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# DESCRIPTION

## Background of the invention

[0001] The present invention relates in general to the sector of machines for the preparation of beverages. More particularly, it relates to a machine for preparing espresso coffee (or another beverage) provided with an improved system for regulating the temperature of the water in the boiler. The present invention also relates to a method for regulating the temperature of the water in an espresso coffee machine.

## Prior art

[0002] EP 2,490,580 relates to a machine for the preparation of coffee or the like. The machine comprises one or more operating groups, each of which comprises at least one boiler, a pump, a heating unit, and a unit for extracting the aromas and dispensing the espresso coffee infusion via the associated ducts. Each group is provided with a system for controlling and regulating parameters for production of the espresso coffee. According to one embodiment, the machine comprises means for modulating the pressure for extraction of the espresso coffee infusion. According to one embodiment, the machine comprises means for regulating the temperature for extraction of the espresso coffee infusion. According to one embodiment, the machine comprises a control unit which contains various stored pressure profiles which can be called up by the operator.

[0003] The water necessary for percolation of the coffee is usually heated by means of direct or indirect contact thereof with a heating element, normally an electrical resistance.

[0004] In an attempt to ensure a sufficiently stable temperature of the water, espresso coffee machines which use a closed loop regulating system are known. This system comprises a water container (tank), a heating element (for example an electrical resistance or the like), a temperature sensor and a regulating device.

[0005] The regulating device causes switching on or switching off of the heating element depending on the temperature sensed by the temperature sensor. In particular if the temperature of the sensor is lower than a reference temperature (desired temperature) the regulating device causes switching on of the heating element otherwise the regulating device causes switching off of the heating element.

[0006] WO2017009186 and WO2017009189, in the name of the Applicant, describe lever or piston machines.

[0007] EP2,789,276 describes a modular machine A coffee machine for preparing and

dispensing espresso coffee comprising the features of the preamble of claim 1 is known from US2012/222666.

### **Summary of the invention**

**[0008]** The Applicant has noted that the temperature regulating system adopted in known machines does not ensure a sufficient degree of precision. In particular, the Applicant has noted that the precision of the system may be negatively affected by the frequency of use of the machine and/or by other factors, for example the structure of the machine and/or environmental factors.

**[0009]** The Applicant has also noted that the water, along its flow path (from the moment it has been heated until the moment it reaches the puck of coffee powder) comes into contact with metallic (or non-metallic) parts to which it releases heat or, on some occasions, from which it receives heat.

**[0010]** The Applicant also noted that the temperature of the water which reaches the puck of coffee powder may be influenced by the temperature of the room in which the machine is installed.

**[0011]** The Applicant has also noted that the frequency of use of the machine influences significantly the temperature of the water reaching the puck of coffee powder. In other words, if the machine is used substantially continuously, the temperature of the water which reaches the puck of coffee powder is substantially constant and predictable, but in other conditions of use, the temperature varies considerably. As is known, often an espresso coffee machine has peak periods, periods of frequent use, but also has periods of inactivity or sporadic use, which are not entirely predictable a priori. For example, the first coffees dispensed in the morning, after a night of inactivity, are typically dispensed at a temperature lower than that desired.

**[0012]** In any case, for at least some of the aforementioned reasons, the temperature of the water in contact with the coffee powder is different from the reference temperature sensed by the temperature sensor.

**[0013]** The proposed aim of the Applicant is to provide a machine for the preparation of espresso coffee (or other beverage) which supplies heated water so that it reaches the puck of coffee powder at a predefined temperature, independently of the frequency of use of the machine, the flow path of the water and the contact with a number of components and/or environmental factors, in order to obtain a high repeatability and uniformity of quality during dispensing of the beverage.

**[0014]** According to a first aspect, the present invention relates to a machine for preparing and dispensing espresso coffee comprising:

a water supply;

a dispensing group and a corresponding coffee boiler containing water under pressure;

a heater device for heating the water in the coffee boiler;

a temperature sensor for measuring the temperature of the water in the coffee boiler;

a processor connected to said temperature sensor and configured to drive said heater device so that said water in the coffee boiler is at a set reference temperature  $Trif$ ,  $Trif\_new$ ,

wherein said processor comprises a feedback system; and

wherein the value of said set reference temperature is varied as a function of at least one of the following parameters:

1. (a) a first parameter which is a function of the time elapsed from a machine operating cycle or a frequency of use of the machine within a time interval;
2. (b) a second parameter which is a function of the temperature of a component of the machine; and
3. (c) a third parameter which is a function of the environment in which the machine is installed.

**[0015]** Preferably, the processor is configured to control the switching on or the switching off of the heater device on the basis of the temperature sensed by the temperature sensor.

