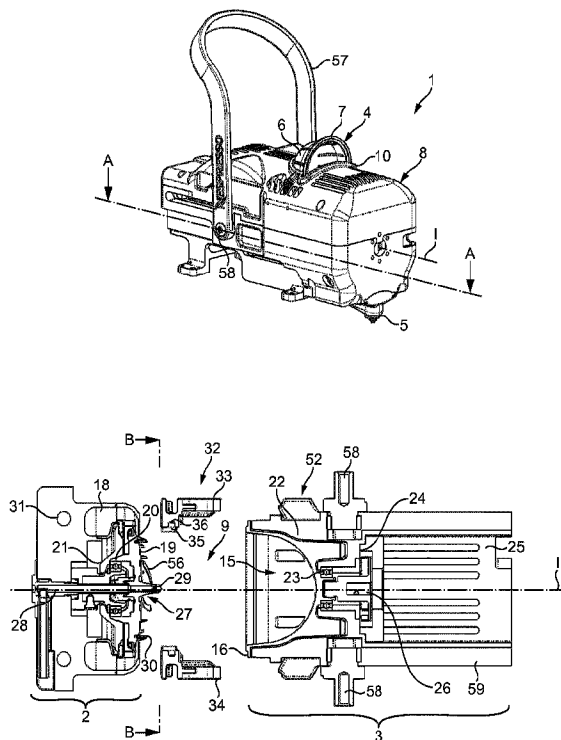




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(54) Titre : UNITE D'INFUSION DE BOISSON, EN PARTICULIER POUR MACHINES PERMETTANT DE PREPARER DES BOISSONS A PARTIR DE CAPSULES
(54) Title: BEVERAGE BREWING UNIT PARTICULARLY FOR MACHINES FOR PREPARING BEVERAGES FROM CAPSULES



(57) Abrégé/Abstract:

The invention relates to a beverage brewing unit (1) particularly for machines for preparing beverages from capsules, comprising:
-a casing (8),
-a capsule enclosing assembly comprising a first enclosing part (2) connected to the casing and a second enclosing

(57) Abrégé(suite)/Abstract(continued):

part(3), moveable relative to the first enclosing part in a longitudinal direction, preferably in a translatory movement, between a capsule insertion position in which the two enclosing parts are at distance from each other and a capsule enclosing position in which the capsule is enclosed between the first and second enclosing parts(2,3), -a capsule insertion assembly (32) comprising a pair of jaws (33, 34) arranged for guiding the capsule (4) towards the intermediate insertion position and holding it in said position; -wherein the jaws (33, 34) are moveable between a capsule holding position and a capsule release position; wherein the jaws (33, 34) are driven from the capsule release position to the capsule holding position by first actuation means (47) and from the capsule holding position to the capsule release position by second actuation means (52)and; wherein the first and second actuation means (47, 52) are arranged at longitudinal distance one another along the direction of longitudinal axis (I) for the relative movement of the two enclosing parts (2, 3).

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(54) **Title:** BEVERAGE BREWING UNIT PARTICULARLY FOR MACHINES FOR PREPARING BEVERAGES FROM CAPSULES

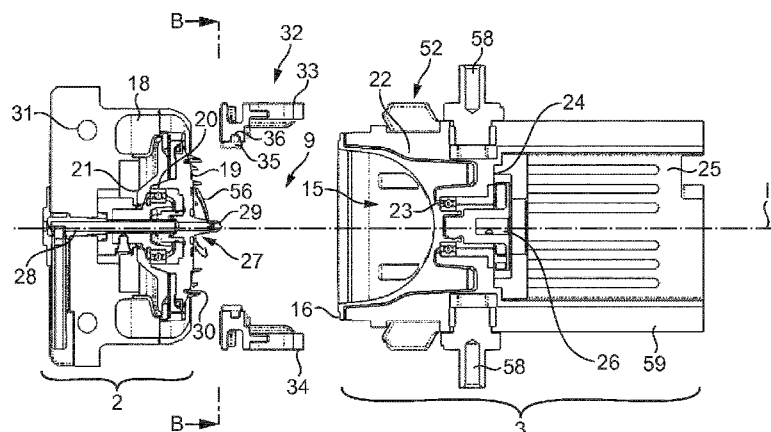


FIG. 2

(57) **Abstract:** The invention relates to a beverage brewing unit (1) particularly for machines for preparing beverages from capsules, comprising: -a casing (8), -a capsule enclosing assembly comprising a first enclosing part (2) connected to the casing and a second enclosing part (3), moveable relative to the first enclosing part in a longitudinal direction, preferably in a translatable movement, between a capsule insertion position in which the two enclosing parts are at distance from each other and a capsule enclosing position in which the capsule is enclosed between the first and second enclosing parts (2,3), -a capsule insertion assembly (32) comprising a pair of jaws (33, 34) arranged for guiding the capsule (4) towards the intermediate insertion position and holding it in said position; -wherein the jaws (33, 34) are moveable between a capsule holding position and a capsule release position; wherein the jaws (33, 34) are driven from the capsule release position to the capsule holding position by first actuation means (47) and from the capsule holding position to the capsule release position by second actuation means (52) and; wherein the first and second actuation means (47, 52) are arranged at longitudinal distance one another along the direction of longitudinal axis (I) for the relative movement of the two enclosing parts (2, 3).

Beverage brewing unit particularly for machines for preparing beverages from capsules

Field of the invention:

The present invention relates to a beverage brewing unit particularly for machines for preparing beverages from capsules containing a beverage ingredient. The invention further relates to a beverage preparation machine comprising such a brewing unit.

Background:

Certain beverage preparation machines use capsules containing ingredients to be extracted or to be dissolved and/or ingredients that are stored and dosed automatically in the machine or else are added at the time of preparation of the drink. Some beverage machines possess filling means that include a pump for liquid, usually water, which pumps the liquid from a source of water that is cold or indeed heated through heating means.

Especially in the field of coffee preparation, machines have been widely developed in which a capsule containing beverage ingredients is inserted in a brewing unit. The brewing unit is tightly closed about the capsule, water is injected at the first face of the capsule, the beverage is produced in the confined volume of the capsule and a brewed beverage can be drained from a second face of the capsule and collected into a receptacle such as a cup or glass.

Brewing units have been developed to facilitate insertion of a capsule and removal of the capsule upon use.

EP1757 212B1 relates to an example of these brewing units. The devices comprise a frame, a fixed enclosing part for the capsule, a movable enclosing part which is mounted relative to the frame in a sliding relationship, one or two knuckle joint mechanisms that provide a mechanical system which enables to close in a steady and fluid-tight manner the enclosing parts about the capsule while also resisting to the counter-force acting while re-opening and generated by the internal brewing pressure, and a handle for directly leveraging the knuckle joint mechanism. Such a device forms a simple assembly enabling insertion of the capsule by vertical (gravity) fall through a passage in the frame and removal of the used capsule in the same direction as the insertion direction. The movable enclosing parts of the brewing unit are actuated manually via the handle.

An important aspect is to provide a unit which is convenient and reliable for insertion of a capsule in the passage followed by closure of the brewing unit around the capsule and, after brewing, ejection of the capsule from unit.

In EP1757212B1, the device comprises stop means such as pivoting guiding jaws which the second mobile part acts on in order to move them apart during the passage of the capsule from its intermediate position to its position of extraction. In particular, the jaws are moved apart by lateral actuation levers which act on tabs of the guiding jaws so as to move them from a capsule holding position to a capsule release position and vice versa. The lateral actuating levers are mounted along vertical pivot axes to be able to swivel when any one of their two opposite free ends is engaged by a protruding cams positioned on the side of the moving enclosing part.

WO2011/151781A1 relates to a brewing apparatus for a machine for preparing beverages comprising a capsule gripping device including a pair of movable jaws and telescopic pushers provided with respective transversely protruding parting formations having respective first and second pushing surfaces capable of parting the jaws when the movable receiving assembly moves towards and away from the closed position respectively.

EP2520203B1 relates to an apparatus for preparing a beverage started from a powder material contained in a sealed cartridge, comprising a percolating assembly and a cartridge loading and unloading device including a pair of jaws adapted to held the cartridge at an infusion position and to discharge the cartridge at the end of the infusion to provide the space for a new cartridge; said jaws being driven from an unloading spread apart position to a cartridge restraining closed position by telescopic cams associated with the percolating assembly.

WO2012085774A1 relates to an infusion apparatus for a machine for preparing beverages comprising a movable assembly and a cooperating assembly adapted to define an infusion chamber, a gripper type holding device including a pair of movable jaws adapted to assume a relative holding position in which the jaws are capable of receiving and retaining a capsule introduced between the assemblies; and opening means opening the jaws; said opening means comprising a bearing structure and a spring-biased opening member capable of maintaining the gripper type holding device with jaws wide open for a predetermined stroke of the movable assembly which is adapted to allow the exhausted capsule to be released.

The prior art essentially discloses loading and unloading jaw-type systems in which the actuation requires either a telescopic or a movable additional actuation means (e.g., swiveling actuation levers). The problem lies in the complexity and the risk of blocking of these devices.

