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(54) **LIQUID BEVERAGE DISPENSING MACHINE**

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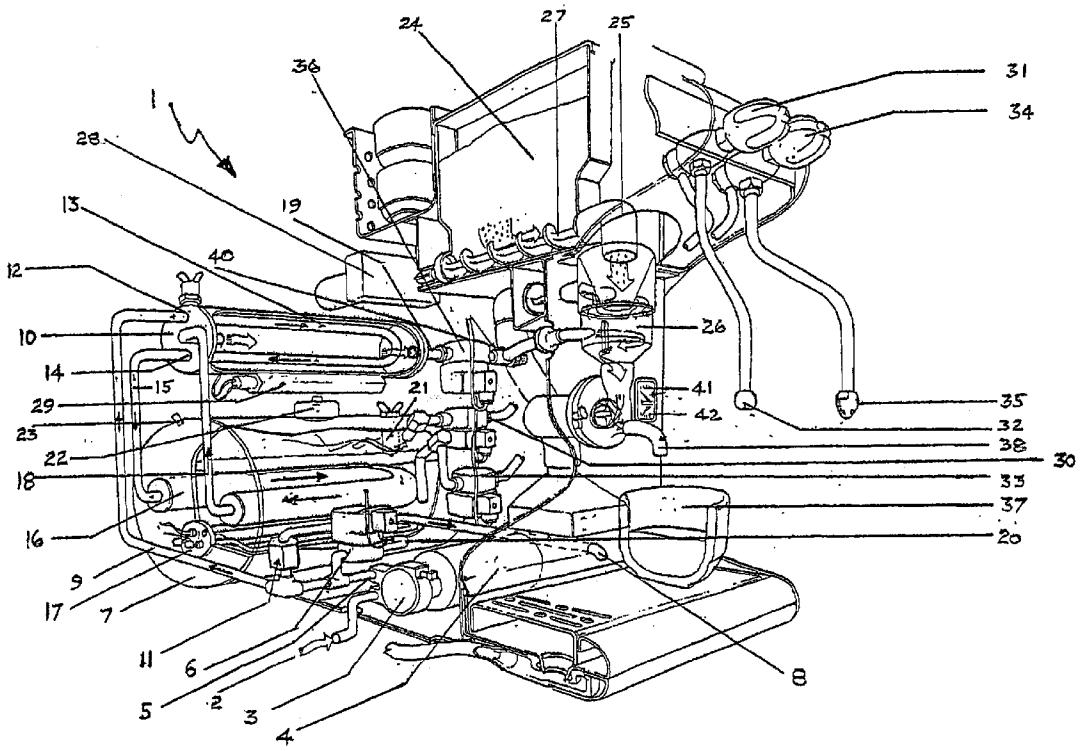
(57) **ABSTRACT**

A brewing machine (**1**) for delivering hot beverages, the machine (**1**) including: an inlet (**2**) for receiving a supply of water; at least one boiler (**7**) which receives water from the water supply and which is capable of delivering hot water and/or steam; a mixing station (**26**) which receives hot water and a predetermined dose of a beverage (such as coffee) for mixing with said hot water and subsequent delivery of said beverage from said machine (**1**); a cooling chamber (**10**) which receives part of the water supply and which delivers hot water at a predetermined maximum temperature to said mixing station (**26**) via an outlet (**19**); the cooling chamber (**10**) including at least one inlet (**12**) and at least one outlet (**14**) wherein said cooling chamber (**10**) receives cold water from the water supply and wherein the cooling chamber (**10**) receives hot water from the boiler (**7**) for delivery to the mixing station (**26**); and wherein the temperature of the hot water in the cooling chamber (**10**) which is delivered to the mixing station (**26**) is tempered by cold water.



