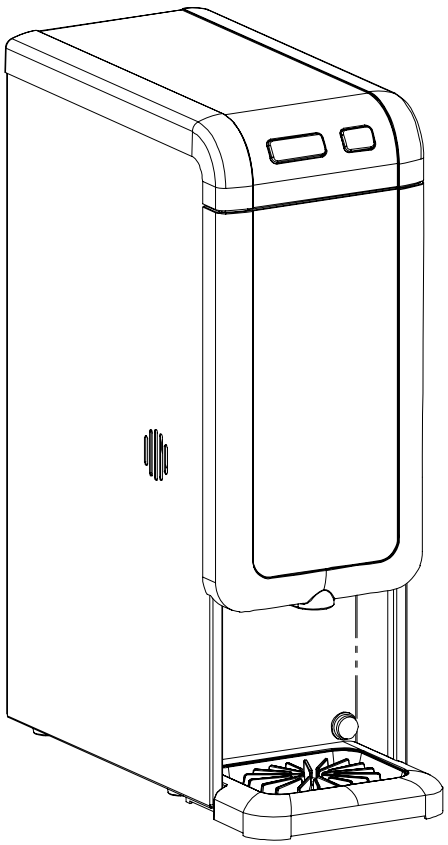
BRAVILOR BONAMAT



Operating principle

Solo

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1. OPERATING PRINCIPLE SOLO

1.1 General operation

The machine works according to a pump system developed by Bravilor Bonamat. This system has the following advantages:

- The components that are responsible for the correct dosing of the water are housed in a cold water unit. As a result, the largest cause of faults with machines, the formation of scale on the dosing valves, is limited to a minimum.
- The float that regulates the water level is also located in the cold–water circuit. This is another reason why the formation of scale is limited to a minimum.

1.2 Water dosing system

After a selection key is pressed, the pump motor is driven with a controlled time and speed. The pump rotor displaces a certain amount of cold water from the cold water reservoir to the bottom of the boiler. As a result, the hot water in the boiler is pushed upwards towards Depending on the selected beverage, an ingredient is dosed which, together with the dosed water, is or is not mixed and poured into a cup.

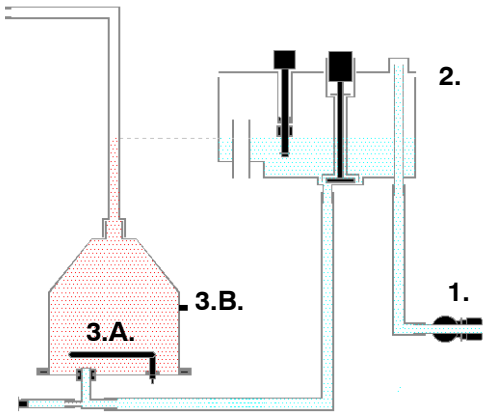

Fig. 1 The water dosing system

The water dosing system consists of the following main components:

1. Magnetic valve
2. Float tank, complete
   - A. Float
   - B. Pump motor
   - C. Pump rotor
   - D. Pump housing
   - E. Encoder

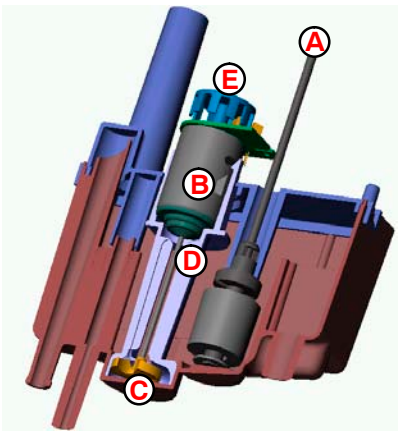

Fig. 2 Float tank, complete

3. Element complete (boiler)
   - A. Element
   - B. Temperature sensor (NTC)

1.2.1 Initialisation

The machine is switched on by connecting the plug to the wallsocket. A green lamp starts blinking in the left selection button.

1.2.2 Filling

The float tank and the boiler are connected by a siphon hose. Together, they form a communicating vessel. When the machine is switched on for the first time, the float tank (fig. 2) will be empty and the float (fig. 2 , A.) will be low.

- The magnetic valve (fig. 1 , 1.) is opened and fills water in the float tank with a speed of litres per minute, depending on the pressure.
- The water in the float tank flows to the boiler through the hose under the float tank.
- After the water level has pushed the float upwards, the water level in the float tank is the same as that of the boiler. The magnetic valve is switched off.

Please note:

Because the float tank is filled faster than the water ”drops” to the boiler, the filling process will be made with short intervals.

1.2.3 Heating

After the system is completely filled with water, element (fig. 1 , 3. A.) is switched on by means of a relay in the machine.

The temperature sensor (fig. 1 , 3. B.), which is mounted on the outside of the boiler, measures the actual temperature of the water. This ensures that the water in the boiler is heated to the desired final temperature.

During the heating, a green lamp blinks in the left selection button. This indicates that the machine is not yet ready for use.

The temperature sensor is of the type NTC (Negative Temperature Coefficient). The higher the measured temperature the lower the resistance of the sensor.