Another problem lies in the lack of precise control of the positioning or centering of the capsule relative to the enclosing members during the closure of the brewing unit. Indeed, for example, if the two telescopic or movable members are not perfectly

coordinated, one of the two jaws may release the capsule sooner thereby causing the capsule to position itself in a biased arrangement in the receiving cavity of the capsule enclosing assembly. Considering the capsule enclosing assembly can be a rotational or centrifugal system driving the capsule at high elevated speeds, a lack of centering of the capsule in the enclosing assembly may cause damage to the capsule and/or unbalance of the rotational extraction system which may create vibrations and/or noises.

Summary of the invention:

According to the present invention, these objects and others are achieved with a beverage brewing unit as described herein.

In particular, the invention relates to a beverage brewing unit particularly for machines for preparing beverages from capsules.

The unit comprises

- a casing ,
- a capsule enclosing assembly comprising a first enclosing part connected to the casing and a second enclosing part, moveable relative to the first enclosing part, along a longitudinal direction, preferably in a translatory movement, between a capsule insertion position in which the two enclosing parts are at distance from each other with a passage formed in between and a capsule enclosing position in which the capsule is enclosed between the first and second enclosing parts,
- a capsule insertion assembly comprising a pair of jaws arranged for guiding the capsule towards the intermediate insertion position and holding it in said position; said jaws comprising a pair of support surfaces for holding the capsule against gravity;
- wherein the jaws are moveable between a capsule holding position in which the support surfaces are close to one another a distance sufficient to hold the capsule in said position and a capsule release position in which the support surfaces of the jaws are spread apart a distance sufficient to no longer hold the capsule;

wherein the jaws are driven from the capsule release position to the capsule holding position by first actuation means and from the capsule holding position to the capsule release position by second actuation means;

- 5 wherein the first and second actuation means are arranged at longitudinal distance one another along the direction of longitudinal axis for the relative movement of the two enclosing parts in such a manner that the first actuation means acts on the jaws when the second enclosing part moves relatively away from the first enclosing part and the two enclosing parts are sufficiently distant one another to allow the capsule
10 to be removed from the capsule enclosing assembly through the passage after brewing; and the second actuation means acts on the jaws when the second enclosing part moves relatively towards the first enclosing part and the enclosing parts are sufficiently close one another to enable the capsule to be properly maintained or hold by at least one of the enclosing parts before being enclosed by
15 the enclosing parts.

Preferably, first and second actuation means form parts of the second enclosing part or are most preferably shared between the second enclosing part and the capsule insertion assembly. Preferably, the first and second actuation means comprise non-telescopically projecting cam portions of the second enclosing part.

- 20 Preferably, the first actuation means is arranged to block the jaws in the capsule holding position when the first and second enclosing parts are in the capsule insertion position; the jaws thereby being prevented to spread apart by the load of the capsule when it is inserted in the passage by gravity. Therefore, it is possible to reliably handle capsules relatively heavy, of large sizes or which may contain a
25 relatively large weight of beverage ingredient.

- In one aspect, the second enclosing part comprises a pressing edge for pressing against a flange of the capsule; said edge circumventing a cavity for receiving at least a part of the body of the capsule therein. In such case, the first actuation means preferably comprises a pair of first cam portions extending longitudinally beyond the
30 pressing edge in direction of the first enclosing part. The first actuation means may further comprise a pair of complementary cam portions for engagement with the pair of first cam portions and provided on the jaws or on (upper) extension parts of the jaws.

The second actuation means also preferably comprises a pair of second cam portions extending rearwardly offset relative to the pressing edge, preferably, along the sides of the second enclosing part and protruding outwardly. The second actuation means may further comprise a pair of complementary cam portions provided on the capsule insertion assembly, such as on a surface of the jaws or of (lower) extension portions of the jaws.

Preferably, the jaws are pivotally mounted on the casing or first enclosing part along pivot axes which are substantially parallel to the direction of longitudinal axis of relative movement of the enclosing parts. These pivot means enable the jaw to move between the capsule holding position and the capsule release position.

In particular, the first and second actuation means are arranged at relative spacial distance respectively above and below the pivot axes of jaws on the casing or first enclosing part.

Preferably, the jaws are held in each position by force retaining means so as to be able to take two stable positions i.e., capsule holding and release positions.

In particular, the force retaining means comprise, for each jaw, a resilient biasing member (e.g., springs) connected respectively to the jaw and to the casing or first enclosing part, on each side of the pivot axle of the jaw, to force the jaw in one of the two positions, thereby forming stable positions, depending on the offset position of the pivot axle relative to the line connecting the connection points of the resilient biasing member.

Preferably, the force retaining means comprises, for each jaw, a magnetic arrangement providing a magnetic attraction force between the jaw and a portion of the casing or first enclosing part when the jaw is positioned in any one of the two positions.

The first enclosing part also preferably comprises a brewing interface member with elastic pushing means, preferably at least one spring-blade, which act on the capsule, preferably its lid, to unstick it from the said member.

The second enclosing part also preferably comprises capsule ejecting means which engage the capsule, preferably its body, to facilitate its removal from the cavity.

The first enclosing part and second enclosing part may form together at least part of a centrifugal brewing unit in which the capsule is driven in rotation for exerting forces

of centrifugation inside the capsule resulting in beverage to be extracted from the capsule.

The invention further relates to a beverage production device comprising a brewing unit described herein. The beverage production device may comprise, as known
5 per se, a water reservoir, pump for supplying water to the brewing unit, a heater for heating the water supplied to the brewing unit and a control unit for controlling the operations device and its various components.

Brief description of the figures:

10 Figure 1 shows a perspective view of the beverage brewing unit of the present invention;

Figure 2 shows a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of plane direction A-A when the unit is open;

Figure 3 shows a perspective view of the beverage brewing unit of figure 1 with the upper part of the casing and the first enclosing part being removed;

15 Figure 4 shows a perspective view of the beverage brewing unit of figures 1 or 2 with the lower part of the casing and the first enclosing part being removed;

Figure 5 is a partial view along plane direction B-B of the capsule insertion assembly (one jaw only) in the capsule holding position (without capsule being inserted in the passage);

20 Figure 6 is a partial view along plane direction B-B of the capsule insertion assembly (one jaw only) in the capsule release position (without capsule being inserted in the passage);

Figure 7 is a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of direction A-A in capsule insertion position with a capsule being inserted
25 in and held in intermediate insertion position by the capsule insertion assembly;

Figure 8 is a view in plane direction C-C of the beverage brewing unit of figure 7;

Figure 9 is a partial perspective view of the beverage brewing unit of figure 7;

Figure 10 is a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of direction A-A during the closure of the brewing unit with a capsule being
30 held in the capsule insertion assembly still in capsule holding position;

Figure 11 is a view in plane direction C-C of the beverage brewing unit of figure 10;

Figure 12 is a partial perspective view of the beverage brewing unit of figure 10;

Figure 13 is a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of direction A-A during the closure of the brewing unit with a capsule being released by the capsule insertion assembly;

Figure 14 is a view in plane direction C-C of the beverage brewing unit of figure 13;

5 Figure 15 is a partial perspective view of the beverage brewing unit of figure 13;

Figure 16 is a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of direction A-A in closure of the brewing unit in which the capsule is enclosed by the first and second enclosing parts;

Figure 17 is a view in plane direction C-C of the beverage brewing unit of figure 16;

10 Figure 18 is partial perspective view of the beverage brewing unit of figure 16;

Figure 19 is a cross sectional view of the beverage brewing unit of figure 1 along the cut plane of direction A-A during the re-opening of the beverage brewing unit for ejection of the capsule from the cavity of the second enclosing part;

Figure 20 is view in plane direction C-C of the beverage brewing unit of figure 19;

15 Figure 21 partial perspective view of the beverage brewing unit of figure 19.

Detailed description of preferred modes:

The present detailed description is given as a non-limiting (preferable) mode in which many variations and combinations are still possible. In particular, the use of terms such as “preferably”, “optionally”, “in general”, “may”, “for example”, “non-limiting” (etc.) provide a suitable vocabulary intended to relate to the broadest possible invention as well as to allow the general invention to take the form of many possible options. In particular, essential or non-essential technical characteristics described in this section can be individually combined with more general characteristics present in the summary of the invention and claims, unless the combinations appear technically infeasible to the skilled artisan.

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By reference to figures 1 to 4, the invention relates to a beverage brewing unit 1, such as a brewing unit of a coffee machine. The unit of the invention first comprises a capsule enclosing assembly comprising a first enclosing part 2 and a second enclosing part 3.

30 The brewing unit is generally conceived to receive and enclose a capsule 4 for the preparation of a beverage by feeding water in the capsule, extracting the beverage out of the capsule and dispensing it through a beverage outlet 5 generally located in front of the unit. The unit is further conceived to eject the capsule using gravity; the

capsule generally falling through a passage and into a capsule collecting bin (not illustrated).

The capsule 4 has generally a cup-shaped body 6 with a rim or flange 7 extending outwardly and a lid such as a sealing membrane and/or filter wall. The capsule generally contains a dose of beverage ingredient such as roast and ground coffee for preparing a coffee extract, soluble coffee, leaf or soluble tea for preparing a tea extract and the like.