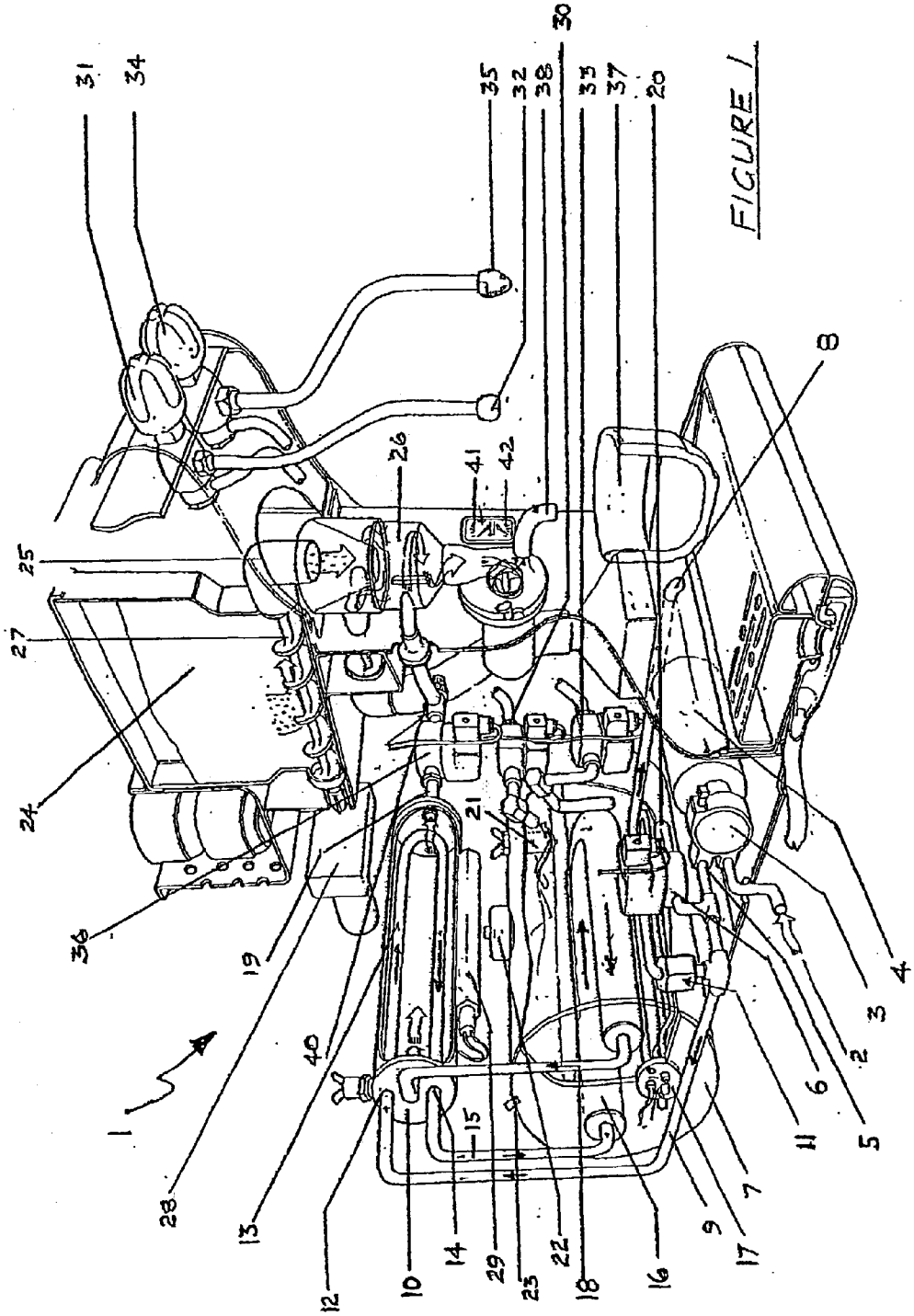

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FIGURE 1

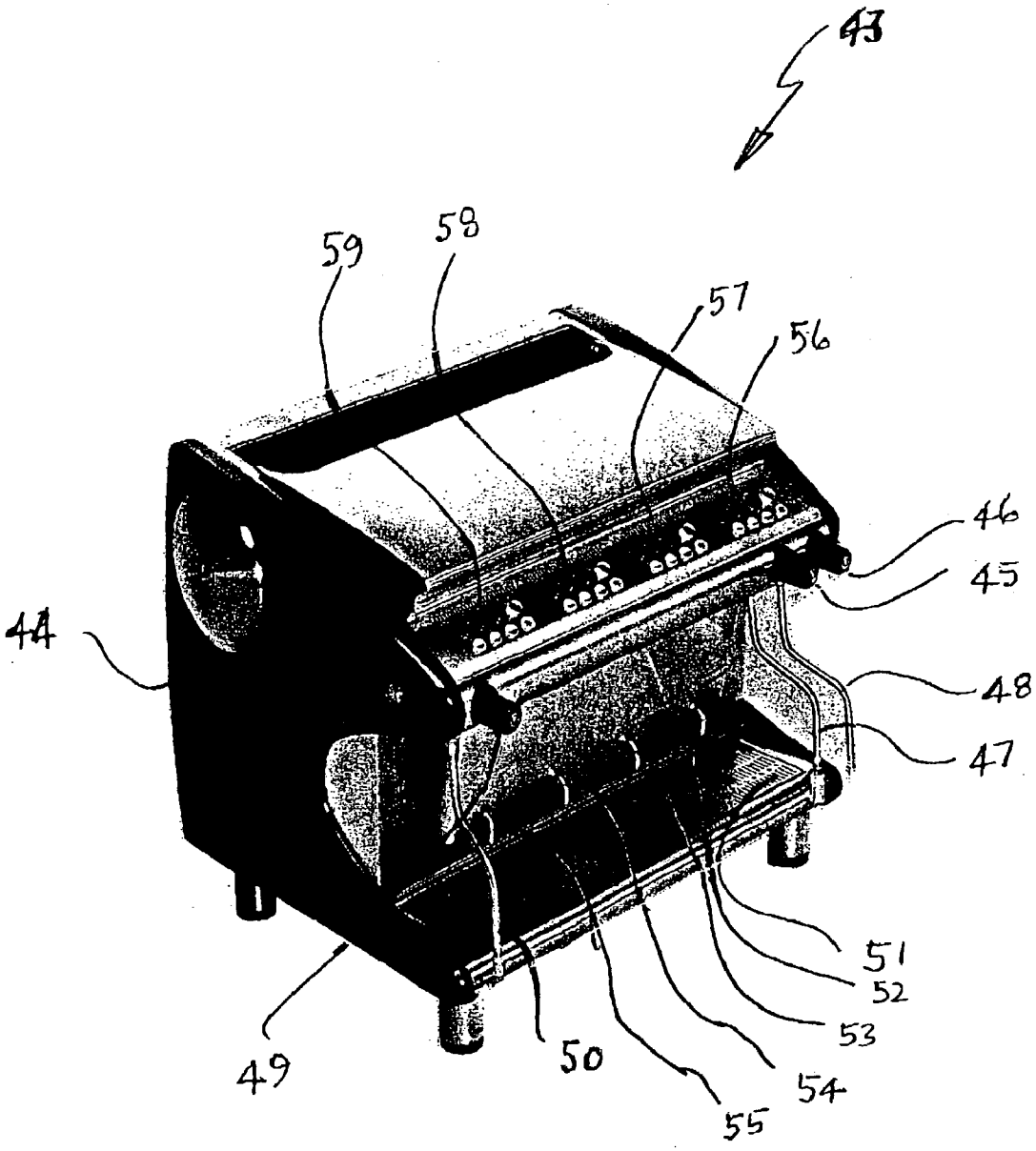

FIGURE 2

LIQUID BEVERAGE DISPENSING MACHINE

BACKGROUND

[0001] The present invention relates to beverage making machines and more particularly relates to improvements in such machines for dispensing hot beverages such as coffee. Widespread consumption of coffee has spawned production of various machines for dispensing and brewing coffee. These machines can be generally divided into two main categories namely vending machines which may be operated by consumers on demand and which dispense coffee and other hot-beverages according to a mix prescribed by the consumer and generally at the touch of a button. Those machines provide a generally low standard of beverage, but they are quick and convenient and therefore have satisfied a particular market. The second category of machine is the brewing type which brews coffee beans and produces a higher quality of coffee such a cappuccino. There is a wide class of coffee consumers which are discerning as to quality and demand a high standard of coffee. Coffee brewing machines have been able to satisfy this market. The present invention is directed towards improvements in vending and expresso machines and particularly the latter category of machines which have primarily been adapted for brewing coffee from coffee ground. More particularly, the present invention provides a coffee dispensing machine capable of dispensing hot beverages such as coffees including cappuccino using soluble coffee and means for controlling and monitoring the delivery temperature of the beverage.