**[0016]** The heater device may comprise an electrical resistance.

**[0017]** The feedback system may comprise a Proportional-Integral-Derivative or Proportional-Integrative-Derivative controller.

**[0018]** The first parameter could be function of the time elapsed since the last machine operating cycle.

**[0019]** If the first parameter for varying said set reference temperature ( $Trif$ ,  $Trif\_new$ ) were to be the time elapsed since the last beverage extraction cycle, with the time elapsed since the last dispensing operation being termed  $t_0$ ,  $Trif$  may be modified as follows:

$$t_0 < t_1 \quad : \quad Trif\_new = Trif + \Delta T1;$$

$$t_1 < t_0 < t_2 \quad : \quad Trif\_new = Trif + \Delta T2;$$

$$t_2 < t_0 < t_3 \quad : \quad Trif\_new = Trif + \Delta T3;$$

...

$$t_{n-1} < t_0 < t_n \quad : \quad Trif\_new = Trif + \Delta Tn;$$

where:

$t_1 < t_2 < \dots < t_n$  are times and

$\Delta T_1, \Delta T_2, \dots \Delta T_n$  are temperatures (positive, negative or zero) where  $n = 1, 2, 3, \dots$

**[0020]** Advantageously, the second parameter could be a function of the temperature of a component of the machine which is contact with a flow of water from the coffee boiler during a beverage dispensing operation.

**[0021]** The third parameter could be a function of a temperature of the environment in which the machine is installed.

**[0022]** According to another aspect, the present invention provides a method for preparing and dispensing espresso coffee comprising:

supplying water in a coffee boiler containing water under pressure;

providing a dispensing group;

heating the water in the coffee boiler;

measuring the temperature of the water in the coffee boiler;

controlling the heating of the water in the coffee boiler so that said water in the coffee boiler is at a set reference temperature;

providing a feedback system; and

varying said value of said reference temperature as a function of at least one of the following parameters:

1. (a) a first parameter which is a function of the time elapsed from a machine operating cycle or a frequency of use of the machine within a time interval;
2. (b) a second parameter which is a function of the temperature of a component of the machine; and
3. (c) a third parameter which is a function of the environment in which the machine is installed.

**[0023]** The present invention will become completely clear from the following detailed description, provided by way of a non-limiting example, to be read with reference to the attached drawings in which:

- Figure 1 is a simplified hydraulic diagram which shows only the essential elements for comprehension of the present invention;
- Figure 2 is a first temperature vs. time graph; and
- Figure 3 is another temperature vs. time graph.

**[0024]** Figure 1 is a simplified hydraulic diagram. In particular, the hydraulic diagram in Figure 1 shows only a few components of an espresso coffee machine, i.e. those which are necessary for understanding the present invention.

**[0025]** The description below, for the sake of convenience, refers in particular to an espresso coffee machine, but the present invention is not limited to such machines and is applicable to machines for dispensing other beverages. For example, barley powder or another cereal powder may be used instead of coffee powder. Therefore, the expression "espresso coffee machine" must be understood as comprising also machines for preparing other beverages. Similarly, the expression "espresso coffee" must be understood as having a wider meaning corresponding to the product (coffee, barley or other cereal) used for the preparation of the beverage.

**[0026]** The machine to which the present invention relates may also be a machine of the lever or piston type. By way of a further alternative, the present invention may also be applied to a machine of the modular type, for example of the type described in EP 2,789,276.

**[0027]** Typically an espresso coffee machine 10 receives water from a tank or a pipe 1 and, by means of a pump 2, sends this cold water under pressure to the components downstream. In other embodiments, the pump 2 is not present since a pressure (typically from the mains water supply) sufficient for correct operation of the machine is in any case ensured. This pressure for example may be about 3 bar.

**[0028]** Downstream of the pump 2 there may be a solenoid valve 3 and a coffee boiler 4. Inside the coffee boiler 4 the water is heated up to a reference temperature, indicated below as Trif.

**[0029]** A group 9 for dispensing the beverage (espresso coffee or the like) has a fluid connection with the coffee boiler 4. In some machines, two or more dispensing groups 9 are connected to the same coffee boiler. Each dispensing group 9 is configured such that a portafilter (also termed filter holder) 5 may be attached in a removable manner. In turn, each portafilter 5 comprises a body, which is typically substantially cylindrical, with a closed bottom provided with one or more nozzles 51. The body of the portafilter 5 is configured to support a filter 52 filled at least partly with pressed coffee powder 53.

**[0030]** In order to prepare an espresso coffee, the hot water under pressure, which is contained inside the coffee boiler 4, is made to pass through the coffee powder 53, percolate from the filter 52 and flow out from the nozzle 51 (or nozzles).