In the illustrated example, the first enclosing part 2 is static relative to an outer casing 8 of the brewing unit. The outer casing can be formed in two or more parts. The second enclosing part 3 is mobile relative to the first enclosing part and outer casing 8, from an open position in which a passage 9 is formed between the two enclosing parts and a closed position in which the passage 9 is eliminated and the capsule is enclosed and in engagement between the two enclosing parts for enabling the preparation of the beverage.

The passage 9 forms a through-opening, preferably vertically oriented, positioned between the two enclosing parts 2, 3 when the two parts are spaced apart in the fully open or capsule insertion position of the brewing unit. Above the passage, is preferably provided an insertion hole 10 of a sufficient size for insertion of the capsule 4 by gravity. The insertion hole may be given a shape complementary to the shape of the capsule and/or guiding sliders for facilitating the introduction and guidance of the capsule during insertion through the casing. Below the passage is also preferably provided an ejection opening of a sufficient size for ejection of the capsule from the passage 9.

The second enclosing part 3 is actually mobile or moveable, from the open position to the closed position and reciprocally, along a main longitudinal direction of open/closure movement, defined along axis I, relative to the first enclosing part 2. For this, the second enclosing part 3 is guided in its opening/closing movement in or along the casing 9. The casing may extend forwardly by the beverage outlet 5. However, this is not mandatory and the beverage outlet can also be associated directly to the first enclosing part 2 and be mobile with it.

In the illustrated example, the second enclosing part 3 is guided via a pair (preferably two pairs) of guiding pins or rods 11, 12 (figure 3) along a pair (preferably two pairs)

of opposite guiding rails 13, 14 provided on the inner side walls of the casing 8 and extending longitudinally along or parallel to the axis **I**.

It should be noted that the longitudinal direction of movement of axis **I** is preferably horizontal or slightly horizontal and the passage 9 preferably extends vertically or slightly vertically. "Slightly" refers here to a variation relative to the strictly, respectively, horizontal or vertical directions of not more than about 15-20°.

The second enclosing part 3 comprises a cavity 15 dimensioned for receiving the body or, at least part of the body, of the capsule 4. The second enclosing part 3 further comprises a pressing edge 16 which generally applies closure forces on the flange 7 of the capsule in the closed position; such flange being squeezed between the pressing edge 16 and a complementary pressing portion or edge 17 of the first enclosing part 2 in the closed position of the unit (see figure 16).

In the present non-limiting embodiment, the unit is a centrifugal brewing unit for preparing the beverage by application of centrifugal forces to the liquid fed in the capsule and collecting the beverage or liquid extract in a beverage collector 18 provided in the first enclosing part.

The first enclosing part 2 preferably comprises a brewing interface member 19, for engaging the capsule, in particular its lid and/or flange, which is rotationally mounted, such as via (ball) bearing(s) 20, relative to a base member 21 of the first enclosing part. The collector 18 is preferably formed in the first enclosing part 2 to collect beverage leaving the capsule by effect of centrifugation from the brewing interface member 19. In particular, the collector 18 is provided as an annular cavity extending around the brewing interface member.

The second enclosing part 3 also preferably comprises a capsule holder 22, which is rotationally mounted, such as via (ball) bearing(s) 23, on a base member 24 of the second enclosing part. The capsule holder 22 is further linked to a rotary motor 25 via a rotational axle 26.

In the closed position of the brewing unit illustrated in figure 16, the capsule holder 22 of the second enclosing part and the capsule inserted in the cavity are driven in rotation (centrifugation) about a median longitudinal axis **O1**. The brewing interface 19 is thus also driven in rotation about the same axis **O1**.

In the present case, as shown in figure 2, the first enclosing part 1 comprises liquid injection means 27 to supply liquid, generally hot water, within the capsule, during extraction in the closed position of the enclosing parts (figure 12). However, in possible variations, the liquid injection means could as well be positioned at the second enclosing part 3 such as directly behind the cavity. The liquid injection means 27 comprises a conduit of liquid 28, preferably aligned with the longitudinal rotation axis **O1**, and an injection lance or needle 29. The lance or needle protrudes from the engaging surface of the brewing interface member 19 to enable to perforate or enter in the capsule. The lance or needle 29 further preferably comprises liquid inlet(s) for distributing liquid inside the capsule in one or more privileged directions.

The brewing interface member 19 may optionally also comprise a beverage heating means 31 to maintain the beverage (e.g., centrifuged liquid coffee extract) at a suitable serving temperature in the collector before draining through the outlet. The beverage heating means can be formed integrally with the collector 18 or be a separate element connected to it.

It should be noted that, in general, the brewing unit is preferably intended to be arranged with a substantially horizontal or slightly inclined longitudinal direction of movement **I**. Also, the longitudinal rotation axis **O1** is generally substantially aligned with the longitudinal direction of movement **I**. However, it is possible that compensation means of play are necessary to compensate for a possible misalignment of the enclosing parts.

The brewing interface member 19 may optionally also comprise beverage extraction means for assisting the beverage in draining from the capsule. For example, the beverage extraction means comprises a series of perforation members 30 for creating openings through the lid of the capsule. The perforation members can be small spikes, blades, needles and the like. It should be noted that, in possible reverse or simply different configurations, these extraction means can be positioned inside the cavity 15 or be distributed respectively on surfaces of the first and second enclosing members.

It should be noted that a configuration of the first enclosing part being mobile along the longitudinal direction of open/closure movement of the brewing unit (axis **I**) and the second enclosing part 3 being static relative to the casing 8 is also possible. It is also possible to have both first and second enclosing parts 2, 3 mobile relative to the

casing 8 in the longitudinal direction **I** from the open position to the closed position and reciprocally.

It should be noted that in possible variants, the first and/or second enclosing part(s) 2, 3 can be movable along the longitudinal direction of axis **I**, for only a final or small portion of the closing path of the brewing unit. Therefore, the movement of first and/or second enclosing part(s) can encompass movements having directions which are curved, inclined and/or parallel to axis **A** during the closure of the brewing unit before the final portion of the closing path, such as in the initial portion of the closing path.

According to a central aspect of the invention, the brewing unit comprises a capsule insertion assembly 32 comprising a pair of symmetrically arranged jaws 33, 34 arranged for guiding the capsule when inserted in the passage through the insertion hole 10 and for holding it in place. The jaws are generally positioned on each side of the passage. They are movable between a capsule holding position and a capsule release position. Each jaw generally comprises a support surface 35 for holding the flange 7 of the capsule and preventing it from falling by gravity. The surfaces 35 generally extend transversally relative to the direction of insertion of the capsule or direction of extension of the passage (or relative to the guiding surfaces of the jaws) in order to stop the flange of the capsule. The jaws are pivotally associated to a static part of the unit, preferably to the casing. In particular, the jaws may be connected to a U-shaped portion 63 of the casing. It should be noted that the jaws could also be connected, in an equivalent manner, to the first enclosing part 2.

Figures 5 and 6 illustrate a preferred example of the capsule insertion assembly 32. The capsule insertion assembly formed by the pair of jaws is generally symmetrical with respect to the vertical longitudinal plane passing through axis **I** (so is also preferably the brewing unit in general). Each jaw 33 preferably comprises, above the support surface 35, a guiding sliding surface 36, which may be shaped as an inwardly oriented U, for receiving the flange 7 of the capsule. Therefore, when the capsule is inserted in the unit, the flange of the capsule is properly guided along this surface and is finally stopped by the support surface 35 which extends substantially transversally relative to the sliding surface 36 in the position of figure 5 representing the capsule holding position. For this, the diameter of the flange 7 of the capsule is typically greater than the transversal distance between the support surfaces 35 when

the jaws are in the capsule holding position. Each jaw is pivotally mounted on the casing along a pivot axle 37. The pivot axles are preferably parallel to the direction of relative movement of axis I of the enclosing parts. Therefore, the jaws are able to take two positions, a capsule holding position (figure 5) and a capsule release position (figure 6) by rotating along the pivot axle 37.

The jaws 33, 34 are preferably maintained in each position by force retaining means. In the preferred example, the force retaining means comprise, for each jaw, a resilient member 38, such as a traction helical spring (or equivalent means), connected respectively at a first end or connection point 39 respectively to a lower portion of the jaw positioned below the pivot axle 37 and at a second end or connection point 40 to the casing positioned above the pivot axle 37. The force retaining means are thereby arranged such that the jaws can take only two stable positions depending on the offset position of the pivot axle 37 relative to the extension line 41 connecting the connection points 39, 40 of the resilient member. In particular, figure 5 illustrates the jaw in the capsule holding position in which the pivot axle 37 is outwardly offset relative to the extension line 41 of the resilient member. The resilient member (traction spring) exerts thereby a traction force sufficient to keep the jaw in such position. In figure 6, the jaw moved to its capsule release position in which the support surfaces 35 of the two jaws are spread apart (i.e., a distance greater than the diameter of the flange of the capsule). In this position, the pivot axle 37 is positioned inwardly offset relative to the connection points 39, 40. Again, the resilient member 38 exerts a traction force sufficient to keep the jaw in such position.

