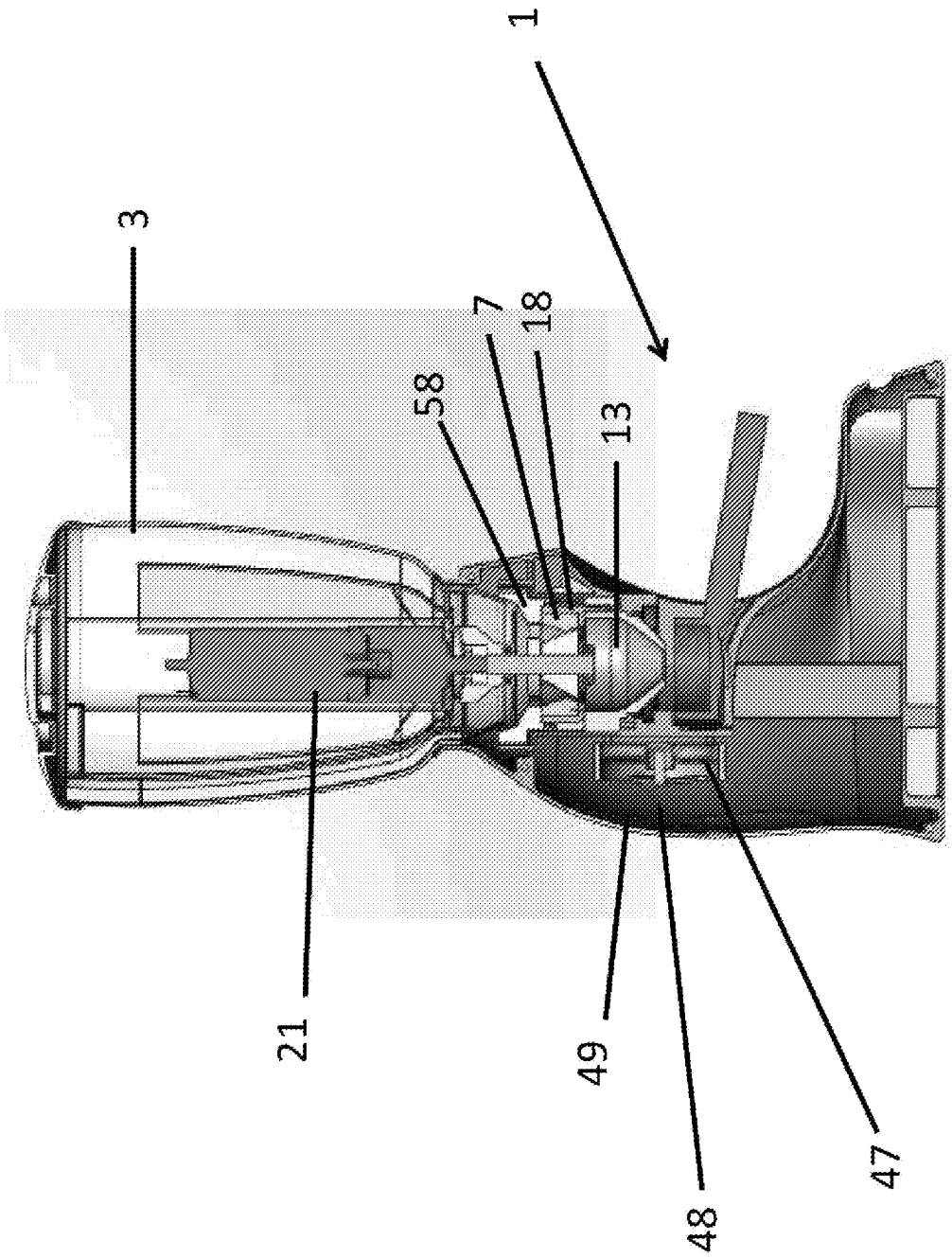

Fig. 6

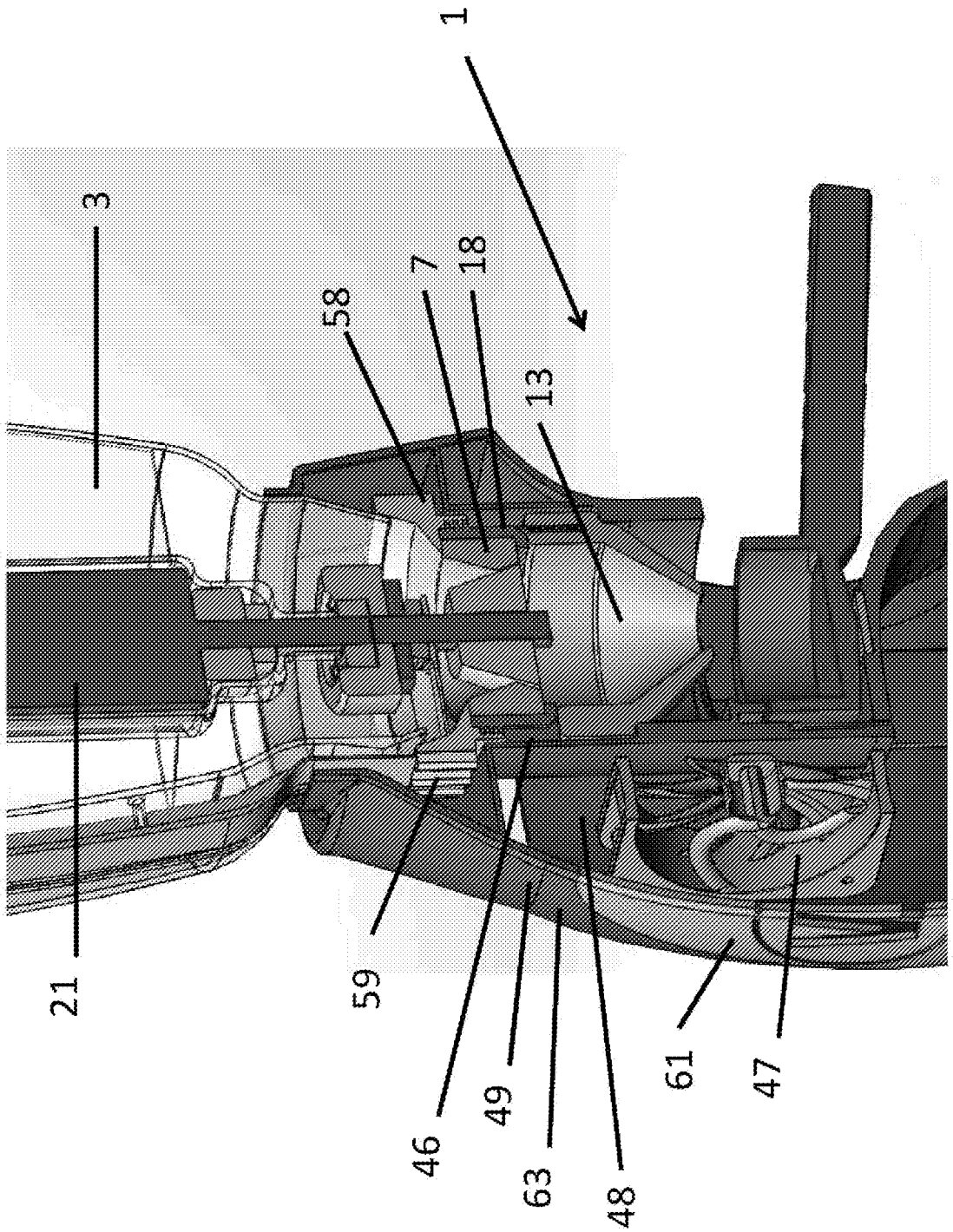

Fig. 7

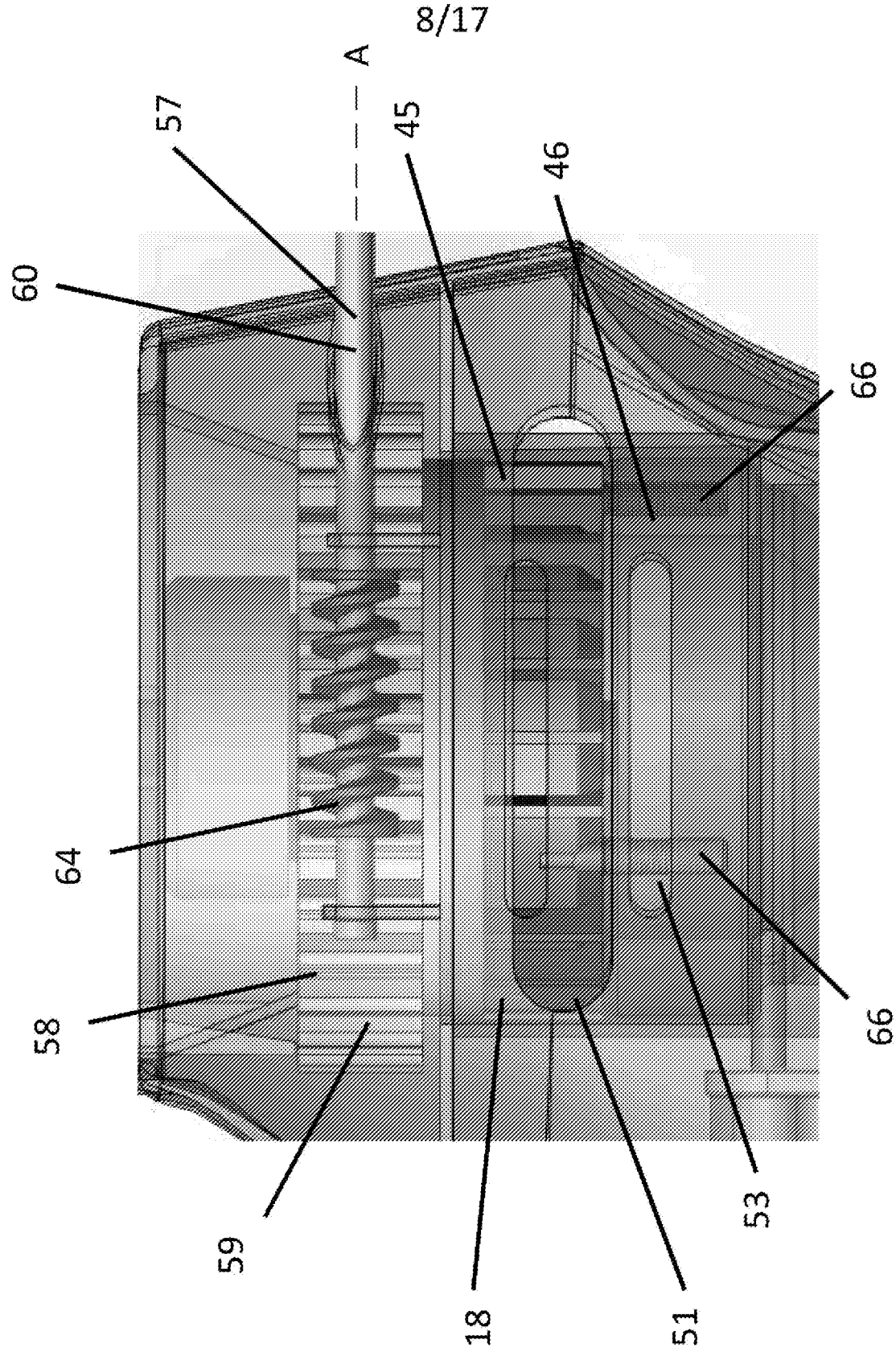

Fig. 8

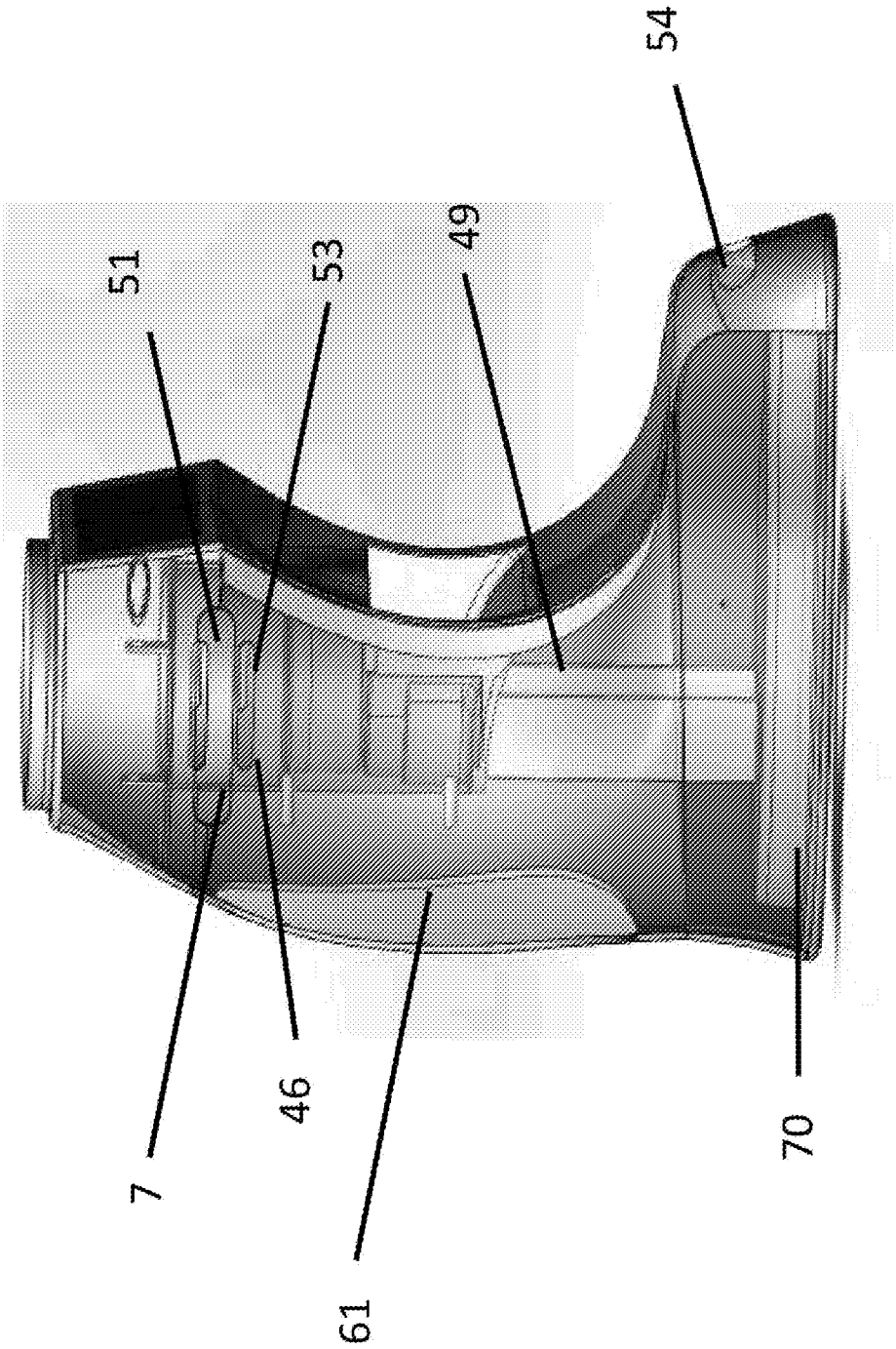

Fig. 9

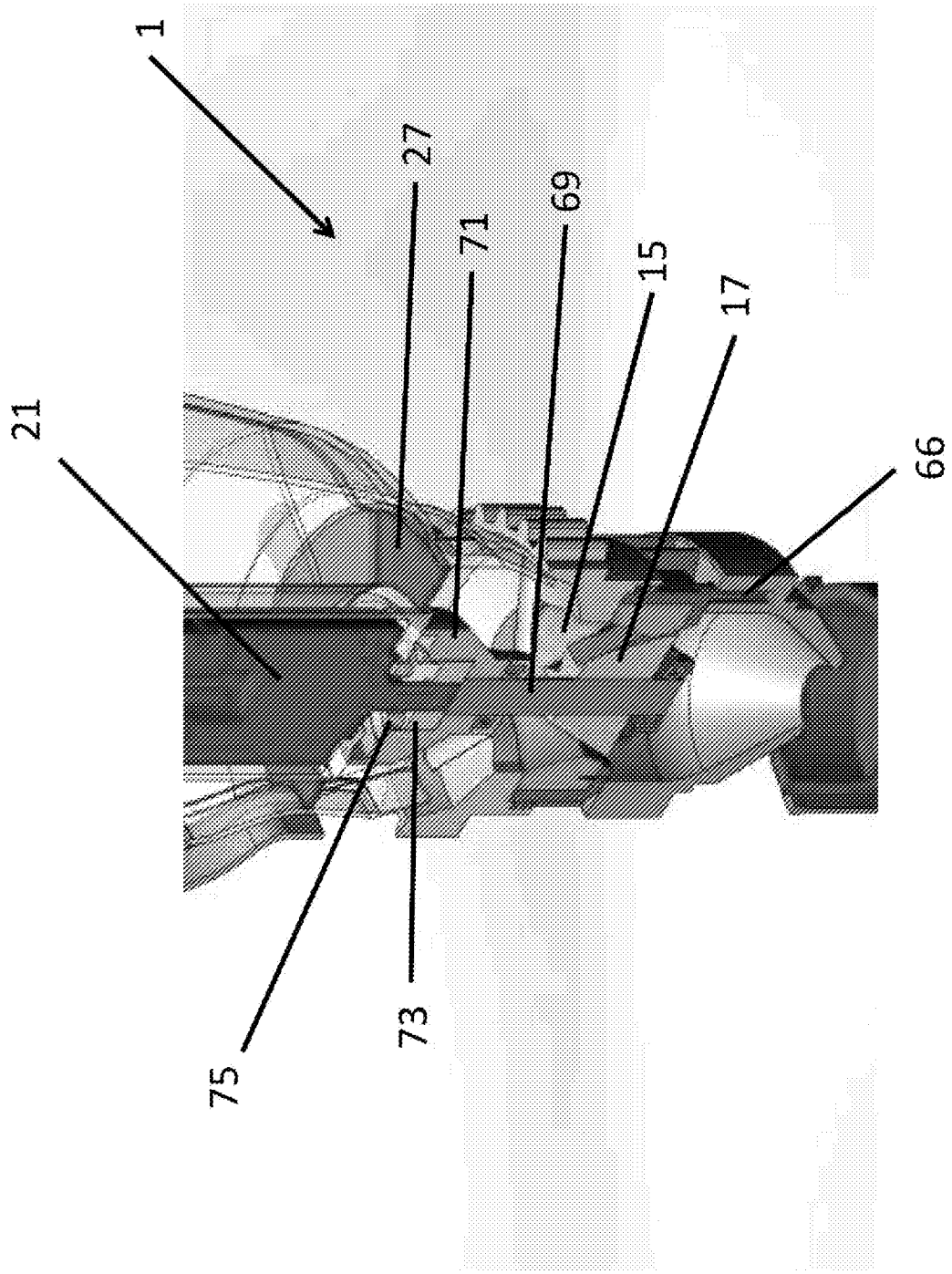

Fig. 10

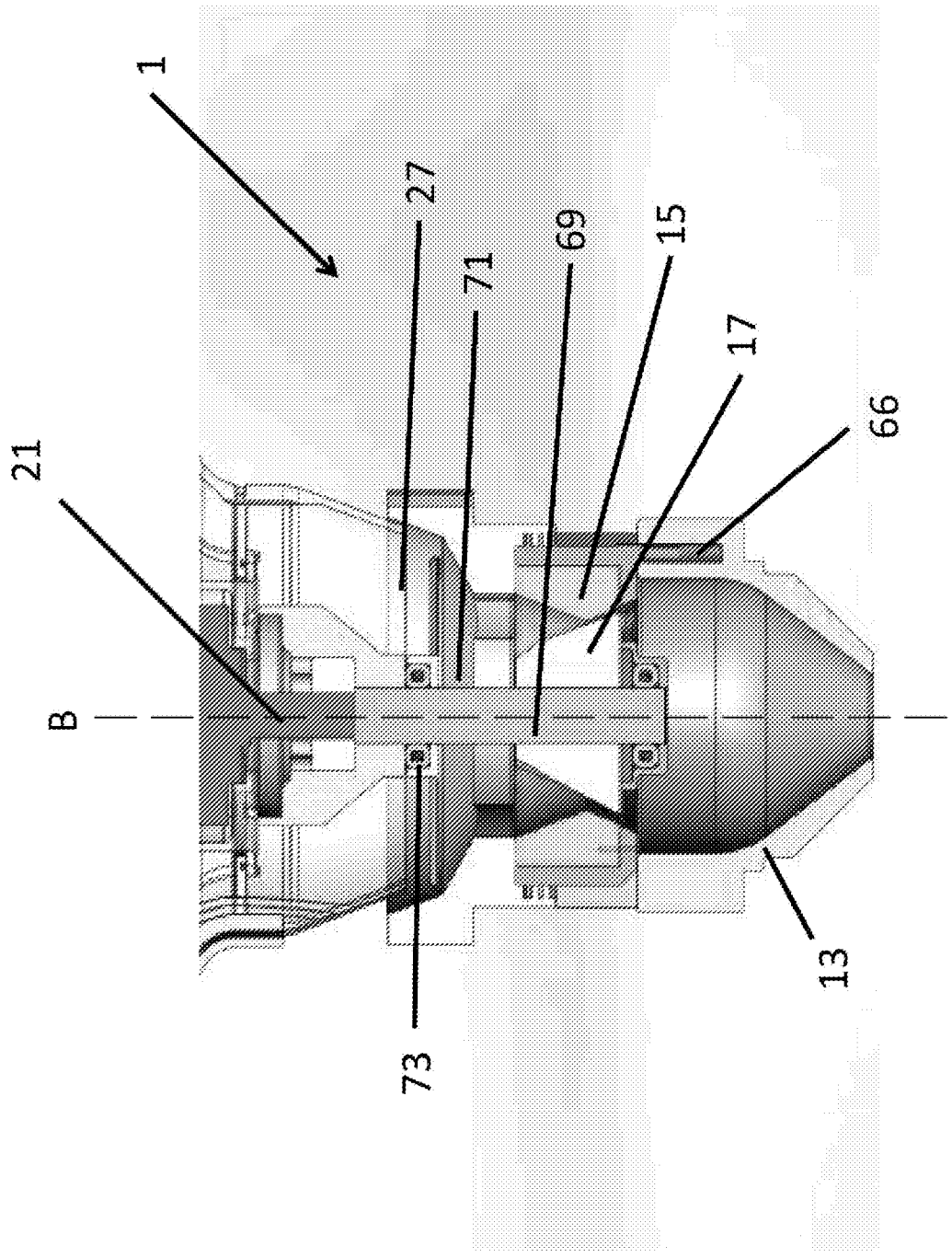

Fig. 11

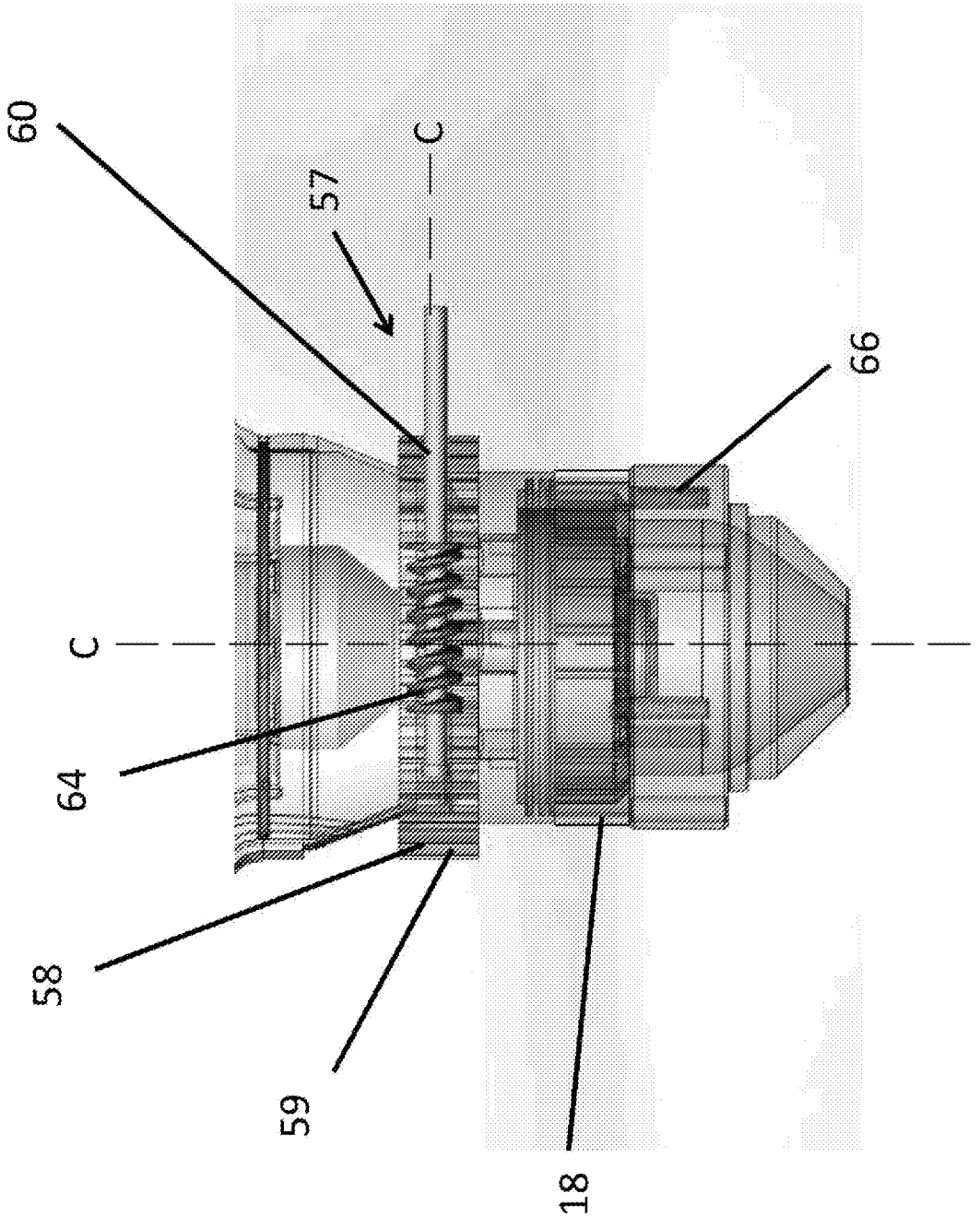

Fig. 12

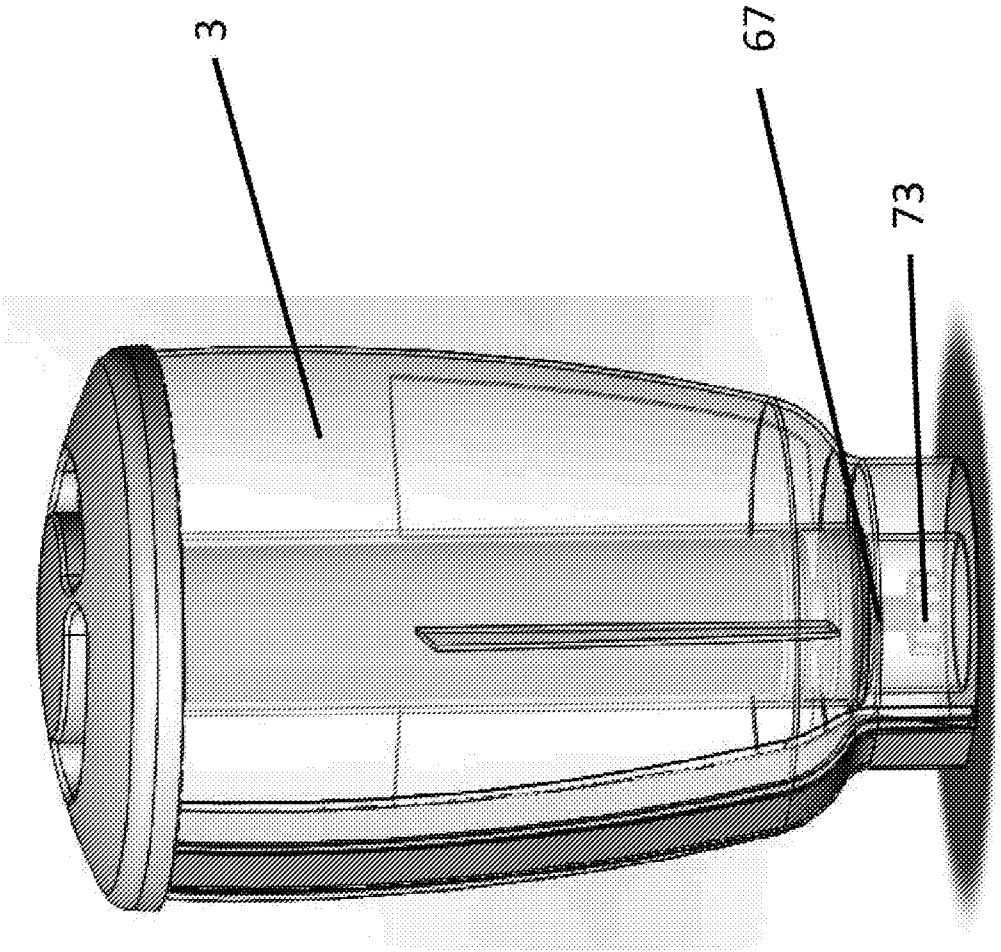

Fig. 13

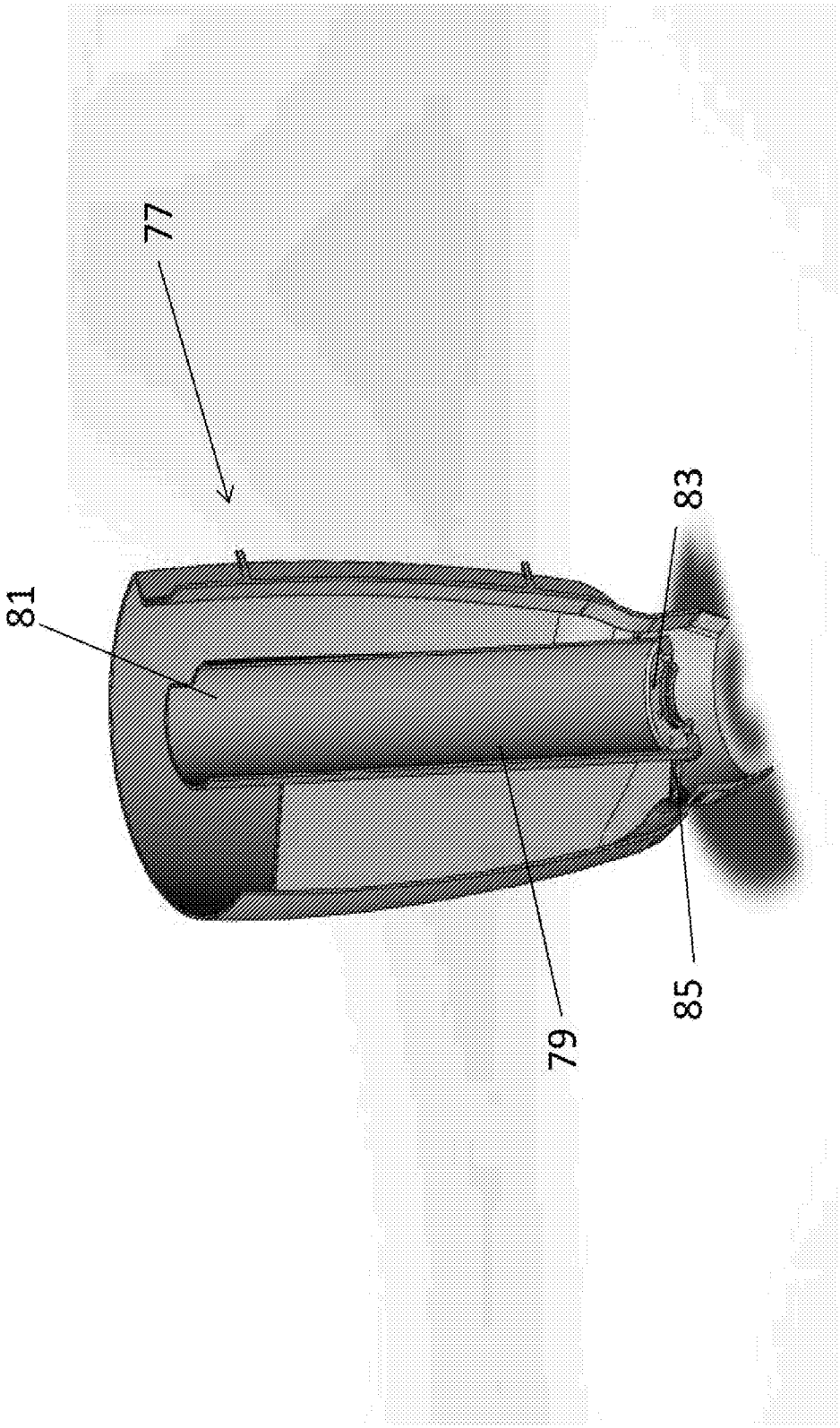

Fig. 14

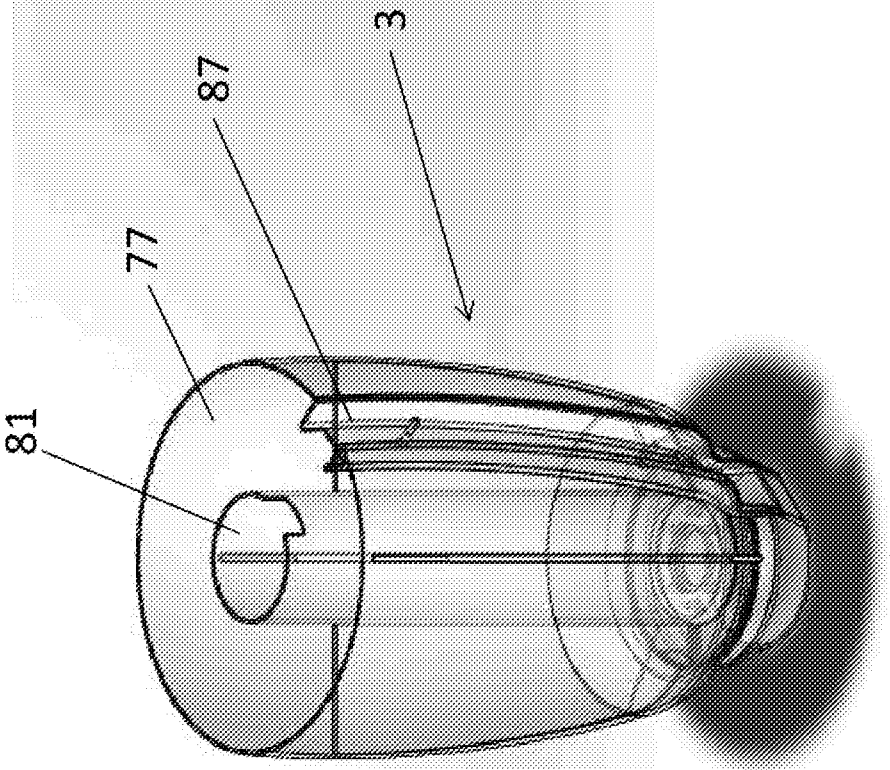

Fig. 15

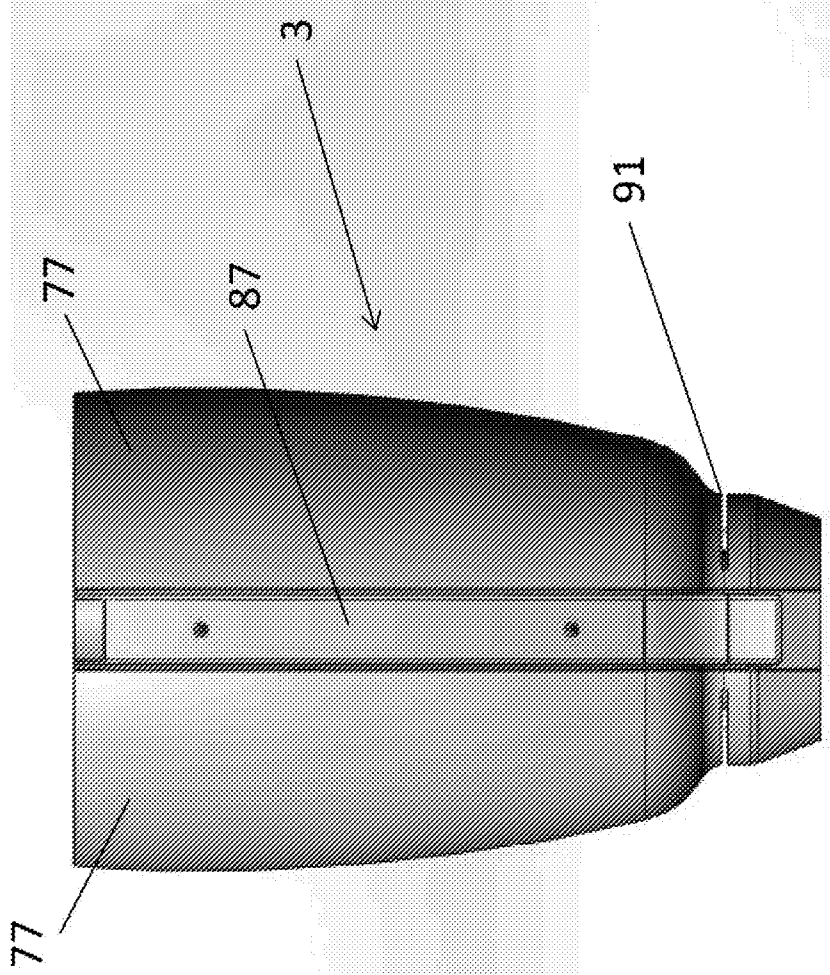

Fig. 16