Hot water has a lower specific weight than cold water. As a result, the hot water in the boiler will not want to flow back to the float tank through the siphon hose at the bottom. That part of the system will therefore remain cold. The latter is very important because precisely the parts of the float tank are sensitive for scale.

The temperature sensor is mounted on the outside of the boiler. As a result, there is no feed–through in the wall and therefore there cannot be any long–term leakage.

This measurement is less direct. This is why the temperature is regulated proportionally. The heating switches on for a certain time and off for a certain time.

After the period that the heating has been off, a measurement is made. The next time, the heating will be on for longer or shorter.

The higher the temperature in the boiler, the shorter the moments become that the element is on, and the longer the intermediate time becomes. In this way, an accurate temperature is obtained in the boiler.

1.2.4 Dosing

Dosing is allowed when:

- The float is in the top position.
- The boiler temperature > locking temperature.
- After a selection key is pressed, the pump motor (fig. 3) is driven for a certain time, depending on the amount, with a certain speed (number of revolutions).

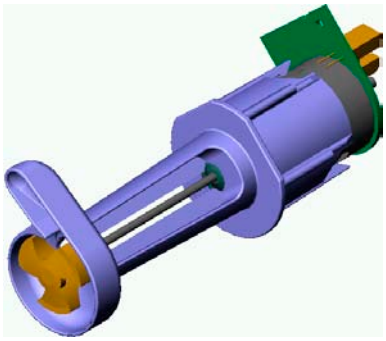

Fig. 3 Pump motor + rotor

- The pump rotor rotates in the pump chamber, which is filled with water. This is formed by the bottom of the float tank and the underneath of the pump housing (Fig. 4).

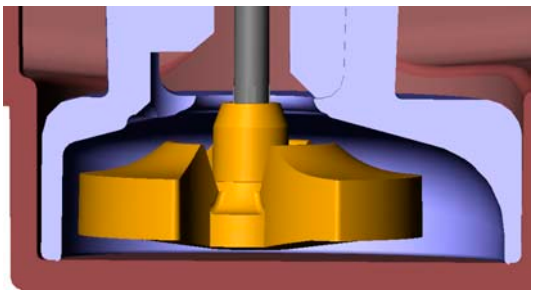

Fig. 4 Pump housing

- The pump rotor pumps the water out of the pump chamber, through the siphon hose in the bottom of the boiler.
- As a result, the hot water in the boiler is pushed out of the boiler.
- The float and the magnetic valve ensure that the level in the float tank is maintained and that water remains in the pump chamber.

The volume of the displaced liquid (yield) is mainly determined by the time and speed of the pump motor.

The time that the motor is on is regulated from the software and is very accurate.

The number of revolutions of the motor is measured with an active revolution counter.

Figure 5 shows that a disc is mounted on the shaft of the pump motor (A = Encoder). This disc rotates at the same speed as the pump rotor.

The encoder rotates between a light sensor (B) and interrupts a light beam. The interruption of the light beam is converted to pulses that can be read by the electronics.

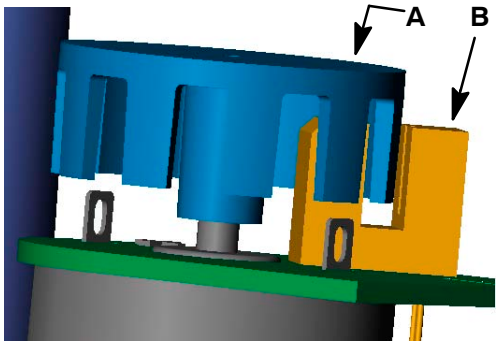

Fig. 5 Encoder

This forms an active revolution regulation that guarantees that, during the time that the pump motor is on, the speed and thus the water yield remain constant.

1.3 Powder dosing system

The powder dosing system consists of an ingredient holder (canister) that is driven by a motor (canister motor).

After the start key is pressed, the canister motor will rotate after a certain delay. This motor drives a worm, which transports the ingredient to the canister outlet.

The control of the canister motor regulates timing and dosing speed. The ingredient will be poured into the mixer at the same time that the water flows out.However, the canister motor will stop slightly earlier than the water, to rinse the mixing jug clean.

Depending on the type of ingredient, “beater springs” are used in the canister. These springs ensure that less tunnel formation occurs. This is the caking of ingredient against the walls.

1.4 Mixing system

The mixing unit (Fig. 7) mixes the hot water and the ingredient. After a selection key is pressed, the water will be dosed in the mixing chamber after a certain delay. The product falls into the mixing chamber from above.

An exhaust opening is mounted on top of the mixing chamber (Fig. 6). This cover has an opening at the rear, which is pressed into an exhaust opening through the sheet–metal work. The function of this exhaust system is to ensure that vapour from the mixing chamber does not get the chance to reach the ingredient holder outlet.