**[0031]** The machine 10 preferably also comprises a substantially closed box-like body and a support surface, with associated drip tray, for resting cups or other containers during

dispensing of the beverage.

**[0032]** Figure 1 also shows, in schematic form, a processor 8 (CPU or the like) for managing certain electrical and/or electronic functions of the machine. Preferably, the processor 8 is mounted on an electronic board. For the purposes of the present invention, the term "processor" comprises not only a CPU or the like, but also other electric and/or electronic components such as one or more memories (preferably nonvolatile memories), relays, connectors or similar components.

**[0033]** For the purposes of the present invention, the processor 8 is connected to a temperature sensor 7 which is configured to sense the temperature of the water inside the coffee boiler. The processor 8 is also connected to a heating element for heating the water inside said coffee boiler. The heating element may comprise, typically, an electrical resistance. Obviously, the connection between the processor 8 and the heating element may be a physical connection (for example via a cable), but preferably it is an indirect or logic connection. For example, the processor 8 could control switching on or switching off of the heating element (for example the electrical resistance) by operating a relay or the like.

**[0034]** As mentioned above, the processor may also manage other important functions of the machine, which, however, are not relevant for the purposes of the present invention. On the basis of the diagram shown in Figure 1, the processor may be connected to the pump 2 and/or to the solenoid valve 3.

**[0035]** The connections in the diagram of Figure 1 are shown as physical cable connections, but may also be wireless using any data transmission standard for wireless personal area networks (WPAN), for example Bluetooth, Zigbee or the like. In any case, the cable connection is preferred.

**[0036]** Typically the processor 8 is configured to maintain a certain desired reference temperature inside the coffee boiler. The processor controls the switching on or the switching off of the heating element on the basis of the temperature sensed by the temperature sensor. In particular, if the temperature of the sensor is lower than a reference temperature (desired temperature), the processor 8 causes switching on of the heating element, otherwise the processor 8 causes switching off of the heating element.

**[0037]** Preferably, in order to increase the thermal stability, the processor 8 does not perform merely a comparison between the reference temperature and the temperature detected by the temperature sensor 7, but uses a more sophisticated logic system. Preferably, according to the present invention, the processor 8 employs a so-called Proportional-Integral-Derivative or Proportional-Integrative-Derivative (PID) controller system. As is known, the PID system is a feedback system generally used in control systems. Owing to an input which determines the current value, the system is able to react to any positive or negative errors which tend towards the value 0. The reaction to the error may be regulated and this makes this system very versatile. Basically, the PID technique considers also the derivative and the integral of the

temperature difference.

**[0038]** According to the present invention, the reference temperature  $Trif$  is not constant, but is varied as a function of at least one of the following:

1. (a) a first parameter indicative of the frequency of use of the machine and/or the time elapsed from a reference extraction cycle;
2. (b) a second parameter indicative of the temperature of a component of the machine, preferably a component acted on by the water flow during the preparation and/or dispensing of the beverage; and
3. (c) a third environmental parameter indicative of the environment in which the machine is installed.

**[0039]** As regards the parameter (a), the Applicant has realized that the temperature of the dispensing water, and therefore the temperature of the beverage, is influenced among other things by the frequency with which the espresso coffee machine is used and/or the time elapsed from an extraction cycle taken as a reference cycle. Advantageously, the last (or penultimate) coffee dispensing operation performed by the machine may be taken as the reference extraction cycle.

**[0040]** According to the Applicant, the use of the machine with varied frequency (a lot of coffees per hour or a few coffees per hour) forces the water to release different quantities of heat. This means that the water, which reaches the coffee powder, has a different temperature depending on the use.

**[0041]** According to the present invention, the processor 8 is configured to modify suitably the reference temperature  $Trif$  of the water inside the boiler over time in order to compensate for the temperature drops caused by infrequent use of the machine. In other words, if a major decrease in the temperature of the water is expected, then  $Trif$  will be correspondingly increased. If, on the other hand, only a slight drop in temperature is expected,  $Trif$  will be increased less than in the preceding case. If the machine is operating under normal conditions and is being used with a certain continuity,  $Trif$  will not be increased, namely will be kept unvaried.

**[0042]** For example, if the time elapsed from the last beverage extraction cycle is considered as the significant parameter for modifying the reference temperature  $Trif$ , with the time from the last dispensing operation being termed  $t_0$ ,  $Trif$  may be modified as follows:

$$t_0 < t_1 \quad : \quad Trif\_new = Trif + \Delta T1;$$

$$t_1 < t_0 < t_2 \quad : \quad Trif\_new = Trif + \Delta T2;$$

$$t_2 < t_0 < t_3 \quad : \quad Trif\_new = Trif + \Delta T3;$$

...

$$t_{n-1} < t_0 < t_n \quad : \quad Trif\_new = Trif + \Delta Tn;$$

where

$t_1 < t_2 < \dots < t_n$  are times and

$\Delta T_1, \Delta T_2, \dots, \Delta T_n$  are temperatures (positive, negative or zero) where  $n = 1, 2, 3, \dots$ . Typically  $n$  may be comprised between 2 and 4.