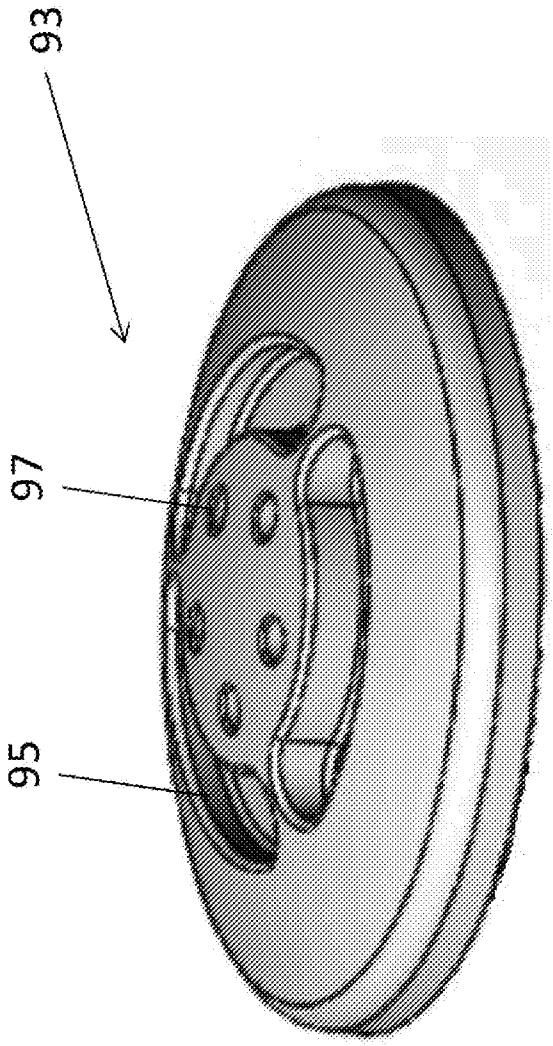

Fig. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2014/001151

A. CLASSIFICATION OF SUBJECT MATTER

A47J 42/00 (2006.01) A47J 42/40 (2006.01) A47J 42/54 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

Databases: WPI, EPODOC. Cluster: TXTE. IPC/CPC: A47J42/00/low, grind, crush, ground, burr, blade, scale, weight, chute, channel, outlet, heat, temp, hot, extract and similar keywords.
Espacenet: Applicant/Inventor Search, Cited/Citing document search
AUSPAT: Applicant/Inventor Search