Preferably, the force retaining means further (or alternatively) comprise a magnetic arrangement 42 providing a magnetic attraction force between each jaw and a portion 43 of the casing (or it may alternatively be a portion of the first enclosing part) when the jaw is positioned in the two stable positions. In particular, the lower portion of the jaw comprises a ferro-magnetic element or magnet 44 and the portion 43 of the casing comprises two separate ferro-magnetic elements or magnets 45, 46; each one being positioned at a short distance to secure the jaw in the two stable positions. In particular, the two ferro-magnetic or magnets 45, 46 are arranged at a short transversal distance from each other. Therefore, in the capsule holding position of figure 5, the jaw is secured firmly in position by the attraction created between the element 44 of the jaw and the element 46 of the casing. Whereas in the capsule

release position of figure 6, the jaw is secured firmly in position by the attraction created between the element 44 of the jaw and the element 45 of the casing. It should be noted that the terms “ferro-magnetic elements” or “magnets” are used here to refer to elements showing a magnetic attraction to each other when submitted to a magnetic field or creating a magnetic field.

It should be noted that the force retaining means could be simply limited to the magnetic arrangement (with no resilient member).

According to an aspect of the present invention, the jaws are driven from the capsule release position (figure 6) to the capsule holding position (figure 5) by first actuation means and, from the capsule holding position to the capsule release position by second actuation means. This will now be explained in greater detail.

In particular, first actuation means 47 are non-telescopic and provided, at least partially, on top of the second enclosing part 3. The actuation means 47 extend also symmetrically on each side of the passage 9 above the jaws. The first actuation means 47 comprise a pair of first cam portions 48 extending longitudinally beyond the pressing edge 16 of the second enclosing part in direction of the first enclosing part. Each cam portion 48 is provided on a rigid elongated extension member 49 which is fixedly connected to the outer surface of the enclosing part 3 and which extends forwardly in direction of the first enclosing part 2. The elongated member terminates at its free end by the cam portion 48 oriented outwardly. The cam portion is arranged to engage a complementary cam portion 50, provided on the jaw. i.e., forming the complementary part of the first actuation means 47. More particularly, the jaw comprises an extension member 51 which extends rearwardly in direction of the second enclosing member 3 and which comprise the complementary inwardly projecting cam portion 50. It should be noted that the elongated extension member 49 and the extension member 51 provide a certain distance between the jaws and the pressing edge 16 of the second enclosing part 3. This distance enables to insert in the passage, capsules with relatively deep bodies (figures 7 to 9). The length of the members 49, 51 can be adjusted by design depending on the depth of the capsules to be received in the brewing unit.

By the relatively rigid engagement of the cam portions 48, 50 together, as also determined by the rigidity of the extension members 49, 51, the jaws become blocked in the capsule holding position and are prevented from spreading apart when

the capsule is received on the support surface. The rigidity is sufficient to maintain the jaw blocked under the force exerted by the load of the capsule during the fall of the capsule in insertion and after its guiding along the sliding surfaces.

5 The capsule insertion assembly further comprises second actuation means 52 for moving the jaw from the capsule holding position (figure 5) to the capsule release position (figure 6). The second actuation means 52 are part of the second enclosing member 3. They are arranged at a certain distance from the first actuation means 47 so that they act on the jaws when the second enclosing part becomes sufficiently close to the first enclosing part.

10 In particular, the second actuation means 52 comprise non-telescopic outwardly projecting cam portions 53 provided on each side of the enclosing part. Each projecting cam portion 53 is preferably arranged rearwardly offset relative to the pressing edge 16. The projecting cam portion 53 is arranged for engaging a complementary cam portion 54 of the jaw, i.e., forming the complementary part of the
15 second actuation means 52, when the second engaging portion moves relatively to the first engaging portion in the approaching phase of the closure of the unit (figure 10). The actuation means 52 are positioned below the axial line of the pivot axle 37 of the jaws such that the jaws are forced to pivot from the holding position of figure 5 to the release position of figure 6. By such engagement of the two cam portions 53,
20 54, the jaws are forced to spread apart thereby releasing the flange of the capsule. The arrangement of the cam portions is such that such release occurs when the flange 7 of the capsule is sufficiently close to the pressing edge 16 of the second enclosing part, thereby ensuring a precise positioning, respectively, centering of the capsule in the cavity (figures 10 and 12).

25 As illustrated in figure 19, in order to facilitate the removal of the capsule from the cavity 15 of the second enclosing part 3, the second enclosing part may comprise capsule ejecting means 55. The ejecting means are preferably configured to engage with the body 6 of the capsule. It should be noted that the ejecting means could also be configured to engage the flange 7 of the capsule such as by having a spring-
30 biased pressing edge. In the illustrated mode, the ejecting means comprises at least one pusher slidably mounted in a housing of the capsule holder 22, against an elastic biasing means such as a coil spring (not represented). Of course, many equivalent variations to the present form of the ejecting means can be envisaged.

As also illustrated in figure 13, for instance, when the brewing unit is re-opened, it may be necessary to unstick the capsule from the engaging surface of the first enclosing part 2, in particular, from its piercing means or needle. For that elastic pushing means, preferably one or more spring-blades 56, can be provided, such as
5 on the surface of the brewing interface member, which act against the capsule to exert axial forces in the direction of the first enclosing part.

The movement of the second enclosing part 3 relative to the first enclosing part 2 can be driven mechanically or by way of a motorized assembly such as described in WO 2012/025258.

10 In the present example, the second enclosing part 3 comprises a lever-type actuating assembly enabling to move the second enclosing part 3 along the longitudinal direction of axis I in guidance with the guiding rails or slots 13, 14 of the casing. In particular, as shown in figure 1, a lever-type actuating assembly comprises a cam means for transforming the rotating movement of a manual handle 57 in a
15 translational movement of the enclosing part along the casing. In particular, the handle is pivotally mounted on the casing via transversal axles 58. On each side of the enclosing part 3, the axle 58 is capable of longitudinally sliding along a longitudinal grooved path 59 during the movement of the enclosing part. Such axle 58 is also connected to a lever 60 comprising, at its free end, a cam disc 61 which
20 engages in an upwardly oriented grooved path 62. Therefore, when the handle is manipulated from a vertical arrangement (figure 1) to a substantially horizontal arrangement (figure 18), the cam disc 61 which is rigidly connected to the handle via the lever 60 travels down in guidance in the transversal grooved path 59 to force the second enclosing part to move forward in direction of the first enclosing part. The full
25 movement of the enclosing part from the open to the closed position and vice versa can be obtained easily by a 90-degree rotational movement of the handle. The system is thus relatively simple and reliable.

The invention further relates to a beverage production device comprising the brewing unit of the invention. Preferably, the brewing unit is positioned in the device
30 horizontally so as to enable a capsule to be inserted by gravity in the insertion hole 10 and be taken in charge by the jaws. More particularly, the capsule enclosing assembly comprising the first enclosing part 2 and second enclosing part 3 is moveable relative to a substantially longitudinal direction of horizontal axis I. The

beverage production device (not represented) may comprise, as known per se, a water reservoir, a water pump, a water heater for supplying hot water to the liquid conduit 28 and a control unit for controlling the preparation of the beverage, in particular, the flow rate of the water pump and the rotation of the motor driving the rotation of the centrifugal chamber assembly.

The functioning of the brewing unit of the invention, in particular, concerning the insertion, enclosing and ejection of the capsule, will now be described in relation to figures 7 to 21.

In the capsule insertion position of figures 7-9, the enclosing parts are spread apart from each other to leave a passage 9 sufficiently longitudinally long to enable a capsule, after insertion in the insertion hole 10 of the casing, to be guided along the sliding surface 36 of the jaws and be retained on the support surfaces 35 of the same jaws. In this position, the jaws are in the capsule holding position and the first actuation means 47 are engaged thereby blocking the jaws in the holding position. In particular, the cam portion 48 of the actuation means 47 is engaged with the complementary cam portion 50 of the jaws. The capsule is therefore sitting in an insertion intermediate position in which the center line **O** of the capsule is substantially aligned (or slightly inclined due to the play between the flange of the capsule and the sliding surfaces of the jaws) with the central axis **I**. In the present context, the capsule is designed as a rotationally symmetrical element which is intended to be rotated at elevated velocity along its central axis in a centrifugal/rotational brewing unit in which it is important to maintain a precise positioning of the capsule inside the cavity to avoid damaging the capsule and/or generating vibrations. However, the invention may apply with a non-symmetrical capsule and/or a system in which the brewing unit is a not centrifugal/rotational. However, a correct alignment of the capsule with the enclosing parts, e.g., the cavity, is still important to maintain for a proper enclosing and/or tightness of the capsule relative to the enclosing parts.

When the handle 57 is moved down, the second enclosing part 3 is forced to move closer to the first enclosing part 2 as illustrated in figures 10-12. The capsule insertion assembly remains in the capsule holding position in this intermediate closing phase, due to the stability of the jaws in capsule holding position, so that the

capsule can be maintained in its intermediate position of reference in engagement between the jaws.