PRIOR ART

[0002] Known hot beverage dispensing machines employ a source of hot water which is mixed with a beverage such as hot chocolate or coffee. These machines include a mixing station at which the mixing of the beverage takes place. Vending machines allow the consumer to select the beverage and the machine does the rest. The beverages delivered by these machines are usually low quality and are not monitored by an operator.

[0003] Known coffee brewing machines are more sophisticated than the vending machines and normally require an operator. Traditionally these machines are known as expresso machines and utilise coffee beans but the quality of coffee is largely dependent upon techniques in making the coffee. Till now, technological developments in the coffee industry have focused on the fresh coffee (espresso and cappuccino) segment ignoring the soluble coffee segment. However, fresh coffee developments have failed to address significant issues in both milk-based and filter varieties. The known brewing machines are effective with potentially high output when operated by a skilled barista. A typical prior art coffee brewing machine is disclosed in U.S. Pat. No. 4,681,028 which teaches a simple coffee machine having a housing, a fresh water supply reservoir mounted therein, a heating element adapted to heat fresh water supplied to a brewing chamber under pressure. The brewing chamber includes an inlet and an outlet for the coffee and further includes a water pump and driving control.

[0004] U.S. Pat. No. 4,491,063 discloses an automatic coffee machine which distributes hot water under pressure from a tank, boiler or the like and delivers it to a chamber where coffee powder is contained. The machine includes filtration of the infusion obtained by the passing of the hot water through the coffee powder. Some of the prior art in this field has been directed to means for avoidance of clogging of the inlet holes of the hot water to the chamber holding the coffee powder.

[0005] U.S. Pat. No. 6,035,762 discloses an expresso coffee machine which operates with filter capsules and includes a brewing unit with two brewing chamber parts which are connected to a brewing water heater and being provided with a multiple nozzle.

[0006] U.S. Pat. No. 6,003,435 discloses a coffee making machine of the type to deliver hot water during a brewing cycle to ground coffee supported in a removable filter unit and includes a heated reservoir for water heating and storage and a spray head to deliver heated water from the reservoir to the filter unit. The unit includes a valved conduit which delivers a first amount of heated water from the reservoir to the spray head and a second valve conduit which delivers a second amount of heated water from the reservoir to the spray head. Selection switches allow an operator to select an amount of coffee to be brewed. The unit further includes a controller in communication with the selection switches and controls actuation of the first and second valved conduit during a brewing cycle to deliver an appropriate amount of heated water to the spray head for delivery to ground coffee in the filter unit thereby to brew the selected amount of coffee.

[0007] Another known expresso coffee machine is disclosed in U.S. Pat. No. 5,388,502 which discloses an expresso coffee machine including an electric water heater and a filter basket holder which has a brewing chamber for receiving coffee grounds in a pouring device arranged at its bottom. The coffee machine further includes a first duct and a second duct having a steam outlet. The first duct opens into the filter basket holding device so as to connect the brewing chamber to the water heater and it includes a through flow controlling valve arranged therein which is always closed when the filter basket holder is not inserted. After the filter basket is inserted into the machine the filter basket holder causes the filter valve to move from its closed position into an open position. Another coffee making machine is disclosed in U.S. Pat. No. 5,063,836 and described therein comprises a reservoir connected to a water supply and including a level sensor controlling the water refill valve to the reservoir. The machine further includes a thermostatically controlled heating element wherein the thermostat and refill valve are controlled by a single modular replaceable solid state circuit board. The level sensor functions cause refill of the reservoir to the appropriate level sensor functions to cause refill of the reservoir to the appropriate level for subsequent brewing of coffee irrespective of the mains water pressure and the route by which water may previously have been removed from the reservoir. The electronically controlled thermostat allows only small drops in temperature for example 3 deg F. before operating to reheat the water in the reservoir. This allows the water to be stored at closer to the boiling point and delivered to contact coffee for brewing purposes at temperatures of not less than 200 deg.

[0008] Traditionally, coffee brewing machines employ coffee beans or grounds in making the coffee and to the best of the applicant's knowledge there has been no use previously of instant coffee in coffee brewing machines. Soluble

coffee could not previously be used in expresso brewing machines due to the method of operation expresso machines operate. Coffee ground or beans is identified in the industry as non soluble coffee wherein the grounds do not spontaneously dissolve in water. Instant coffee is described as soluble coffee. Traditionally, soluble coffee has not been used in coffee brewing machines as no effective techniques have been achieved and no appropriate equipment developed to enable use of this grade of coffee in the production of brewed coffee by brewing machines. If instant coffee was used in traditional expresso machines it would become an amorphous mass of congealed coffee which could not be used. In conventional expresso machines, coffee grounds are subject to steam under pressure which forces the flavour from the coffee grounds. Grounds can withstand steam but due to the physical nature of soluble coffee it cannot be used with steam pressurisation necessitating substantial changes to known machines of soluble coffee is to be dispensed

[0009] There is a need to provide coffee to the quality of brewed coffee in a much faster time than can be now achieved using conventional machines. Traditionally, brewed coffee takes a number of minutes to prepare but there are occasions where consumers may demand coffee in less than 30 seconds. Conventional machines are not adapted for use with soluble coffees nor for speedy production of coffee beverages so the market in fast production of high quality coffee from brewing machines has not hitherto previously been exploited.

[0010] Traditional coffee brewing machines have two boilers one which generates hot water for making the coffee and the other for making steam. Conventional wisdom has been to date that it is not possible to produce brewed coffee from machines using only one boiler within the foot print of the same size as or in a space smaller than existing machines. Accordingly, the conventional machine designs have remained static for some time. Coffee machines ideally deliver coffee at an exit temperature of around 87 deg C. although up to about 93 deg C. is an acceptable coffee delivery temperature. During mass production of coffee from a machine, the exit temperature must be maintained to ensure the coffee is delivered to the consumer at the required temperature.

