

21273 PCT

A Coffee-Maker

The present invention relates to a coffee machine according to the preamble of claim 1 and a method for operating the coffee machine.

Coffee machines, also known as coffee-makers, as described in the preamble of claim 1 are particularly used in the restaurant trade. These machines are generally bulky objects, obstruct an unusually large amount of space in the serving area and in no way do they fit in with modern and attractively designed restaurants. These machines also require a relatively large amount of maintenance and, in the event of breakdowns, cause fairly long service interruptions. Furthermore, the mechanical components thereof, by the nature of the design, are often contaminated with coffee powder and/or escaping water and coffee.

The object of the present invention is therefore to provide a coffee machine whose overall height is smaller than the prior art and/or whose front is visually open. The machine should thus be aesthetically attractive in appearance and be easy to operate and maintain. Furthermore, the design should be such that it has no unhygienic spaces where coffee powder and coffee can build up, the intention being that appropriate routing of the media should prevent contamination from occurring at all.

According to the invention, this object is achieved in that the brewing chamber is recessed in a brewing block which, guided partially over a circular path around a horizontally arranged axis, may be swivelled into a first filling position, then into a second brewing position with hot water feed and coffee discharge and into a third compacted coffee grounds-



expelling position, and wherein this brewing block indirectly or directly entrains one or more similar plungers which are operable axially.

The coffee machine characterised in claim 1 has the advantage of a compact device which is expediently arranged over a circular path and which, despite the small overall height which it requires, has defined working positions and is kinetically advantageous. It is therefore suitable for high serving outputs, more particularly for continuous service in the restaurant trade.

The concept employed in the claim of indirectly actuating the plungers includes solutions in which the movement of the brewing block serves merely as reference for initiating the plunger strokes.

Constructions are preferred in which the flow of media takes place from the top downwards; however, the media may analogously also be conducted in any other optional manner per se if this is required, for instance due to different serving arrangements.

Advantageous developments or operating methods are set forth in the following dependent claims.

The arrangement according to claim 2 can be implemented very economically and is clean and hygienic in operation.

The flanges according to claim 3 permit very simple mechanical actuation of the brewing assembly.

The inclusion of spur gears and cam discs according to claim 4 requires only a central, commercially available drive using a geared motor, which can be fitted outside the brewing assembly.



An alternative to this may be to install individual drive means, cf. claim 5.

A coffee machine according to claim 6 enables two or more cups to be dispensed at the same time in parallel brewing processes.

The coordination of the grinding mechanisms according to claim 7 further considerably reduces the overall height which the machine requires.

The inclusion of a swivelling funnel according to claim 8 allows brewing chambers arranged in parallel, more particularly chambers with different diameters and volumes, to be simply realized. This enables several cups of coffee which have the same quality as a single cup to be dispensed at the same time.

The method for operating the coffee machine according to claim 9 has proved particularly successful, the selected preferred angular positions being feasible starting from any optional location of the starting position.

The kinematics of the method according to claim 10 are advantageous and allow the machine to be operated economically.

Embodiments of the subject of the invention are described in the following with the aid of drawings, in which:

Fig. 1 shows a simplified perspective representation of a coffee-maker,

Fig. 2 shows a schematic representation of the elements of the brewing assembly according to Fig 1,

Fig. 3 shows the coffee-maker of Fig. 1 from the front in a



partial sectional representation,

Fig. 4 shows the coffee-maker of Fig. 1 viewed from the side in a partial sectional representation,

Fig. 5 shows a straining/expelling plunger according to Fig. 3, Fig. 4 in enlarged representation,

Fig. 6 shows a structural diagram of the sequence of movements in the brewing assembly of the coffee-maker according to Fig. 1,

Fig. 7 shows the kinematics of the sequence of movements according to Fig. 6, Fig. 7a showing the movement of the brewing head, the rotation of the brewing block, the stroke movement of the straining/expelling plungers in the brewing block, and 7b showing the control and switching functions over the time sequence of the movements, and

Fig. 8 shows a preferred variant for implementing the sequences of movements according to Fig. 7 using cam discs and drivers, Fig. 8a and Fig. 8b representing respective sides of a spur gear.

In all the Figures, identical parts are provided with the same reference numerals.

Inside an appliance housing denoted 100 is a coffee-maker with a brewing assembly 1 with powder preparation.