As the second enclosing part 3 becomes close enough to the first enclosing part 2 (figures 13-15), the jaws are forced to spread apart in the capsule release position by the second actuation means 52 becoming engaged. The capsule is no longer maintained by the jaws but is sufficiently close to the edge of the cavity 15 to be held by the cavity of the second enclosing part. As the enclosing part continues to move relatively to the first enclosing part, the capsule fits in the cavity. It is also possible to have the first enclosing part be sufficiently close to the capsule to center it well and hold it by the piercing means or needle 29 as the enclosing parts are closing about the capsule.

As the second enclosing part 3 is further moved towards the first enclosing part 2, the flange of the capsule becomes pressed by the pressing edge 16 of the second enclosing part and then by the one 17 of the first enclosing part. In the closed position of the brewing unit, the body of the capsule is housed in the cavity 15; its flange being squeezed between the two pressing edges. The capsule insertion assembly 32 is sufficiently retracted away from the second enclosing part. This position corresponds to the beverage brewing position. Generally, the extraction centrifugation can be run by feeding water in the capsule via the liquid injection means 27, the capsule can be rotated by driving the capsule holder 22 in rotation via the rotary motor. The centrifuged beverage can be collected in the collector 18 and be drained through the beverage outlet 5.

After the beverage preparation, the unit is re-opened as illustrated in figures 19-21 by driving the second enclosing part 3 via the handle and moving it away from the first enclosing part along the longitudinal direction I. Since the capsule insertion assembly is given a stable position (capsule release position), the jaws remains open thereby allowing the capsule to be ejected from the cavity by the capsule ejecting means 55 and then falling through the passage wide open.

In the next phase, as the second enclosing part is still moved away, the capsule insertion assembly becomes engaged by the first actuation means and blocked for insertion of a new capsule in the passage (back to the situation of figures 7-9).

CLAIMS:

1. A beverage brewing unit for machines for preparing beverages from capsules, comprising:
 - a casing;
 - a capsule enclosing assembly comprising a first enclosing part connected to the casing and a second enclosing part moveable relative to the first enclosing part, along a longitudinal direction of an axis, between a capsule insertion position in which the first enclosing part and the second enclosing part are at distance from each other with a passage formed in between, and a capsule enclosing position in which the capsule is enclosed between the first enclosing part and the second enclosing part; and
 - a capsule insertion assembly comprising a pair of jaws arranged for guiding the capsule towards an intermediate insertion position and holding the capsule in said intermediate position, said jaws comprising a pair of support surfaces for holding the capsule against gravity,

the jaws being moveable between a capsule holding position in which the support surfaces are close to one another at a distance sufficient to hold the capsule in said capsule holding position, and a capsule release position in which the support surfaces of the jaws are spread apart at a distance sufficient to no longer hold the capsule,

the jaws configured to be driven from the capsule release position to the capsule holding position by first actuation means and from the capsule holding position to the capsule release position by second actuation means,

the first and second actuation means being arranged at a longitudinal distance from one another, along the direction of the longitudinal axis, for the relative movement of the first enclosing part and the second enclosing part in such a manner that the first actuation means acts on the jaws when the second enclosing part moves relatively away from the first enclosing

part and the first enclosing part and the second enclosing part are sufficiently distant from one another to allow the capsule to be removed from the capsule enclosing assembly through the passage after brewing,

the second actuation means acting on the jaws when the second enclosing part moves relatively towards the first enclosing part and the first enclosing part and the second enclosing part are sufficiently close one another to enable the capsule to be properly maintained or held by at least one of the enclosing first enclosing part and the second enclosing part before being enclosed by the first enclosing part and the second enclosing part,

wherein the first enclosing part and the second enclosing part form together at least part of a centrifugal brewing unit in which the capsule is driven in rotation for exerting forces of centrifugation inside the capsule resulting in beverage to be extracted from the capsule.

2. The beverage brewing unit according to claim 1, wherein the first and second actuation means form parts of the second enclosing part or are shared between the second enclosing part and the capsule insertion assembly.
3. The beverage brewing unit according to claim 2, wherein the first and second actuation means comprise non-telescopically projecting cam portions of the second enclosing part.
4. The beverage brewing unit according to any one of claims 1 to 3, wherein the first actuation means is arranged to block the jaws in the capsule holding position when the first and second enclosing parts are in the capsule insertion position; the jaws thereby being prevented to spread apart by the load of the capsule when it is inserted in the passage by gravity.

5. The beverage brewing unit according to any one of claims 1 to 4, wherein the second enclosing part comprises a pressing edge for pressing against a flange of the capsule; said edge circumventing a cavity for receiving at least a part of a body of the capsule therein.
6. The beverage brewing unit according to claim 5, wherein the first actuation means comprises a pair of first cam portions extending longitudinally beyond the pressing edge in direction of the first enclosing part.
7. The beverage brewing unit according to claim 5 or claim 6, wherein the second actuation means comprises a pair of second cam portions extending rearwardly offset relative to the pressing edge.
8. The beverage brewing unit according to any one of claims 1 to 7, wherein the jaws are pivotally mounted on the casing or on the first enclosing part along pivot axes which are substantially parallel to the direction of longitudinal axis of relative movement of the enclosing parts.
9. The beverage brewing unit according to claim 8, wherein the first and second actuation means are arranged at a relative spatial distance respectively above and below the pivot axes of jaws on the casing or first enclosing part.
10. The beverage brewing unit according to claim 8 or claim 9, wherein the jaws are held in each position by force retaining means.
11. The beverage brewing unit according to claim 10, wherein the force retaining means comprise, for each jaw, a resilient biasing member connected respectively to the jaw and to the casing or first enclosing part, on each side of the pivot axle of the jaw, to force the jaw in one of the two positions, thereby forming stable positions, depending on the offset position of the pivot axle

relative to the line connecting the connection points of the resilient biasing member.

12. The beverage brewing unit according to claim 10 or claim 11, wherein the force retaining means comprises, for each jaw, a magnetic arrangement providing a magnetic attraction force between the jaw and a portion of the casing or first enclosing part when the jaw is positioned in any one of the two positions.
13. The beverage brewing unit according to any one of claims 1 to 12, wherein the first enclosing part comprises a brewing interface member with elastic pushing means, which act on the capsule to unstick the capsule from the said member.
14. The beverage brewing unit according to claim 13, wherein the elastic pushing means includes at least one spring-blade configured to act on a lid of the capsule.
15. The beverage brewing unit according to any one of claims 5 to 7, wherein the second enclosing part comprises capsule ejecting means, which engage the capsule to facilitate removal of the capsule from the cavity.
16. The beverage brewing unit according to claim 7, wherein the pair of second cam portions extends along the sides of the second enclosing part and protrudes outwardly.
17. A beverage production device comprising a brewing unit according to any one of claims 1 to 16.

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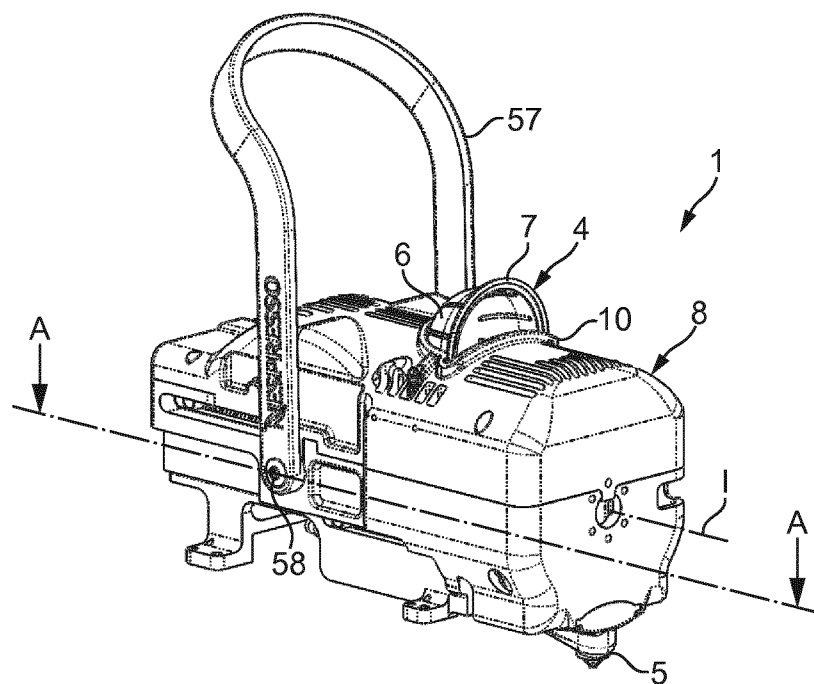