[0011] This can sometimes be difficult to achieve during peak loads. The steam required during preparation of the coffee is ideally distributed at around 100 deg C. Temperature control is effected by means of thermostats and in the prior art machines heat exchange takes place by contact with ambient air at an outlet which can be an inefficient means of temperature control possibly resulting in delivery of coffee which is too hot. One of the problems of the prior art machines is the maintenance of the required discharge temperatures particularly during mass production of coffee. A further disadvantage of the known brewing machines is the space taken up by the machines due to the need for two boilers and the enlarged space needed to accommodate those boilers. It was previously thought not possible to reduce a machine footprint by performing all of its brewing functions with one boiler.

[0012] Milk-based espresso coffee machines must be cleaned and maintained regularly to maintain the output quality. The standard of espresso/cappuccino production depends on operator expertise and equipment maintenance, which can lead to the sale of substandard coffee at a premium where for instance, the operator is inexperienced. Filter coffee must be discarded approximately every 30 minutes leading to inefficiencies. In busy restaurant environments, this policy is often forgotten which leads to substantial sub-standard coffee being served to customers and loss of future sales.

INVENTION

[0013] The present invention addresses the soluble and roast and ground coffee technology as well as addressing the problems of milk-based and filter coffee equipment technology.

[0014] Using soluble coffee, the apparatus of the present invention replicates the production of expresso and fresh-milk coffees. Given that coffee is such a large commodity and the growth in coffee sales is in the espresso and fresh milk arena, the present invention allows a soluble coffee supplier to compete with the espresso market.

[0015] In the United States, in 1999, 886,338 tonnes of coffee were sold in the USA. Soluble coffee at the present time accounts for 9.1% of the total market and fresh coffee 90.1%. Fresh coffee is the fastest growing sub sector in both volume and value terms with increases of 2.4% and 32.6% respectively from 1994 to 1999. The soluble coffee sub sector has declined with a 1.8% fall in value during 1999. Despite its potential higher price, soluble coffee is perceived as inferior to fresh (roast and ground). More coffee is now being consumed away from home, accounting for 57% of the total market. This is reflected in declining supermarket sales of both soluble and fresh coffee.

US$ (millions)	Fresh	Instant	Total
1994	$5,851	$764	$6,615
1998	$7,761	$779	$8,540

[0016]

Age	Number of cups per day
25–29	4.2
30–59	3.8
60+	2.8

[0017] These figures show that although coffee is a growing market with continued expansion forecast, the growth is focused in the fresh coffee sub sector of specialty coffees, consumed primarily away from the home and largely by younger generations. The present invention seeks to provide improvements in and to the prior art brewing machines for preparation of hot beverages such as coffee and which increases the efficiency and speed of production and which is capable of operating to produce coffee beverages from soluble and non soluble coffee. The present invention further provides a cooling chamber for controlling the temperature of delivery of soluble coffee.

[0018] In its broadest from the present invention comprises:

[0019] A brewing machine for delivering hot beverages; the machine including; an inlet for receiving a supply of water, at least one boiler which receives water from said water supply and which is/are capable of delivering hot water and/or steam; a mixing station which receives hot water and a predetermined dose of a beverage such as coffee for mixing with said hot water and subsequent delivery of said beverage from said machine; a cooling chamber which receives part said water supply and which delivers hot water at a predetermined temperature; to said mixing station via an outlet the cooling chamber including at least one inlet and at least one outlet wherein said cooling chamber receives cold water from said water supply and wherein said cooling chamber receives cold water from said boiler for delivery to said mixing station, wherein the temperature of hot water in said cooling chamber which is delivered to said mixing station is tempered by cold water.

[0020] In one broad form, the present invention comprises:

[0021] a brewing machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

[0022] means for controlling a supply of water to at least one boiler having at least one inlet and at least one outlet,

[0023] a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of said water supply,

[0024] a heat exchanger associated with said at least one boiler and in fluid communication with said cool chamber and which receives water from said water supply, wherein said at least one outlet to said cooling chamber communicates with and delivers heated water to a coffee mixing chamber and said at least one outlet to said at least one boiler communicates with a hot water valve and at least one other outlet to said at least one boiler communicates with a steam valve;

[0025] the machine further including a supply of coffee which is delivered to said coffee mixing chamber which terminates in a coffee delivery outlet.

[0026] In another broad form the present invention comprises:

[0027] a machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

[0028] means for controlling a supply of water to a boiler having at least one inlet and at least one outlet, a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of part of said water supply, wherein said cooling chamber delivers heated water to a mixing station at which said beverages are prepared;

[0029] a heat exchanger associated with said boiler and in communication with said cooling chamber and which delivers water to said cooling chamber and which receives water from said water supply;

[0030] wherein said at least one outlet to said cooling chamber communicates with and delivers heated water to a coffee mixing chamber and said at least one outlet to said boiler communicates with a hot water valve and at least one other outlet to said boiler communicates with and delivers steam to a steam valve;

[0031] the machine further including a supply of coffee which is delivered to said coffee mixing chamber which terminates in a coffee delivery outlet.

[0032] In another broad form the present invention comprises:

[0033] a machine for dispensing hot liquid beverages such as coffee, wherein the machine includes means for controlling a supply of water to a boiler having at least one inlet and at least one outlet, a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of said water supply, a heat exchanger associated with said boiler and in communication with said cooling chamber and which receives water from said water supply; wherein said at least one outlet to said cooling chamber communicates with a coffee mixing chamber, wherein the cooling chamber regulates the temperature of water discharged therefrom for use in the said coffee mixing chamber.

[0034] In another broad form the present invention comprises:

[0035] A hot liquid beverage dispensing machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

[0036] a water supply;

[0037] a boiler which receives said water supply and having at least one inlet and at least one outlet, a cooling chamber including at least one inlet and at least one outlet and which is in fluid communication with said water supply and which receives at least a portion of said water supply,

[0038] a heat exchanger associated with said boiler and in communication with said cooling chamber and which receives water from said water supply;

[0039] wherein, said at least one outlet to said cooling chamber communicates with a coffee mixing chamber;

[0040] the machine further including a supply of coffee which is delivered to said coffee mixing chamber which terminates in a coffee delivery outlet; wherein, said coffee is water soluble and instant.