**[0043]** For example, if:

$t_0 < 30 \text{ s}$	$\text{Trif\_new} = \text{Trif} + 0 \text{ }^\circ\text{C}$
$30 \text{ s} < t_0 < 60 \text{ s}$	$\text{Trif\_new} = \text{Trif} + 1 \text{ }^\circ\text{C}$
$60 \text{ s} < t_0 < 90 \text{ s}$	$\text{Trif\_new} = \text{Trif} + 2 \text{ }^\circ\text{C}$
$t_0 > 90 \text{ s}$	$\text{Trif\_new} = \text{Trif} + 3 \text{ }^\circ\text{C}$

**[0044]** Obviously, as soon as a regular frequency of use is re-established - even after a prolonged period of inactivity (involving for example an increase of Trif by  $3^\circ\text{C}$ ), Trif\_new will be  $\text{Trif\_new} = \text{Trif} + 0^\circ\text{C}$ .

**[0045]** In addition or as an alternative to the aforementioned criterion based on the time elapsed from the last dispensing operation, the processor of the temperature regulating system may be configured to modify the reference temperature Trif on the basis of the number of extraction cycles within a certain time interval. This time interval may be a few seconds or a few minutes, for example 1, 5 or 10 minutes.

**[0046]** According to the present invention, if the number of extraction cycles in the period is less than a predefined threshold, it may be necessary to increase the temperature of the water in the coffee boiler and therefore increase Trif. Therefore, the processor 8 acts so as to increase the temperature of the heater device correspondingly.

**[0047]** If the number of extraction cycles corresponds to a set value or is within a set time interval of extraction cycles, the processor does not increase the temperature Trif.

**[0048]** On some occasions, should the temperature inside the coffee boiler be too high (for some reason), the processor could act so as to switch off the power supply to the resistance.

**[0049]** As mentioned above, in addition or as an alternative to the aforementioned criterion of variation of Trif, the reference temperature Trif may be varied as a function of a second parameter indicative of the temperature of a component of the machine, preferably a component acted on by the flow of water during dispensing of a beverage.

**[0050]** In other words, the processor of the system for regulating the temperature of the water

inside the coffee boiler could also be controlled by temperature information of one or more components of the espresso coffee machine, including the dispensing group.

**[0051]** For example, the processor could be configured to receive temperature information relating to the temperature of a solenoid valve, a union, a pipe, a connector, the portafilter, the filter basket in which it is contained or another component passed through by the flow of water flowing out of the boiler and reaching the filter. In this way the processor acts so as to increase the temperature  $Trif$  as a function of the temperature of one or more components, which is in turn indicative of the drop in temperature which would affect the water flowing from the boiler to the dispensing group. Therefore, if the temperature of a predetermined component is less than a certain value, it may be necessary to increase the temperature of the water inside the coffee boiler. Therefore, the processor acts so as to increase the temperature of the heater device in a corresponding manner.

**[0052]** Obviously, in addition to the case where it is required to increase the temperature in response to a non-optimum temperature of a certain component in the machine, the situation could also arise where the temperature of that component is within a certain optimum temperature range or, on the contrary, is too high. In these cases the processor operates accordingly.

**[0053]** As mentioned above, in addition or as an alternative to the aforementioned criteria of variation of  $Trif$  (considered singly or in combination), the reference temperature may be varied as a function of a third environmental parameter indicative of the environment in which the machine is installed.

**[0054]** This environmental information, for example, may include the ambient temperature of the room in which the machine is installed, the external temperature, the atmospheric pressure or the humidity. For example, if the temperature inside the room in which the machine is installed is lower than a certain value, it may be necessary to increase the temperature  $Trif$ .

**[0055]** Figure 2 is a graph showing the progression of the water temperature against time. As can be seen, owing to the effect of a regulating system according to the present invention (comprising a feedback system of the PID or similar type) the temperature is adjusted to a value in the region of the set reference temperature ( $Trif$ ). The form of the graph is purely of a qualitative nature.

**[0056]** Figure 3 is also a graph showing the progression of the water temperature against time. The graph in Figure 3 illustrates in qualitative terms variation of the  $Trif$  for one or more of the aforementioned criteria (a), (b) and/or (c). As can be seen from Figure 3, owing to the effect of a regulating system according to the present invention (comprising a feedback system of the PID or similar type) the temperature is adjusted to a value in the region of the set reference temperature ( $Trif$ ) or in the region of the new set temperature  $Trif_{new}$ .