FIG. 1

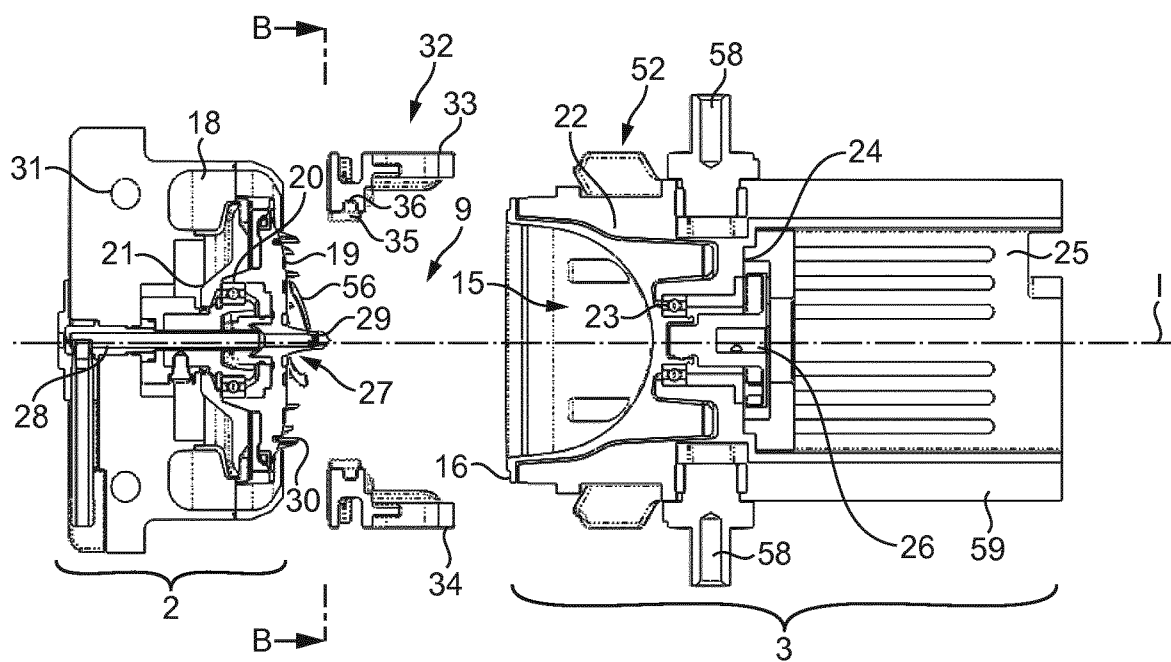


FIG. 2

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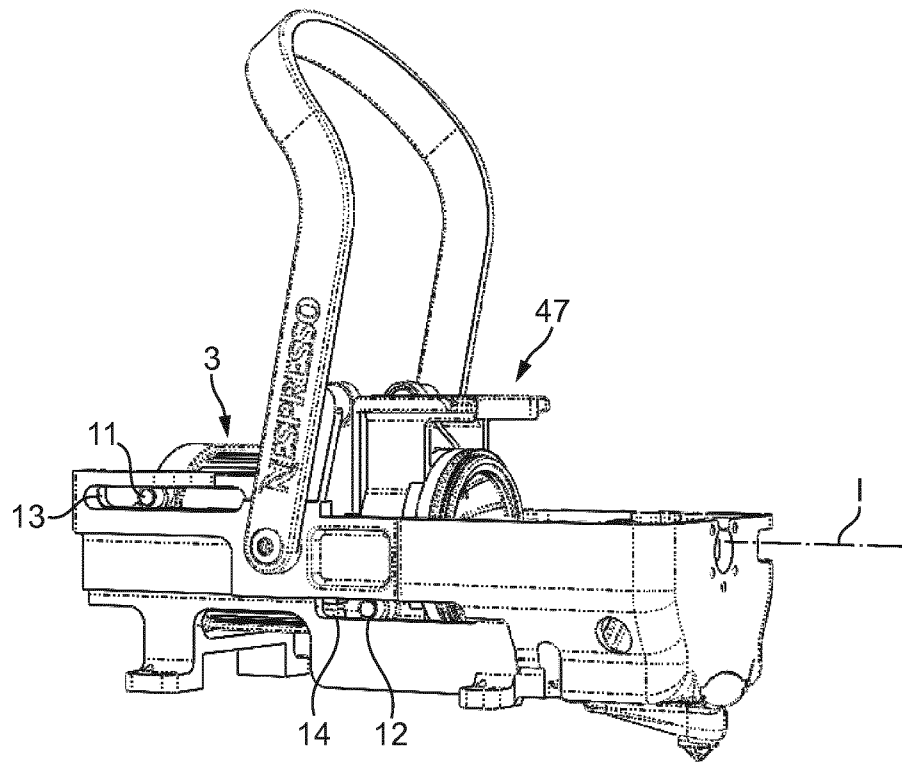


FIG. 3

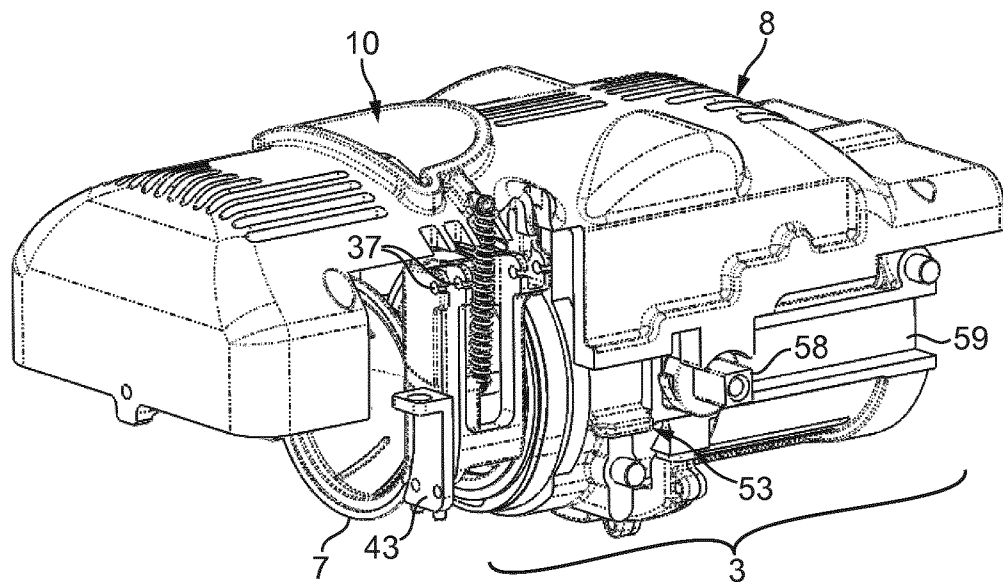


FIG. 4

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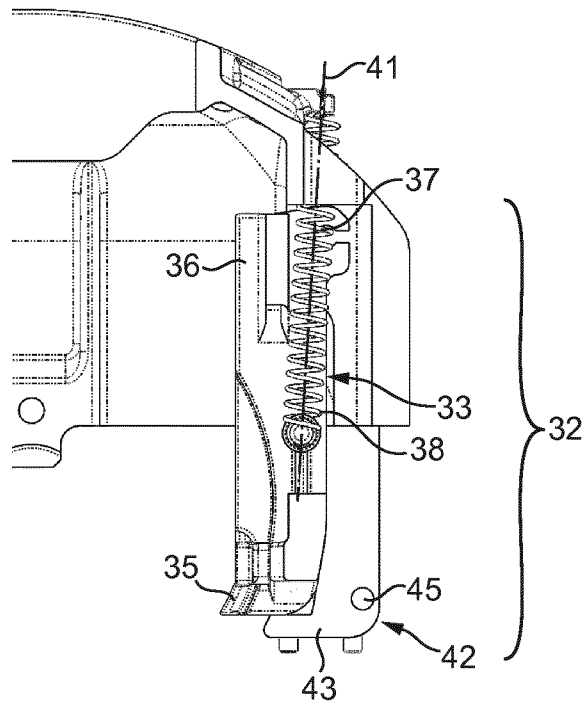


FIG. 5

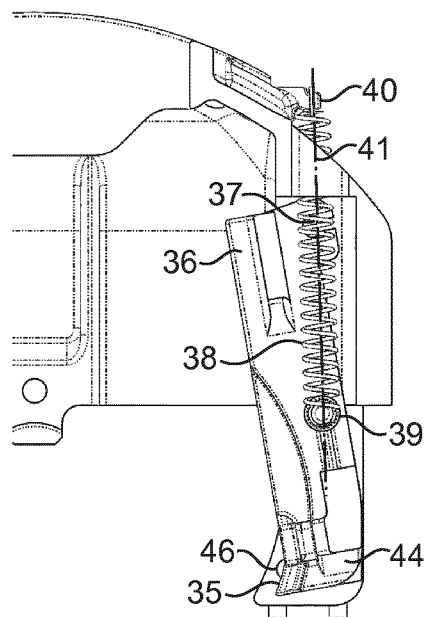


FIG. 6

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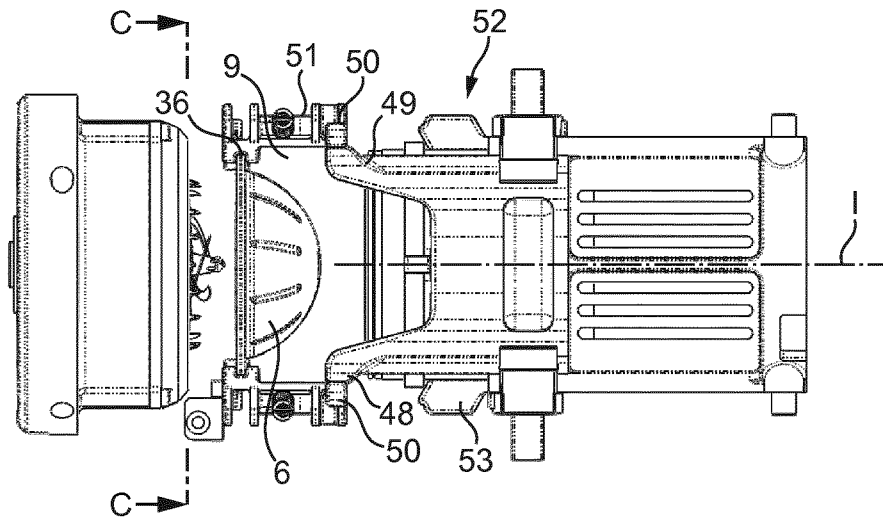