[0041] Preferably, the heat exchanger is incorporated in the boiler and communicates with said cooling chamber via fluid delivery lines. Preferably, the cooling chamber is located intermediate the water supply and the heat exchanger is incorporated in the boiler. Preferably, one of the inlets to said cooling chamber delivers water preferably

cooled to around 85 deg C. to 93 deg C. and which is discharged via an outlet from said cooling chamber to said coffee mixing chamber. The coffee mixing chamber preferably receives soluble coffee stored in a coffee reservoir contained in the machine.

[0042] In another broad form the present invention comprises; a beverage dispensing machine for delivering hot liquid beverages such as coffee wherein the machine is capable of delivery of soluble (instant) coffee and wherein said machine includes a boiler, a station and cooling chamber which controls the temperature at which the coffee is dispensed.

[0043] In another broad form the present invention comprises:

[0044] a cooling chamber for use in a machine for dispensing hot beverages, the machine including;

[0045] an inlet for receiving a supply of water; at least one boiler which receives said water supply and which is/are capable of delivering hot water and/or steam;

[0046] a mixing station which receives hot water and a dose of a beverage for mixing with said hot water and subsequent delivery of said beverage from said mixing chamber;

[0047] wherein said cooling chamber receives at least part said water supply and delivers hot water to said mixing chamber via an outlet at a predetermined maximum temperature;

[0048] the cooling chamber including at least one inlet and at least one outlet wherein said cooling chamber receives cold water from said water supply and wherein said cooling chamber receives hot water from said at least one boiler for delivery to said mixing chamber, wherein the temperature of hot water in said cooling chamber which is delivered to said mixing station is controlled.

[0049] Preferably there is one boiler in said machine for producing hot water and steam and said cooling chamber is located intermediate said boiler and said mixing chamber.

[0050] The cooling chamber receives cold water via a pipe which enters said chamber and returns to said boiler. Preferably the pipe is arranged in said cooling chamber to provide a predetermined pipe surface area in contact with boiled water delivered from said boiler into said chamber. The boiler includes a heat exchanger which receives cold water from said water supply via said cooling chamber and which delivers heated water from said exchanger to said cooling chamber for delivery to said mixing chamber.

[0051] The cooling chamber further includes a heating element which increases the temperature of water for delivery to said mixing chamber from said cooling chamber when the temperature falls below a predetermined minimum delivery temperature. The cooling chamber further includes a thermostat which isolates said heating element when water in said cooling chamber reaches a predetermined maximum value. The cooling chamber delivers water preferably cooled to around 85 deg C. to 93 deg C. via an outlet from said cooling chamber to the coffee mixing chamber.

[0052] Preferably, the pipe is coiled inside the cooling chamber to maximise surface area contact with hot water in said cooling chamber.

DETAILED DESCRIPTION

[0053] The present invention will now be described in more detail according to preferred but non limiting embodiment and with reference to the accompanying illustration wherein;

[0054] **FIG. 1** shows a perspective view of a dispensing machine (with some features abbreviated for clarity) according to a preferred embodiment of the invention.

[0055] **FIG. 2**: shows a perspective exterior view of a machine according to a preferred embodiment of the invention.

[0056] Referring to **FIG. 1** there is shown an abbreviated perspective view of a hot liquid beverage dispenser **1** according to a preferred embodiment of the invention. Dispenser **1** is typical of the known dispensers to the extent that it comprises a water supply, a means for heating, means for brewing a beverage such as coffee and a discharge for the beverage. Known dispensing machines such as vending machines include a boiler, a supply of water to the boiler, a beverage for mixing with hot water generated by the boiler and a dispensing station. Known expresso machines normally include at least two boilers, a steam chamber which allows pressurised steam to infuse over and through coffee beans and a dispensing station for dispensing the beverage. The present invention provides an alternative beverage dispensing machine which is capable of serving coffee made from soluble (instant) coffee and which includes a cooling chamber which controls the temperature at which beverages are dispensed. The machine allows dispensing of beverages including those which would normally be dispensed through an expresso machine with no discernable difference.

[0057] According to the embodiment shown, beverage dispenser **1** includes a water supply inlet **2** controlled by a pressure pump **3** driven by motor **4**. Pressure pump **3** and motor **4** may be housed inside the machine or located externally. Pressurised water is delivered to a variety of locations in the machine. Pressure pump **3** has an outlet **5** which feeds boiler fill solenoid **6**.

[0058] Solenoid **6** controls overfilling of steam and water-boiler **7**. In the event of overpressure, overpressure valve **11** allows release of excess water which is discharged via overflow line **8**. Feed line **9** delivers water to cooling chamber **10** and includes therein a water overpressure valve **11**. Feed line **9** enters cooling chamber **10** via entry **12** forming return loop **13** which continuously delivers cold water to moderate the temperature of the water in cooling chamber **10**. Loop **13** which is preferably a copper pipe, may be coiled to increase the surface of area of contact between the pipe and water in cooling chamber **10**. The greater the surface area exposed to heated water in cooling chamber **10** the greater the heat exchange between supply water in loop **13** and the heated water in cooling chamber **10**. Loop **13** exits cooling chamber **10** via exit **14** whereupon feed line **15** supplies heat exchanger **16** located in boiler **7**. Water which is heated in heat exchanger **16** by heat exchange between heated water in boiler **7** which itself is heated by heating element **17** is delivered via feed line **18** to cooling chamber

10 whereupon contact cooler water in loop **13** reduces the temperature of the water which eventually exits cooling chamber **10** via exit **19**.