Coffee beans are poured into a coffee-bean container 2 in the commonly known manner, this container 2 having a partition wall 3 which allows two different brands of coffee to be used; cf. Fig. 3.

Arranged in the upper region of the appliance housing 100

is a water pump 4, known per se, which feeds boilers 5, 6, 7 which themselves have heating coils 8, 9, 10 wound round them. Coffee grinders 11 and 12 are arranged at an angle of 90^0 to one another and comprise charging funnels 13, 14, powder discharge outlets and electric motors 18, 19. Only the powder discharge outlet 15 is visible in Fig. 1. Between the coffee grinders 11, 12 is a controllable swivelling funnel 22 which selectively supplies freshly ground coffee powder into brewing chambers 25 or 26 located therebeneath.

Located in a so-called brewing head 27 is a brewing yoke 28 to which one large and one small brewing plunger 29 and 30 respectively are secured. The brewing block 32 is illustrated in the filling position with a flat surface 33 in which the aforementioned brewing chambers 25, 26 are accommodated.

A side covering 34 may also be seen, beneath which spindle drives 42 and 43 described below and comprising their gear housings 44 or 45 are located.

The whole assembly is mounted in laminar housing supports 51, 52 which are held by means of spacers 55 which are screwed together. In Fig. 1 the brewing assembly is mounted on two guide rails 56, and may be seen in the pulled-out state. The guide rails 56 fit positively in mutually corresponding recesses 57 in the housing supports 51, 52.

Also evident are cam disc housings 58, 59 which are provided with a yoke guide 49 located on the top thereof.

The appliance housing 100, shown as a dot and dash line, is provided in its lower region with an indicated baseplate 101 comprising a cup rest; between the baseplate and the actual appliance housing 100 is a curved recess 102.

The schematic representation of Fig. 2 is intended to enable the detailed drawings to be more easily understood.

It shows the brewing head 27, which may be raised and lowered in the direction of the arrow, with its yoke 28 and the brewing plungers 29 and 30 arranged therebeneath. Within the brewing block 32, axially displaceable straining/expelling plungers 36 and 37 are fitted in the brewing chambers 25 and 26, each plunger rod 38 or 39 having an internal thread. Arranged laterally on the brewing block 32 are flanges 46, 47 which are used to swivel the said block around an axis A--A.

The partial sectional representation of Fig. 3 again shows the appliance housing 100 with its brewing assembly 1 and its device for preparing and apportioning coffee powder.

In this Figure a grinding mechanism 17 and a second powder discharge outlet 16, the angle α between the electric motors 18, 19 and also the swivel positions I-III of the brewing block 32 are additionally drawn in.

The first filling position is denoted I and corresponds to the position represented in Fig. 3. Located at an angle of 30° thereto in the anticlockwise direction is the second so-called brewing position II, while the compacted coffee grounds-expelling position III is located turned 60° in the anticlockwise direction relative to the starting position (filling position I) on the circular path R.

Also visible is a hot water feed 31 which is connected via valves (not shown) to the boilers 5, 6, 7 (Fig. 1) and discharges into the brewing plunger 30.

It is apparent that the brewing block 32 with its side coverings 34 and 35 is a single piece construction.

Arranged next to the brewing yoke 28 is a scraper 50 which is pivotable in the direction of the arrow. This is actuated by the rotary movement of the brewing head 27, for which purpose there is provided on the covering 35 an

actuating cam - not illustrated for the sake of clarity - which produces the rotary movement in the clockwise direction of the scraper 50 tensioned by a spring, or tilts it, see arrows around the axis of rotation.

In the left-hand part of the appliance housing 100 there is a removable drawer (not represented), arranged in the known manner, for the coffee grounds.

Provided on either side next to the brewing assembly are a hot water outlet 103 and a steam outlet 104 which are commonly known.

The coffee grinders 11 and 12 are charged by way of a shut-off disc 20 with two coffee-bean openings 21.

The coffee-bean container 2 can be removed from the machine and carried even when filled; to do this, the shut-off disc 20 is rotated so that the coffee-bean openings 21 are closed.

Provided in the centre of the curved recess 102, which permits a view through the coffee-maker, are vertically adjustable coffee outlets 105.

The partial sectional representation of Fig. 4 shows further details viewed from the side. It shows, for example, the vertical adjustment option of the coffee outlets 105 by means of guides 107.