FIG. 7

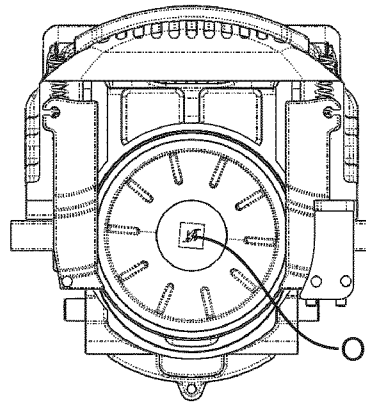


FIG. 8

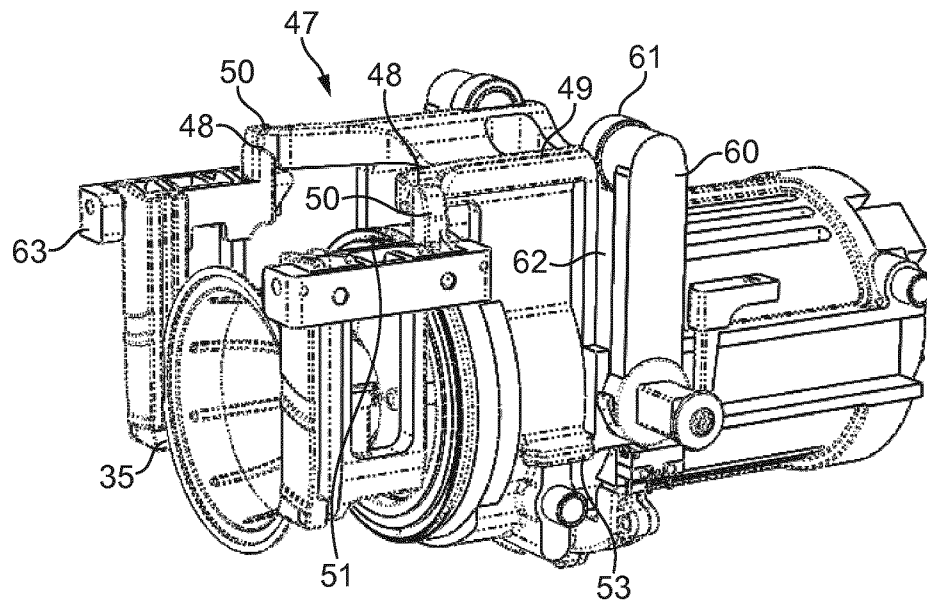


FIG. 9

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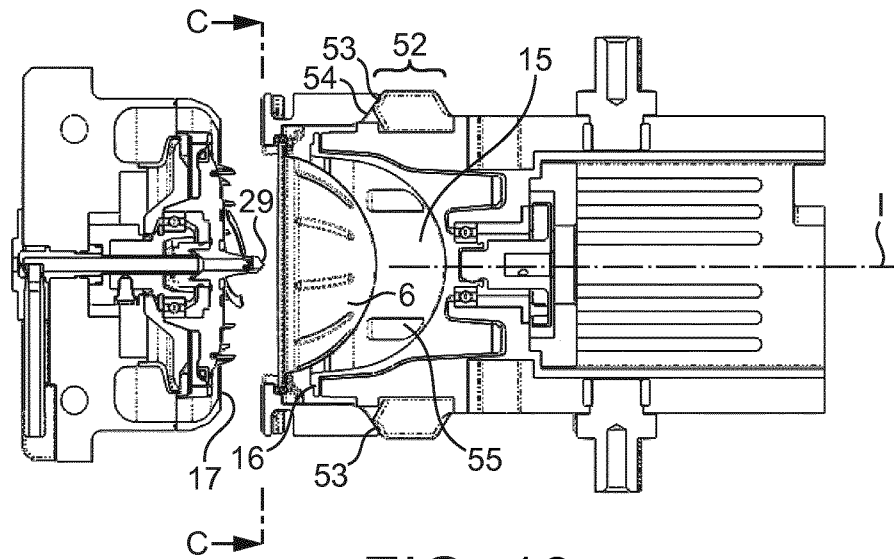


FIG. 10

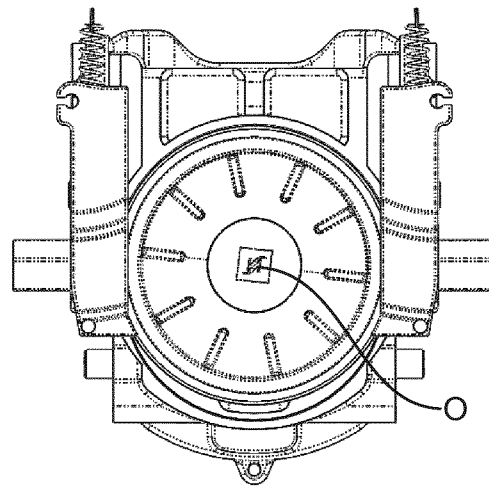


FIG. 11

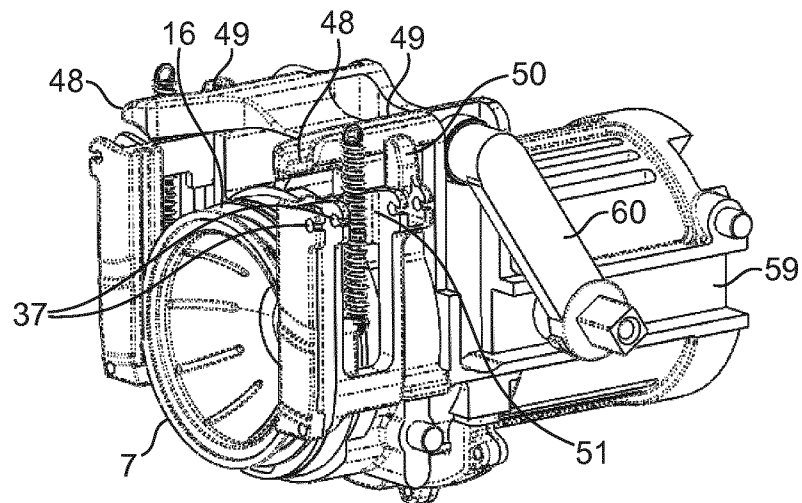


FIG. 12

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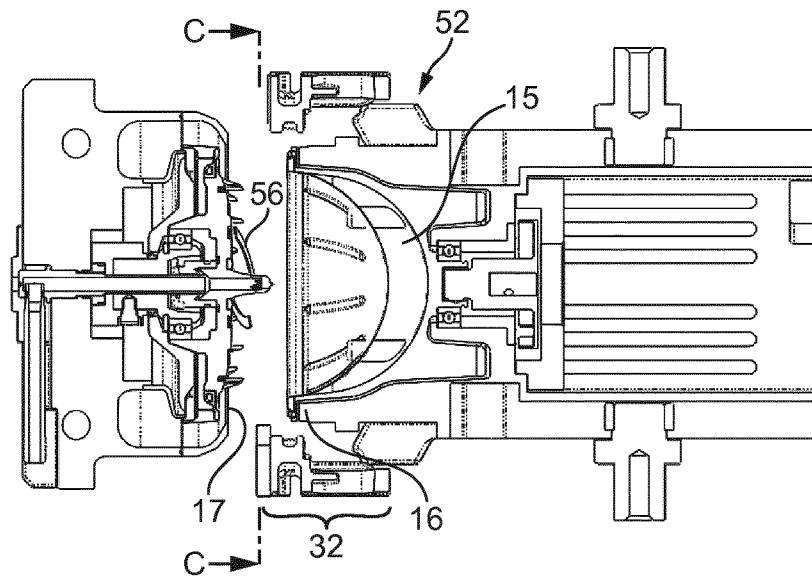