[**0059**] Boiler **7** receives cold water via feed line **20** with the entry of the water regulated by solenoid **6** to avoid overfilling. The water level in boiler **7** is controlled by means of boiler water level probe **21** which extends from the top of boiler **7** to a predetermined elevation according to the maximum depth of water required in the boiler. Steam generated within boiler **7** through heating with element **17** is controlled by overpressure safety valve **22**. Boiler **7** also includes a pressurestat **23** which controls pressure in boiler **7**. Machine **1** further comprises a receptacle or coffee canister **24** which according to one embodiment holds instant coffee in granulated form. Canister **24** terminates in outlet **25** which delivers coffee to coffee mixing chamber **26** when coffee in canister **24** is urged towards outlet **25** by rotating spiral **27** driven by motor **28**. Feed action of spiral **27** is regulated by an operator actuating a control panel on the machine.

[**0060**] In use, the machine operates in the following manner. Once boiler **7** is filled with water from feed line **20** to a predetermined maximum level, it is then heated by heating element **17**. Supply water circulates through lines **9** then **15** via return loop **13** and then through heat exchanger **16** in boiler **7**. Water heated in boiler **7** eventually produces steam within the boiler but this is regulated by safety valve **22** to ensure tolerable pressures are not exceeded. Water level probe **21** sets a maximum water level so at all times there is heated water and steam available for use from boiler **7**. The heating is tempered by U shaped heat exchanger **16** which receives cool water via feed line **15** and delivers heated water back to cooling chamber **10**.

[**0061**] Water from cooling chamber **10** is used in the brewing of the coffee to be dispensed from the machine so the temperature of this water must be at an acceptable level which is preferably around 87-93 deg C.

[**0062**] To assist in regulating the temperature of the water to be discharged from cooling chamber **10**, a dry heating element **29** is attached to boost the temperature in cooling chamber **10** should it fall below a predetermined minimum level acceptable for serving beverages. Supplementary heating by element **29** will be of assistance in periods of high output where the demand on the machine could cause reduction in the ability to maintain a temperature around the optimal 97 deg C.

[**0063**] In the preparation of coffee, the operator requires a supply of water which is directly accessible to the operator, a supply of water for mixing with coffee and a supply of steam. A water and steam supply originate from boiler **7**, but in the case of the water for mixing with coffee drawn from canister **24**, this is drawn from cooling chamber **10** as it is there that the water temperature is maintained within a predetermined temperature range which might be in the region 87 deg C. to 100 deg C. Ideally, this temperature will be closer to 97 deg C. but there may be fluctuation during times of high or low demand.

[**0064**] The supply of steam direct to the operator is delivered via outlet **30** (abbreviated for clarity) which communicates via valve **34** which controls flow of steam via outlet **35**.

[**0065**] The supply of hot water direct to the operator is delivered via outlet **33** which communicates with hot valve **31** which controls flow of hot water via outlet **32**. Water for mixing with coffee is drawn from cooling chamber **10** via hot water dosing solenoid **36** and is delivered to mixing chamber **26**. Mixing chamber **26** is in communication with a canister **24** of coffee which according to the preferred embodiment holds instant or soluble coffee for delivery via outlet **25** prior to mixing in mixing chamber **26**. Coffee in canister **24** is advanced towards mixing chamber **26** by operation of ingredient motor **28** which drives helical screw **27**. Water from solenoid **36** is controlled by a water control flow valve **40** and then is introduced into mixing chamber **26** in a circular motion which promotes mixing with the soluble coffee delivered from canister **24**. Mixed coffee is then delivered to cup **37** via delivery outlet **38**. The operator determines the mix of the coffee according to prescription. Thus the machine can prepare any form of coffee such as expresso, cappucino, short black etc. The embodiment shown has one mixing chamber but it will be appreciated by those skilled in the art, that multiple coffee delivery stations may be included in the one machine allowing for preparation of multiple beverages concurrently. For multiple beverage preparation, it will be necessary to include additional spouts or alternatively, additional dosing solenoids in parallel or series dosing solenoid **36**. Where the machine has multiple filling stations, this would necessitate additional delivery spouts **38** and may require additional take offs from boiler **7** and from cooling chamber **10**.

[**0066**] According to a preferred embodiment, the machine operation is controlled by a control panel.

[**0067**] One of the advantages of the machine is that there is no wastage of spent grounds as in the prior art machines. Also, coffee way be made at the touch of a button and instant or soluble coffee can be used. All soluble coffee is used up. Another advantage of the machine is the potential use of one boiler to supply both the steam and hot water and within a minimum foot print area. Also, beverages may be prepared in a reduced time in comparison to conventional machines. For example, the machine of the present invention may produce coffee in 10 secs using instant coffee without compromise to the quality of beverages which would be expected from the prior art machines. With the dispensing machine herein described according to its various embodiments, the proprietor can achieve high volume, high-speed coffee that tastes as good as the small, specialist prepared product, and costs less to produce. By using soluble coffee, the machine according to the invention produces consistent coffee quality each serve. Up to four different blends of coffee can be sold at the one time through four individual hoppers. The machine is capable of manufacture of all common milk based coffees and espresso. Excellent flavour consistently as good or better than traditional Roast and Ground coffee machines coffee, may be produced in four seconds. Professional quality coffee beverages are achieved without professionally trained operator costs. Minimal maintenance coffee can be produced whilst the operator is preparing other products for the customer.

[**0068**] As distinct from the machine according to the invention, roast and ground coffee machines require ongoing maintenance and calibration. The ground based machines require substantial cleaning because of the grounds and modus operandi and the coffee grinder requires periodic

grinder blade sharpening and ongoing calibration by trained operators. The ground machines are also slow compared to the machine according to the invention and, given the maintenance and trained operator requirements, suffer from inconsistent product and high operating costs. The machine according to the invention, produces the coffee component for an espresso or milk coffee in four seconds as against twenty to forty seconds in a traditional roast and ground espresso machine. Further, coffee does not have to be ground, tampered with or otherwise prepared. Therefore, waiting time is substantially reduced. In twenty-seven months of testing the invention in a number of retail outlets in Australia, not one person noticed that their coffee had been produced using soluble rather than ground coffee. In each retail outlet where the machine was tested, they are now permanent and coffee sales have continued to grow. The machine has the appearance of a conventional roast and ground espresso machine. Untrained personnel can produce good quality coffee quickly and efficiently.

[0069] The cooling chamber which controls the temperature of delivery of the beverage in addition to its adaption to the dispensing machines of the type described herein in detail may be adapted to known hot beverage dispensing machines of the vending machine type. It may also be adapted for expresso type machines and vending machines.

