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(71) Applicant(s):
Kenwood Limited
(Incorporated in the United Kingdom)
New Lane, Havant, Hants, PO9 2NH,
United Kingdom

(72) Inventor(s):
Roland Eden

(74) Agent and/or Address for Service:
QED Intellectual Property Limited
Harrow Exchange, 2 Gayton Road,
HARROW, Middlesex, HA1 2XU,
United Kingdom

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(56) Documents Cited:

US 6405637 B1	US 6374725 B1
US 6224755 B1	US 5647055 A

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UK CL (Edition X) **F2V**
INT CL **A47J, F16K**
Other: **Online: WPI, EPODOC**

(54) Abstract Title: **Valve for coffee maker**

(57) A coffee maker 10 comprises a water tank 20, a heater device 40, a brewing station 50 and a jug or carafe 60 positioned to receive coffee brewed at the station 50. The water tank 20 and the brewing station 50 are interconnected by a water pipe 70, part of which is heated by the heater device 40. The tank 20 is fitted with a flow control valve 30 containing a piston 32 arranged to respond to the head of water in the tank 20 and to heater-induced suction in the pipe 70 by moving within a housing 31 to block or to allow the passage of water from the tank 20 into the pipe 70, to thereby control the flow of water from the tank 20 through the heater 40 to the brewing station 50 so as to ensure that, however much water the tank 20 contains, the heater 40 is able to transfer sufficient heat to water delivered to the brewing station 50 by way of the pipe 70 to provide brewed coffee at a palatable temperature.