FIG. 13

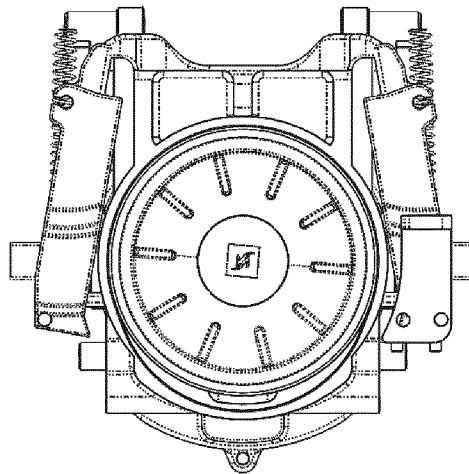


FIG. 14

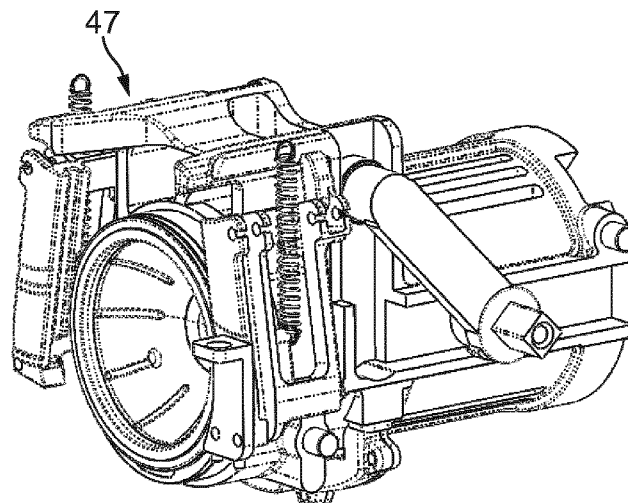


FIG. 15

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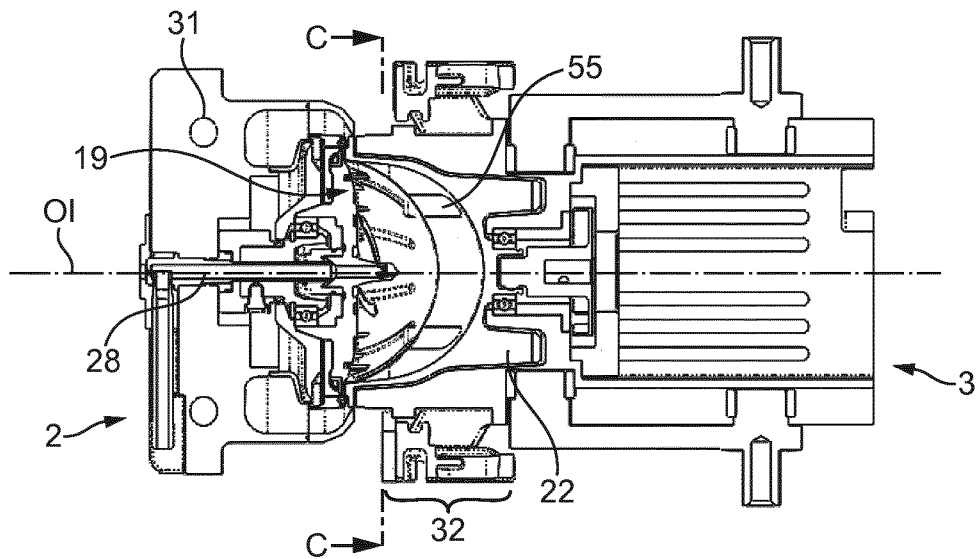


FIG. 16

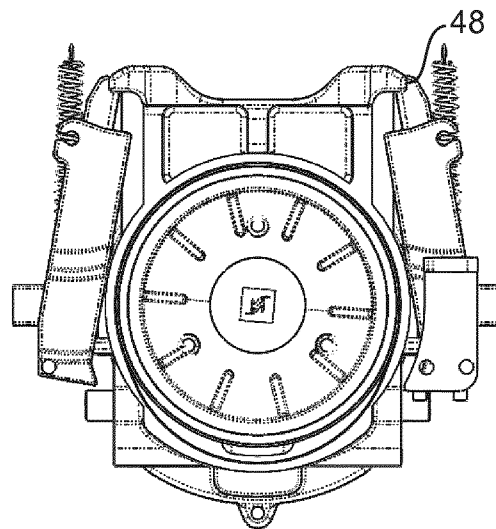


FIG. 17

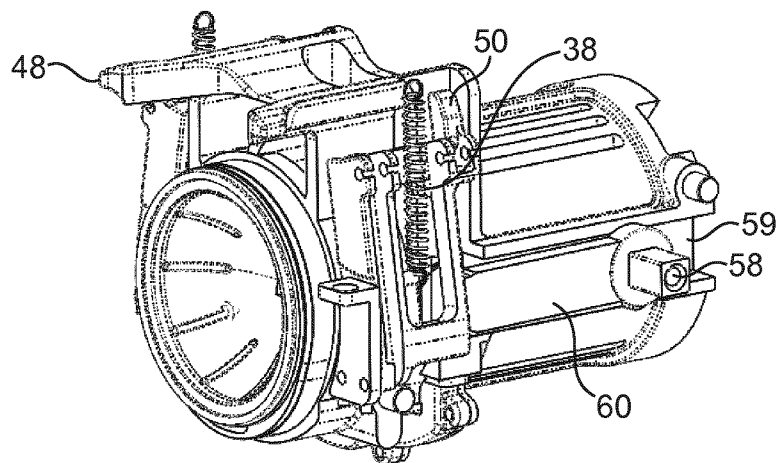


FIG. 18

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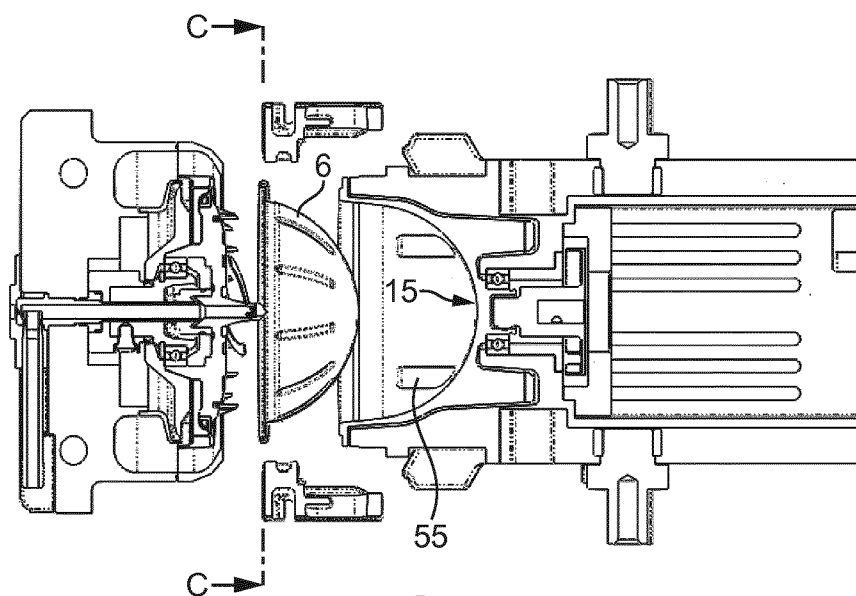


FIG. 19

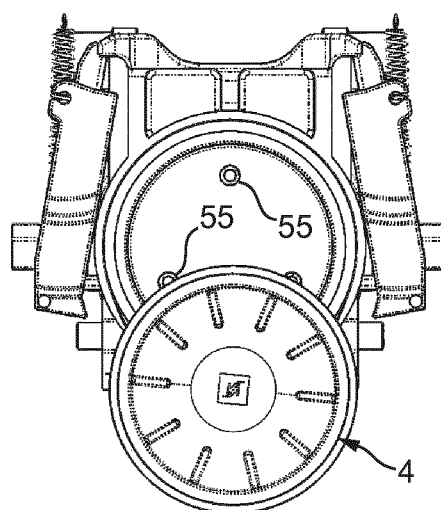


FIG. 20

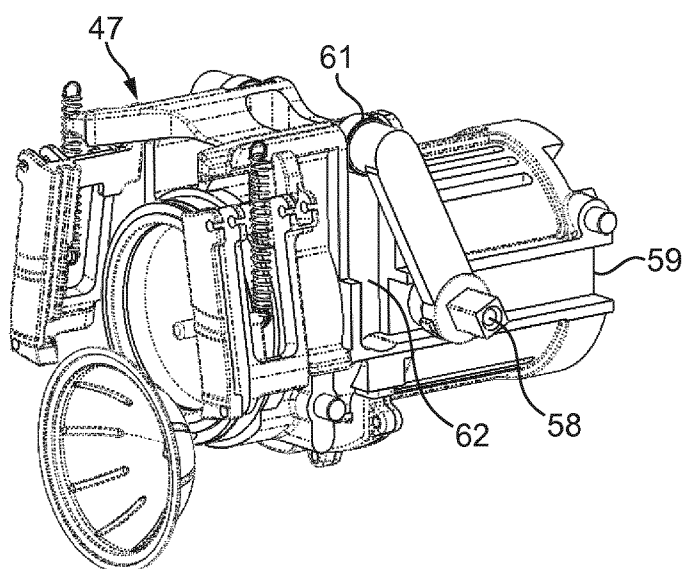


FIG. 21