[0070] Machine **1** further comprises a steam gauge **41** and a water temperature gauge **42** to monitor steam pressure in the boiler **7**. A pump may be installed to maintain pressure no less than a predetermined minimum.

[0071] **FIG. 2** shows a perspective exterior view of a beverage dispensing machine **43** according to a preferred embodiment of the invention. Machine **43** is capable of dispensing coffee beverages such as long black, short black, milk coffee, late and cappuccino and includes a single boiler (not shown) which includes a heat exchanger inside the boiler. Machine **43** has an outer casing **44** which contains the boiler **7**, heat exchanger **16** and cooling chamber **10** (see **FIG. 1**) all of which are concealed from view. Hot water valve **45** provides hot water via wand **47** upon demand by an operator and steam valve **46** provides steam via wand **48** upon demand by an operator. A second steam supply valve **49** delivers steam via wand **50** upon demand by an operator. Cups (not shown) are placed on tray **51** in alignment with delivery spouts **52-55** allowing for multiple beverages to be prepared at the same time. Delivery of beverages is controlled by control panels **56-59** which control respectively delivery spouts **52-55**. Separate buttons on each control panel will allow according to the embodiment shown in **FIG. 2** dispensing of such beverages as short black, long black, cappucino, hot chocolate, hot water, latte or milk coffee.

[0072] Absent from the machine is a closed pressurised steam system as in the prior art machines which allows steam infusion of coffee grounds. That system usually results in wastage of coffee grounds whereas the arrangements for the machine described above eliminate wastage of the beverage.

[0073] It will be recognised by persons skilled in the art that numerous variations and modifications may be made to the invention broadly described herein without departing from the overall spirit and scope of the invention.

The claims defining the invention are as follows:

1 A brewing machine for delivering hot beverages; the machine including;

an inlet for receiving a supply of water; at least one boiler which receives water from said water supply and which is/are capable of delivering hot water and/or steam;

a mixing station which receives hot water and a predetermined dose of a beverage such as coffee for mixing said hot water and subsequent delivery of said beverage from said machine; a cooling chamber which receives part said water supply and which delivers hot water at a predetermined maximum temperature; to said mixing station via an outlet; the cooling chamber including at least one inlet and at least one outlet wherein said cooling chamber receives cold water from said water supply and wherein said cooling chamber receives hot water from said boiler for delivery to said mixing station, wherein the temperature of hot water from said cooling chamber which is delivered to said mixing station is tempered by cold water.

2 A brewing machine according to claim 1 wherein there is one boiler for producing hot water and steam and said cooling chamber is intermediate said boiler and said mixing station.

3 A brewing machine according to claim 2 wherein said cooling chamber receives cold water via a pipe which enters said chamber and returns to said boiler.

4 A brewing machine according to claim 3 wherein said pipe is arranged in said cooling chamber to provide a predetermined pipe surface area in contact with boiled water delivered from said boiler into said chamber.

5 A brewing machine according to claim 4 wherein said boiler includes a heat exchanger which receives cold water from said water supply via said cooling chamber and which delivers heated water from said exchanger to said cooling chamber for delivery to said mixing station.

6 A brewing machine according to claim 5 wherein said station comprises a chamber having an opening which receives a dose of soluble coffee and said hot water from said cooling chamber.

7 A machine according to claim 6 wherein the cooling chamber includes a supplementary heating element for maintaining the temperature of water delivered from said cooling chamber at a predetermined minimum temperature.

8 A machine according to claim 7 wherein said cooling chamber further includes a thermostat which isolates said heating element when water in said cooling chamber reaches a predetermined maximum value.

9 A machine according to claim 8 wherein the temperature of water delivered from said cooling chamber via an outlet from said cooling chamber to said coffee mixing chamber is maintained within the range of 85 deg C. to 93 deg C.

10 A brewing machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

a boiler having at least one inlet and at least one outlet,

a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of said water supply,

wherein said at least one outlet to said cooling chamber communicates with and delivers heated water to a

beverage mixing station and said at least one outlet from said boiler communicates with a hot water valve and at least one other outlet to said boiler communicates with a steam valve;

the machine further including a supply of beverage which is delivered to said mixing station and which terminates in a beverage delivery outlet.

11 A brewing machine according to claim 10 wherein said boiler further comprises a heat exchanger associated with said boiler and in fluid communication with said cooling chamber and which receives water from said water supply via said cooling chamber,

12 A machine according to claim 11 wherein, said the beverage is water soluble coffee.

13 A machine according to claim 12 wherein the heat exchanger receives cold water from said water supply via the cooling chamber.

14 A machine according to claim 13 wherein, when water from said water supply is delivered from said cooling chamber to said heat exchanger, the heat exchanger delivers heated water to said cooling chamber.

15 A machine according to claim 14 wherein, the heat exchanger is located inside the boiler.

16 A machine according to claim 15 wherein, said cooling chamber delivers water to said mixing station at a predetermined temperature.

17 A machine according to claim 16 wherein the temperature of water delivered from said cooling chamber falls within the range of 85 deg C. to 93 deg C. via an outlet from said cooling chamber to said coffee mixing chamber.

18 A machine according to claim 17 wherein; the coffee mixing station comprises a chamber which receives soluble coffee stored in a coffee reservoir adjacent said mixing chamber.

19 A machine according to claim 9 or **18** wherein said boiler includes a first outlet which delivers hot water via a control valve to at least one hot water delivery nozzle.

20 A machine according to claim 10 wherein said boiler includes a second outlet which delivers steam via a steam control valve to at least one steam delivery nozzle.

21 A machine according to claim 20 wherein the cooling chamber includes a supplementary heating element for maintaining the temperature of water delivered from said cooling chamber at a predetermined temperature.

22 A machine according to claim 21 wherein, said water supply is delivered under pressure generated by a delivery pump

23 A machine according to claim 21 wherein the water supply line includes an overflow which operates in the event of over pressure in the supply line.

24 A machine according to claim 23 wherein said coffee reservoir includes means to advance soluble coffee to said coffee mixing chamber upon demand by an operator.