## **REFERENCES CITED IN THE DESCRIPTION**

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

**Patent documents cited in the description**

- EP2490580A [0002]
- WO2017009186A [0006]
- WO2017009189A [0006]
- EP2789276A [0007] [0026]
- US2012222666A [0007]

## Patentkrav

1. Maskine (10) til tilberedning og dispensering af espressokaffe, hvilken maskine omfatter:

- 5           en vandforsyning (1),  
          en dispenseringsgruppe (9) og en tilhørende kaffekoger (4), der indeholder vand under tryk,  
          en varmeindretning (6) til opvarmning af vandet i kaffekogeren (4),  
          en temperatursensor (7) til måling af vandets temperatur i kaffekogeren (4),  
10           en processor (8), der er forbundet med nævnte temperatursensor (7) og konfigureret til at drive nævnte varmeindretning (6), således at nævnte vand i kaffekogeren har en indstillet referencetemperatur (Trif, Trif\_new),  
15           hvor nævnte processor omfatter et feedbacksystem (PID),  
          **kendetegnet ved, at** værdien af nævnte indstillede referencetemperatur (Trif, Trif\_new) varieres som en funktion af en første parameter, der er en funktion af den forløbne tid siden en maskindriftscyklus eller en anvendeshyppighed af maskinen inden for et tidsinterval.

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2. Maskine (10) til tilberedning og dispensering af espressokaffe ifølge krav 1, hvor nævnte processor er konfigureret til at styre tænding eller slukning af varmeindretningen (6) på basis af den temperatur, der registreres af temperatursensoren (7).

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3. Maskine (10) til tilberedning og dispensering af espressokaffe ifølge krav 1 eller 2, hvor nævnte varmeindretning (6) omfatter en elektrisk modstand.

4. Maskine (10) til tilberedning og dispensering af espressokaffe ifølge krav 1, 2 eller 3, hvor nævnte feedbacksystem omfatter en proportional-integral og derivet (PID)-regulator.

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5. Maskine (10) til tilberedning og dispensering af espressokaffe ifølge et hvilket som helst af de foregående krav, hvor nævnte første parameter er en

funktion af forløbet tid siden den seneste maskindriftscyklus.

5 **6.** Maskine (10) til tilberedning og dispensering af espressokaffe ifølge krav 5, hvor nævnte første parameter til variation af nævnte indstillede referencetemperatur (Trif, Trif\_new) er den forløbne tid siden den seneste drikkevareekstraktionscyklus, og hvis den seneste dispenseringsoperation benævnes  $t_0$ , kan Trif modificeres som følger:

$$t_0 < t_1 : \quad \text{Trif\_new} = \text{Trif} + \Delta T1;$$

$$t_1 < t_0 < t_2 : \quad \text{Trif\_new} = \text{Trif} + \Delta T2;$$

$$t_2 < t_0 < t_3 : \quad \text{Trif\_new} = \text{Trif} + \Delta T3;$$

...

$$t_{n-1} < t_0 < t_n : \quad \text{Trif\_new} = \text{Trif} + \Delta Tn;$$

hvor:

10  $t_1 < t_2 < \dots < t_n$  er tidspunkter, og  
 $\Delta T1, \Delta T2, \dots \Delta Tn$  er temperaturer (enten positive, negative eller nul),  
 hvor  $n = 1, 2, 3, \dots$

15 **7.** Maskine (10) til tilberedning og dispensering af espressokaffe ifølge et hvilket som helst af de foregående krav, hvor værdien af nævnte indstillede referencetemperatur (Trif, Trif\_new) endvidere varieres som en funktion af en anden parameter, der er en funktion af temperaturen for en komponent af maskinen, som kommer i kontakt med en strøm af vand fra kaffekogeren under en drikkevaredispenseringsoperation.

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**8.** Maskine (10) til tilberedning og dispensering af espressokaffe ifølge et hvilket som helst af de foregående krav, hvor værdien af nævnte indstillede referencetemperatur (Trif, Trif\_new) endvidere varieres som en funktion af en tredje parameter, der er en funktion af temperaturen i det miljø, hvor maskinen er installeret.