The structural association of the flanges 46 and 47 comprising their axle bearings 53, 54 with the brewing block 32 is also apparent. Also evident are the different diameters of the brewing chambers 25 and 26, the larger brewing chamber 25 being used for preparing two cups of coffee at the same time. The necessary selective apportioning of the coffee powder into the brewing chambers 25, 26 is effected by the

controllable swivelling funnel 22 which turns the funnel 22 around a swivel axis 22' by means of a swivel drive 23 and a rack 24.

The swivel drive 23 has a commercially available electric motor with pinion.

The necessary rotation of the threaded spindles 87 apparent in Fig. 4 for the axial plunger movement is effected by way of the two gear housings 44 and 45.

The straining/expelling plunger 36 illustrated in Fig. 5 as representative has a strainer plate 80 on its end face which serves as the brewing strainer, also commonly known. It is fixed in a plunger body 81 by means of a central screw fitting 82. Located peripherally in the plunger body 81 is an annular groove 83 in which an annular seal 84 - a Neoprene (Trademark) O-ring - is inserted. Evident beneath the strainer plate 80 is an annular recess 85 which opens into an outlet bore 86 with an internal thread 88 in which is fitted a hose coupling 41 with a hose 40 serving for the coffee outflow.

A plunger rod 38 with an internal thread acts centrally on the plunger body 81; it is driven by the threaded spindle 87 mentioned in connection with Fig. 4.

The kinematics of the sequence of movements may be analyzed with the aid of the structural diagram in Fig. 6. The cams required for a central mechanical drive are symbolized by a single cam disc K; the same applies to the drive D.

According to Fig. 6, first there is a turning movement a of the cam disc, then a first movement b of the brewing block through 30^0 , a second movement c through 30^0 , a plunger movement d upwards over a first stage, a plunger movement e

upwards over a second stage; also, a drive f of the cam disc K and drives g of the plungers are required.

The practical implementation of the cam disc K is represented in Fig. 8 as described below.

The actual sequences of movements as a function of time t may be understood from Fig. 7 in which the movements m and functions S listed below may be determined. The time t from 0 to Z here corresponds to a complete operating cycle.

According to Fig. 7a:

- vm37 movement m of the brewing head (vertical motion)
- cm32 movement m of the brewing block (circular motion)
- sm36,37 stroke movement of the straining/expelling plungers (stroke motion)

According to Fig. 7b, the following sequential control and switching functions S are allocated to the movement sequences according to Fig. 7a:

- i initialization electronically, position and hot water
- ii selection of powder duct, small or large quantity (large quantity represented)
- iii selection of associated grinder
- iv grinding time - determines coffee quantity
- v route for a small quantity, short grinding time
- vi brewing valve from the boiler to the brewing chamber
- vii feed time of the water pump, quantity-recording using a flow meter
- viii brewing operation in the brewing chamber with coffee delivery
- ix brewing valve set to outflow
- x stroke movement displaces residual water into outflow (additional pressing)
- xi coffee grounds are expelled and scraped off

- xii rotation back to the starting position, limit switches monitor

The simplest translation of the kinematics into a mechanical control is achieved according to Fig. 8 by means of two cam discs, located opposite one another on the axes A--A, which are associated with spur gears 60 with teeth 61.

Located peripherally are recesses 64 which are used to move a driver 69 in and out, the said driver being a component part of the brewing head 27 described earlier. The cam discs are realised by cam grooves 62 and 63, so that the driver pins 69 and 70 are guided on both sides.

Accordingly, the external cam groove 63 may be seen in view in Fig. 8a, while in Fig. 8b the internal cam groove 62 of the spur gear 60 appears as a solid line. In addition, switching bars 66 may be seen on the interior side of the spur gear 60 (Fig. 8a) which initiate microswitches (not shown).

A central bearing bore 68 enables the spur gear 60 to turn around the axis B--B.

The design of the spur gears 60 is such that identical parts are used on both sides of the brewing assembly in the cam disc housings 58 and 59. Cf. Fig. 4.

The implementation of the preferred embodiment described above is achieved using commercially available components and techniques, more particularly also the drive- and control means. Thus, for example, a windscreen wiper motor known from the motor vehicle industry is used to drive the spur gears using a worm gear and a 24V direct current motor. The other electromotive drives, apart from the coffee grinders, likewise have their known application in the vehicle industry. The controlling of the method sequence over time is effected with similarly conventional microprocessors and control- and

switching elements.