Google Patent Search: Keyword search: coffee grinder, coffee machine, coffee dispensers and grind, crush, ground, burr, blade, scale, weight, chute, channel, outlet, heat, temp, hot, extract and similar keywords.
Google Search: Keyword search: Coffee grinders with scales, coffee grinders and dispensers

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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
18 March 2015	18 March 2015
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Alison Cropley AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832460

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2014/001151**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/015801 A1 (REGO) 31 January 2013 whole document. see especially abstract, figs 1a & 1b	1 - 5, 7 - 38
X	US 2010/0011975 A1 (MAZZER) 21 January 2010 whole document see especially fig. 1	1 - 5, 7 - 38
X	WO 2011/109873 A1 (BREVILLE PTY LIMITED) 15 September 2011 see figs. 1 - 5, pg. 5 lines 33 - 37, pg. 10 lines 30 - 33	1 - 5, 7 - 21, 31 - 38
X	AU 2012209041 A1 (SUNBEAM CORPORATION LIMITED) 21 February 2013 figs. 1 - 4, pgs. 9 & 10	1 - 5, 7 - 21, 31 - 38
A	GB 844438 A (DITTING) 10 August 1960	1 - 5, 7 - 38
A	US 7934670 B2 (FORD) 03 May 2011	1 - 5, 7 - 38
A	US 6572036 B2 (GLUCKSMAN et al.) 03 June 2003	1 - 5, 7 - 38
A	US 5522556 A (KNEPLER et al.) 04 June 1996	1 - 5, 7 - 38

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2014/001151

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

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

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

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

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

See Supplemental Box for Details