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**9.** Fremgangsmåde til tilberedning og dispensering af espressokaffe, hvilken fremgangsmåde omfatter:

30 tilførsel af vand (1) til en kaffekoger (4), der indeholder vand under tryk, tilvejebringelse af en dispenseringsgruppe (9),

opvarmning (6) af vandet i kaffekogeren (4),  
 måling af vandets temperatur i kaffekogeren (4),  
 regulering af opvarmningen af vand i kaffekogeren, således at nævnte  
 vand i kaffekogeren (4) har en indstillet referencetempera-  
 5 tur (Trif, Trif\_new),  
 tilvejebringelse af et feedbacksystem (PID), og  
 variation af nævnte værdi af nævnte indstillede referencetempera-  
 tur (Trif, Trif\_new) som en funktion af en første parameter, der er en  
 funktion af den forløbne tid siden en maskindriftscyklus eller en anven-  
 10 delsehyppighed af maskinen inden for et tidsinterval.

**10.** Fremgangsmåde ifølge krav 9, hvor nævnte første parameter er en funk-  
 tion af den forløbne tid siden den seneste maskindriftscyklus.

15 **11.** Fremgangsmåde ifølge krav 9 eller 10, hvor nævnte første parameter til  
 variation af nævnte indstillede referencetemperatur (Trif, Trif\_new) er den for-  
 løbne tid siden den seneste drikkevareekstraktionscyklus, og hvis tidspunktet  
 for den seneste dispenseringsoperation benævnes  $t_0$ , kan Trif modificeres  
 som følger:

$t_0 < t_1$  : Trif\_new = Trif +  $\Delta T_1$ ;  
 $t_1 < t_0 < t_2$  : Trif\_new = Trif +  $\Delta T_2$ ;  
 $t_2 < t_0 < t_3$  : Trif\_new = Trif +  $\Delta T_3$ ;  
 ...  
 20  $t_{n-1} < t_0 < t_n$  : Trif\_new = Trif +  $\Delta T_n$ ;  
 hvor:

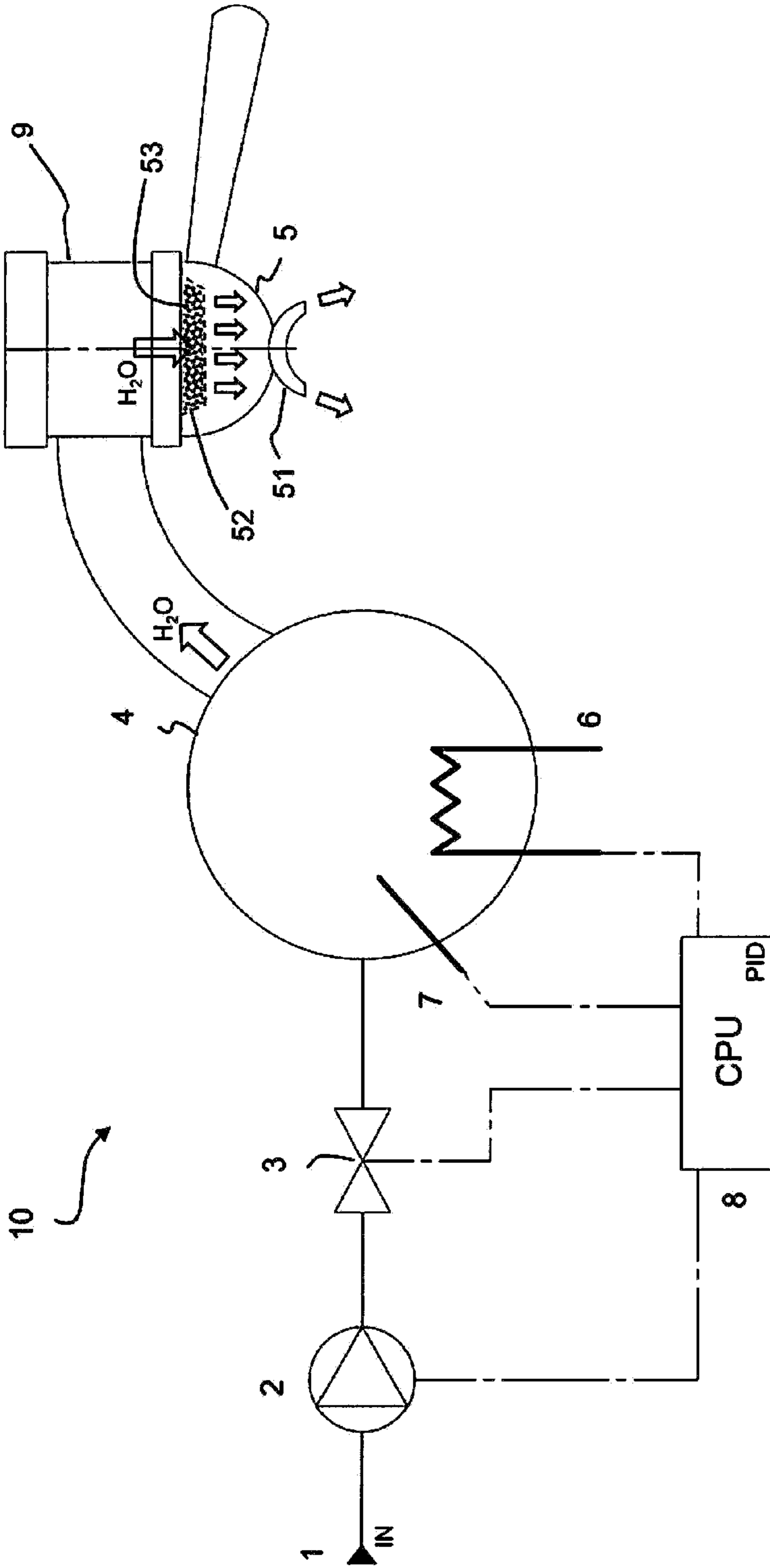
$t_1 < t_2 < \dots < t_n$  er tidspunkter, og  
 $\Delta T_1, \Delta T_2, \dots, \Delta T_n$  er temperaturer (enten positive, negative eller nul),  
 hvor  $n = 1, 2, 3, \dots$