25 A machine according to claim 24 wherein a solenoid valve is located intermediate said cooling chamber and said control valve for delivery of hot water to said coffee mixing chamber.

26 A machine according to claim 25 wherein a solenoid valve is located intermediate said boiler and said control valve for delivery of hot water to said hot water nozzle.

27 A machine according to claim 26 wherein a second solenoid valve is located intermediate said boiler and said control valve for delivery of steam to said steam delivery nozzle.

28 A machine according to claim 27 wherein said water supply is circulated through said machine by an electric motor.

29 A machine according to claim 28 wherein a heating element is housed in the boiler for heating said water delivered by said water supply.

30 A machine according to claim 29 wherein; said boiler includes a relief valve for release of steam in the event of over pressure.

31 A machine according to claim 30 further including a control panel for setting machine operations.

32 A machine according to claim 31 wherein the cooling chamber includes a thermostat

33 A beverage dispensing machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

a boiler having an inlet which receives a supply of water;

a cooling chamber including at least one inlet in communication with said water supply and at least one outlet and which is in communication with a heat exchanger located inside said boiler;

wherein one outlet from said cooling chamber communicates with and delivers heated water to a coffee mixing chamber; and

wherein one outlet to said boiler communicates with a hot water valve and at least one other outlet from said boiler communicates with and delivers steam to a steam valve;

the machine further including a supply of soluble coffee which is delivered to said coffee mixing chamber which terminates in a coffee delivery outlet.

34 A cooling chamber for use in a machine for dispensing hot beverages, the machine including;

and inlet for receiving a supply of water, at least one boiler which receives said water supply and which is/are capable of delivering hot water and/or steam;

a mixing station which receives hot water and a dose of a beverage for mixing with said hot water and subsequent delivery of said beverage from said mixing chamber; wherein said cooling chamber receives at least part of said water supply and delivers hot water to said mixing chamber via an outlet at a predetermined maximum temperature; the cooling chamber including at least one inlet and at least one outlet wherein said cooling chamber receives cold water from said water supply and wherein said cooling chamber receives hot water from said at least one boiler for delivery to said chamber, wherein the temperature of hot water in said cooling chamber which is delivered to said mixing station is controlled.

35 A cooling chamber according to claim 34 wherein there is one boiler in said machine for producing hot water and steam and said cooling chamber is located intermediate said boiler and said mixing chamber.

36 A cooling chamber according to claim 35 wherein said cooling chamber receives cold water via a pipe which enters said chamber and returns to said boiler.

37 A cooling chamber according to claim 36 wherein said pipe is arranged in said cooling chamber to provide a predetermined pipe surface area in contact with boiled water delivered from said boiler into said chamber.

38 A cooling chamber according to claim 37 wherein said boiler includes a heat exchanger which receives cold water from said water supply via said cooling chamber and which delivers heated water from said exchanger to said cooling chamber for delivery to said mixing chamber.

39 A cooling chamber according to claim 38 wherein said cooling chamber further includes a heating element which increases the temperature of water for delivery to said mixing chamber from said cooling chamber when the temperature falls below a predetermined minimum delivery temperature.

40 A cooling chamber according to claim 39 wherein said cooling chamber further includes a thermostat which isolates said heating element when water in said cooling chamber reaches a predetermined maximum value.

41 A cooling chamber according to claim 40 wherein, said cooling chamber delivers water preferably cooled to around 85 deg C. to 93 deg C. via an outlet from said cooling chamber to said coffee mixing chamber.

42 A cooling chamber according to claim 41 wherein said pipe is coiled inside said cooling chamber to maximise surface area contact with hot water in said cooling chamber.

43 A machine for dispensing hot liquid beverages such as coffee, wherein the machine includes means for controlling a supply of water to a boiler having at least one inlet and at least one outlet, a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of said water supply, a heat exchanger associated with said boiler and in communication with said cooling chamber and which receives water from said water supply; wherein said at least one outlet to said cooling chamber communicates with a coffee mixing chamber and wherein the cooling chamber regulates the temperature of water discharged from said cooling chamber for use in said coffee mixing chamber.

44 A machine for delivering hot beverages such as coffee wherein the machine is capable of delivery of soluble (instant) coffee; and wherein the machine includes a boiler and a cooling chamber for delivery of water for mixing with said soluble coffee; wherein said cooling chamber maintains the temperature of water delivered to said mixing chamber within a predetermined temperature range.

45 A machine according to claim 44 wherein the boiler further comprises a heat exchanger which receives cold water from said water supply and returns hot water to said cooling chamber from said boiler for delivery to a mixing chamber in which said hot water mixed with said soluble coffee.

46 A machine for the preparation of servings of one or multiple hot liquid beverages such as coffee, wherein the machine includes;

means for controlling a supply of water to a boiler having at least one inlet and at least one outlet; a cooling chamber including at least one inlet and at least one outlet and which is in communication with said water supply and which receives at least a portion of part of said water supply;

a heat exchanger associated with said boiler and in communication with said cooling chamber and which receives water from said water supply and delivers water to said cooling chamber;

wherein said at least one outlet to said cooling chamber communicates with and delivers heated water to a coffee mixing chamber and said at least one outlet to said boiler communicates with a hot water valve and at least one other outlet to said boiler communicates with and delivers steam to a steam valve;

the machine further including a supply of soluble coffee which is delivered to said coffee mixing chamber which terminates in a coffee delivery outlet.

47 A heat exchanger for use with a brewing machine for delivering hot beverages; the machine including a boiler, a mixing station and a cooling chamber, wherein said heat exchanger is located in said boiler and receives cold water from a water supply via said cooling chamber and which delivers heated water from said exchanger to said cooling chamber for delivery to said mixing station.

48 A heat exchanger according to claim 47 wherein the temperature of said water delivered to said cooling chamber from said heat exchanger in said boiler to said mixing station is controlled by said cooling chamber.

49 A heat exchanger according to claim 48 wherein said cooling chamber includes a thermostat which maintains the temperature of water delivered from said cooling chamber at a predetermined maximum and a heating element which maintains the temperature of said water at a predetermined minimum.

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