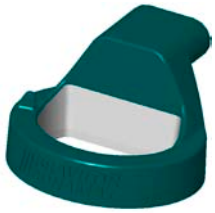

Fig. 6 Exhaust hood

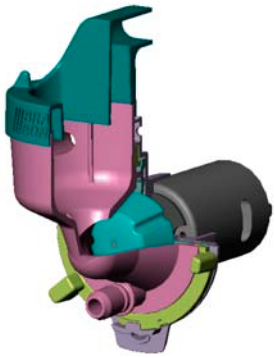

Fig. 7 Mixing unit

1.5 Ventilation system

The ventilation system (Fig. 8) removes the steam, that developes during dosing. So the settling of warm steam and condensation in the mixing chamber will be prevented. Therefore the mixing chamber will get less dirty.

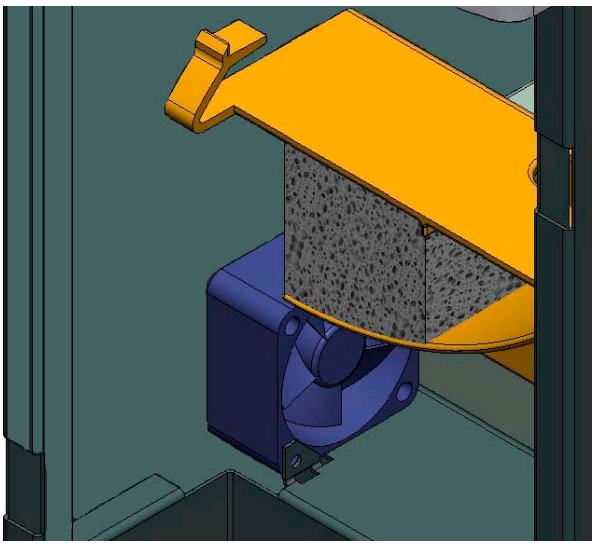

Fig. 8 Ventilation system

1.6 Operating system

The operating system consists of a:

- Keyboard
- Main board

1.6.1 Keyboard

The keyboard is the printed circuit board with the LED (green), two selection buttons and two potentiometers, but does not have a processor. By means of the potentiometers the amount and strength of the drink can be set, with the aid of a screwdriver. When the keyboard is replaced, the machine will therefore have the factory settings.

1.6.2 Main board

The main board is located in the machine and is fitted with electronics to drive the machine. The power supply for the low–voltage current components is regulated from this board, as well as the temperature regulation. This board switches the electrical components on or off.The main board is also fitted with a microprocessor that regulates the boiler heating. There are no settings to be filed on the main board.

1.7 Hardware protections

The machine is equipped with a number of hardware protections. These protections ensure that no dangerous situations can arise, such as overheating and/or water in the machine.

1.7.1 Overflow protection

This protection is in the float tank and ensures that, if the water becomes too high, excess water is passed through the overflow and hose to the bottom of the machine.

1.7.2 Back–flow protection

The water from the magnetic valve is sprayed against the cover of the float tank, via a pipe in the float tank. Then, it goes into the float tank itself. In this way, water is prevented from flowing back into the system and getting into the water system if the water pressure is released from the magnetic valve.

1.7.3 Boiling protection

The boiling protection consists of a relay and a temperature sensor against the boiler. This protection ensures that the machine cannot boil. The relay is regularly switched on and off to keep the water in the boiler at the right temperature. The printed circuit relay does not switch much. If the solid–state relay becomes defective, this can make a direct connection. This is why the heating element is permanently switched on. The temperature sensor constantly measures the temperature of the water. When the water temperature is too high, the operating system switches the relay off. Thus, the heating element will also be switched off. This prevents the water from boiling.

1.7.4 High temperature safety switch

The high temperature safety switch is mounted on the outside of the boiler by means of two Klixons. If, for whatever reason, the operating system does not switch the boiler off, the Klixons ensure that the voltage on the element is mechanically switched off.

1.8 Software protection

Depending on the type of machine, it is provided with a number of software protections. The software looks at all inputs and outputs of the machine during the entire process. If situations arise that are not allowed, the software intervenes. This intervention usually results in the machine being switched off and a malfunction message by quickly blinking of the green LED in the left selection button. For possible solutions to these malfunction messages, see the malfunction list underneath.

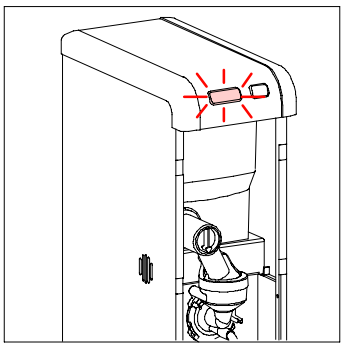

Fig. 9 Error message: quickly blinking green LED in left selection button

The green LED in the left selection button is blinking slowly.

– The machine is busy with filling, heating, dosing or rinsing.

Malfunction message, the green LED in the left selection button is blinking quickly. There is a malfuncion at:

– The water supply:
  If the process of filling the float tank takes too long, what ever reason, the machine switches off.
– The boiler heating:
  If the temperature sensor is broken or the temperature rises above tje 97 °C, the machine switches off.

Remove the plug from the wallsocket and put it in again. If after that the green LED is still blinking quickly, remove the plug again.

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