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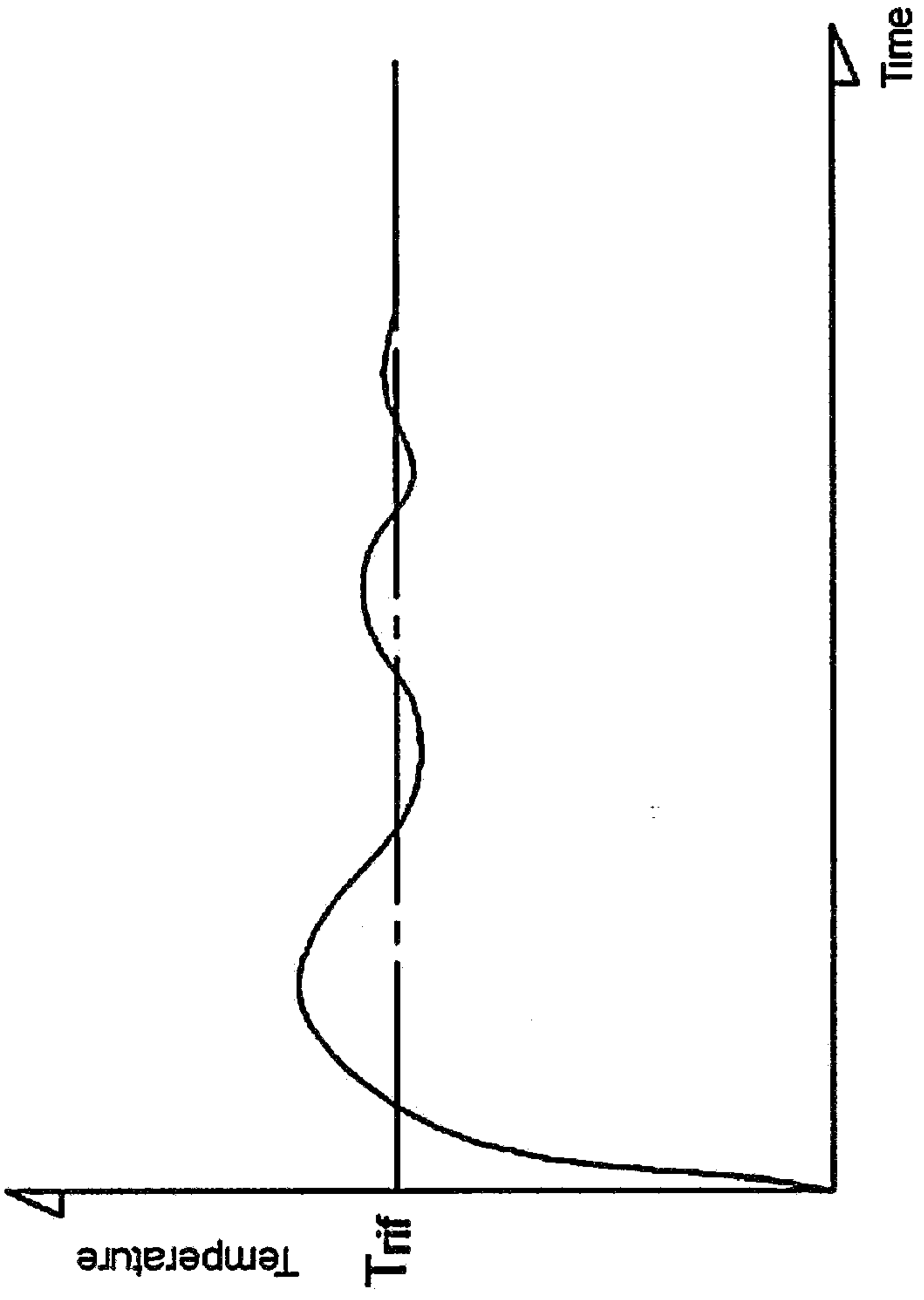
**12.** Fremgangsmåde ifølge krav 9, hvor værdien af nævnte indstillede referen-  
 cetemperatur (Trif, Trif\_new) endvidere varieres som en funktion af en anden  
 parameter, der er en funktion af temperaturen for en komponent af maskinen,  
 som kommer i kontakt med en strøm af vand fra kaffekogeren under en

dispenseringsooperation.