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

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

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

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

Remark on Protest

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

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

☐ No protest accompanied the payment of additional search fees.

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1 - 5 & 7 - 27 (in full) & 31 - 38 (in part) are directed to an apparatus for discharging a ground coffee beans. The feature of the grinder arranged to grind the coffee beans dispensed by the first container, the grinder being arranged such that it is able to vertically discharge the ground coffee beans is specific to this group of claims.

- Claims 28 - 30 (in full) & 31 - 38 (in part) are directed to an apparatus for discharging ground coffee beans to a container. The feature of the apparatus comprising a scale arranged to weigh the discharged beans in the container is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2014/001151**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
WO 2013/015801 A1	31 January 2013	EP 2694216 A1	12 Feb 2014
		US 2014123857 A1	08 May 2014
		US 2014203118 A1	24 Jul 2014
		WO 2012138327 A1	11 Oct 2012
US 2010/0011975 A1	21 January 2010	US 8826803 B2	09 Sep 2014
		AU 2009202677 A1	04 Feb 2010
WO 2011/109873 A1	15 September 2011	AU 2011226749 A1	04 Oct 2012
		CN 102883642 A	16 Jan 2013
		EP 2544571 A1	16 Jan 2013
		RU 2012143623 A	20 Apr 2014
		US 2013001339 A1	03 Jan 2013
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End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.