A coffee-maker executed according to the invention is able, with a boiler output of 3kW per hour, to prepare 200 cups of delicious coffee. Even higher serving outputs are possible if larger connection capacities are available and corresponding provisions are made for removing the coffee grounds.

The whole brewing assembly 1 can be pulled out of the coffee-maker on the guide rails 56, cf. Fig. 1, and is therefore extremely easy to maintain. When it is pulled out, the remaining components and units of the machine are also easily accessible, so that any repair- and stoppage times can be kept down to a minimum.

It is possible to reduce the overall height of the whole brewing assembly still further by means of special stepping motors and other drives used in combination with electronic servo controls, so that the function of the cam discs may de facto be implemented by a software solution.

The functions initiated in the embodiment by means of commercially available microswitches can obviously also be achieved in a non-contact manner, producing technical advantages particularly in the case of a software solution.

The refinement and further technical development of the subject of the invention described above can be implemented by one skilled in the art without additional inventive activity; it is predominantly a matter of the financial outlay and thus the number of units to be produced.

A preferred version of a coffee grinder which can be incorporated into the coffee-maker described above in a particularly space-saving manner is described in detail in the parallel patent application (under reference 21283 PCT).

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Known coffee grinders may obviously also be used.

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Claims

1. A coffee machine comprising at least one cylindrical brewing chamber and a device for preparing and apportioning coffee powder, which brewing chambers are each closable by means of an upper and a lower axially displaceable plunger and into which hot water may be introduced under pressure, characterised in that the brewing chamber (25;26) is recessed in a brewing block (32) which, guided partially over a circular path (R) around a horizontally arranged axis (A--A), may be swivelled into a first filling position (I), then into a second brewing position (II) with hot water feed and coffee discharge and into a third compacted coffee grounds-expelling position (III), and wherein this brewing block (32) indirectly or directly entrains one or more similar plungers (29,30;36,37) which are operable axially.

2. A coffee machine according to claim 1, characterised in that the brewing block (32) is pivotally held between two laterally arranged flanges (46,47) and in that this brewing block (32) has a partially cylindrical exterior shape which, in the region of the brewing chambers (25,26), contains a flat surface (33) orthogonal to the walls thereof.

3. A coffee machine according to claim 2, characterised in that the two flanges (46,47) are actuated by means of spur gears (60) non-positively connected to the outside thereof.

4. A coffee machine according to claim 3, characterised in that cam discs (62,63) are associated with the spur gears (60), which move the brewing block (32) with its upper brewing plungers (29,30) and wherein they additionally actuate a scraper mechanism (50) which scrapes off the residues when the compacted coffee grounds are expelled.





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5. A coffee machine according to one of claims 1 to 4, characterised in that the plungers (29,30;36,37) and a scraper (50) for removing the residues when the compacted coffee grounds are expelled are operated electrically, electromechanically and/or fluid-mechanically.

6. A coffee machine according to one of claims 1 to 5, characterised in that at least two brewing chambers (25,26) which have different diameters and volumes are provided side by side in the axial direction (A--A).

7. A coffee machine comprising two coffee grinders according to claim 6, characterised in that grinding mechanisms (17) are arranged above the brewing chambers (25,26), and in that their electric motors (18,19) enclose an angle (α) of 180° to 30° between them.

8. A coffee machine according to claim 7, characterised in that a controllable swivelling funnel (22) is provided above and between the brewing chambers (25,26) for diverting the coffee powder supply.

9. A method for operating the coffee machine according to one of claims 1 to 6, characterised in that the brewing block (32) is swivelled in one direction around the axis (A--A) from its starting position in the first filling position (I) through 30° to the second brewing position (II), from the brewing position (II) through another 30° to the third expelling position (III) and is then turned back through 60° in the opposite direction to its starting position.

10. A method according to claim 9, characterised in that, after the outflow of coffee in the second brewing position (II), the brewing plunger is moved upwards until it has travelled out of the brewing chamber, and in that, in the expelling position (III), the straining/expelling plunger then moves to the top end of the brewing chamber and expels the





compacted coffee grounds completely, and in that the straining/expelling plunger remains in its upper position at least during part of the rotation back into the first filling position (I) and in that, during this, the scraper lies on the flat surface of the brewing block.