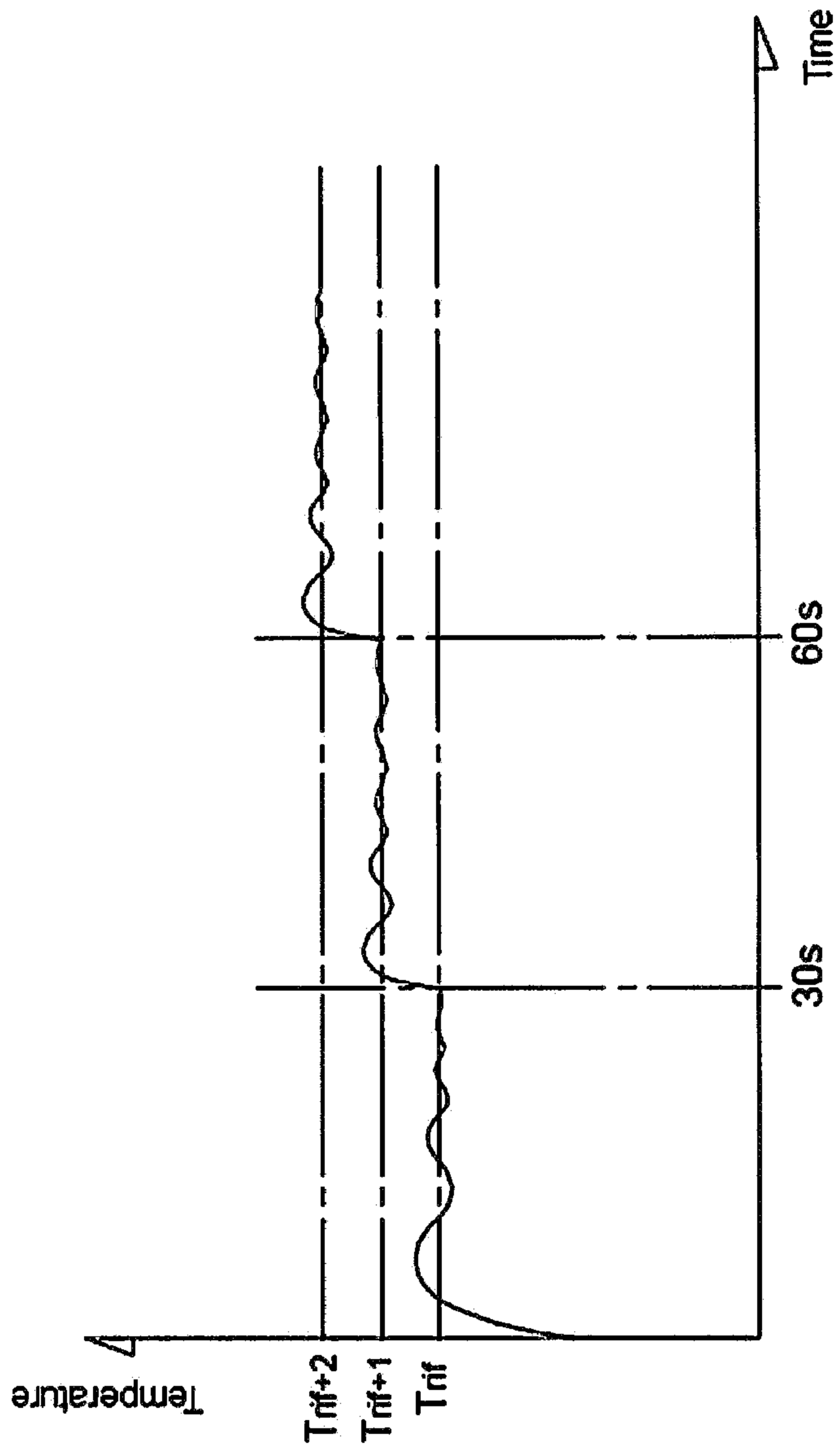
# DRAWINGS



**Fig. 1**



**Fig. 2**



**Fig. 3**