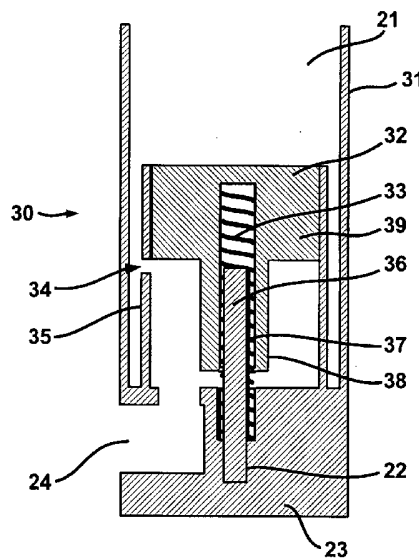


Fig 2

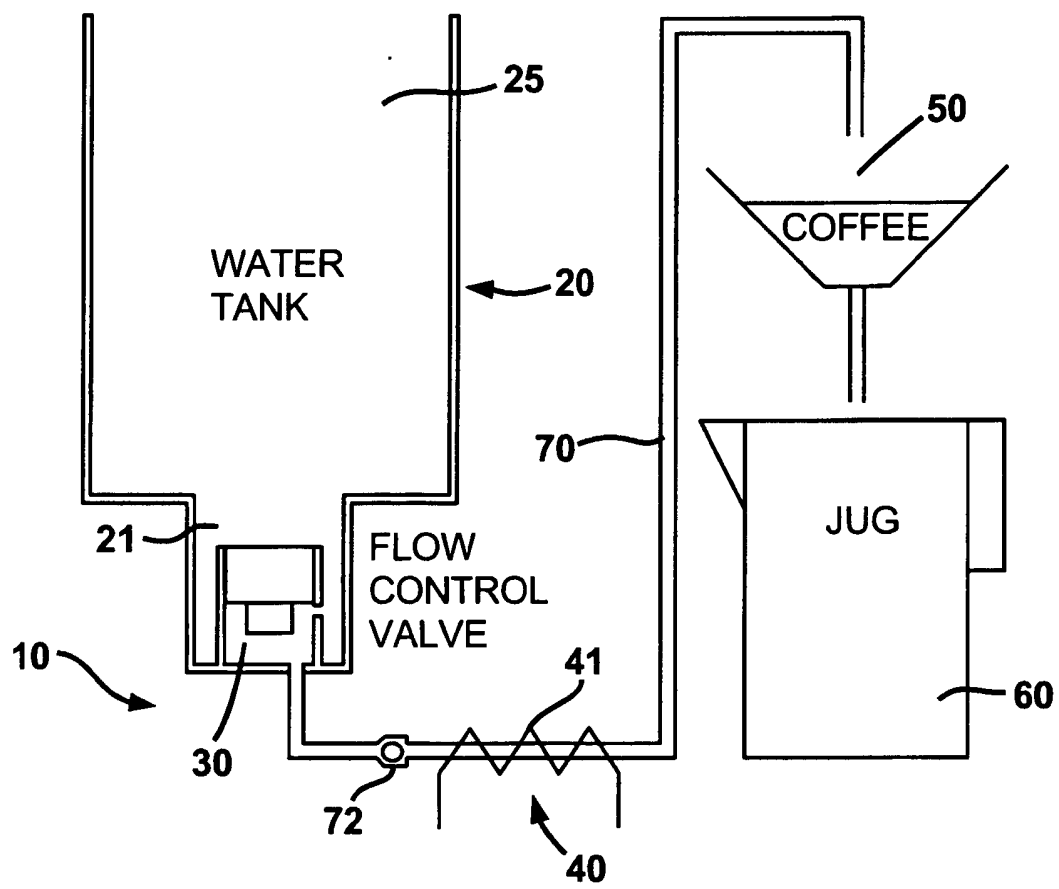


Fig 1

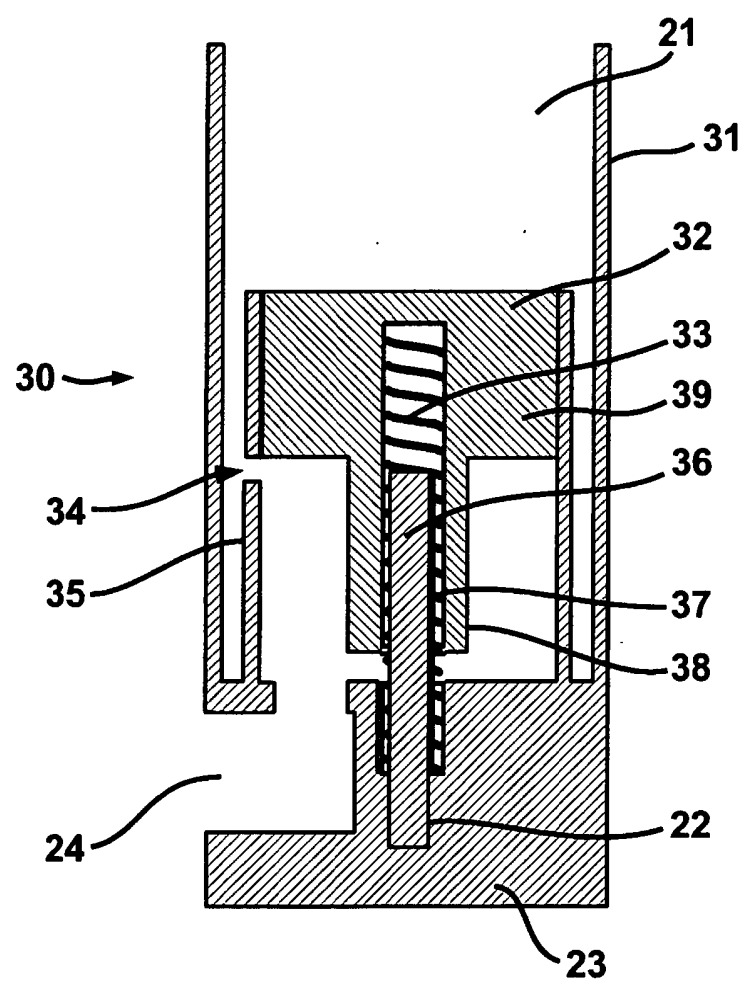


Fig 2

COFFEE MAKER AND VALVE ARRANGEMENTS THEREFOR

This invention relates to coffee makers and it relates more particularly to valve arrangements for controlling a flow of water from a supply tank
5 through a heater to a coffee-brewing station of a coffee maker.

Difficulties are experienced with some such coffee makers in that, particularly when the water tank is full and there is a substantial head of standing water, the water tends to flow into and through the heater too
10 rapidly to be sufficiently heated.

It is an object of the invention to address this difficulty and accordingly there is provided, in or for a coffee maker having a water tank, a heater and a brewing station, a valve arrangement configured to operate in
15 conjunction with heater-induced suction to slow down a flow of water from the tank when the tank is full, but which provides little or no impedance to the water flow as the tank empties. The invention also encompasses a coffee maker incorporating such a valve arrangement.

20 In a preferred embodiment of the invention, the valve arrangement includes a flow control valve mounted in a well at the base of the water tank.

It is further preferred that the flow control valve comprises a housing
25 having an aperture formed in a wall thereof communicating with the tank interior and an outlet from the tank, and a piston resiliently urged toward a first position clear of said aperture; the piston being movable, against

the resilient force, toward a further position in which it blocks said aperture.

In operation of a preferred embodiment of the invention, the action of
5 heating the water creates suction tending, with assistance from the weight of a head of water for the time being held in the tank, to draw water from the water tank outlet.

Further preferably, the arrangement is such that, when the tank is full, the
10 combined effects of the suction and the head of water cause the piston to move toward said further position, thereby closing said aperture and temporarily preventing further flow of water out of the tank.

A further preferred embodiment of the invention incorporates a check
15 valve configured to block a flow of water into the heater as the water is heated, thereby removing the suction from the tank outlet and allowing the piston to return, under said resilient force, to the first position to re-open the aperture.

20 It is still further preferred that the check valve is configured to re-open once the heated water has been delivered to the brewing station, thus permitting the suction again to combine with the weight of the head of water to overcome the resilient force and moving the piston again to said further position to shut off the aperture.

In order that the invention may be clearly understood and readily carried into effect, one embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

- 5 Figure 1 shows, in schematic side elevation and part cross-sectional view, a coffee maker in accordance with one example of the invention; and

Figure 2 shows, on an enlarged scale and in cross-sectional side view, a water valve arrangement for the coffee maker of Figure 1.

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Referring now to the drawings, Figure 1 shows, schematically, a coffee maker 10 comprising a water tank 20 fitted with a flow control valve 30, a heater device 40, a brewing station 50 and a jug or carafe 60 positioned to receive coffee brewed at the station 50. The water tank 20 and the
15 brewing station 50 are interconnected, in known manner, by a water pipe 70, part of which is heated by the heater device 40. The pipe 70 incorporates a check-valve 72, which performs a significant function in relation to the operation of this embodiment of the invention, as will be described later.

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Coffee makers are well known products, and those skilled in the art will be aware that the various components described thus far may take many different forms and be provided in many different configurations. For example, it is well known that the heater device 40 may comprise an
25 electrically-driven element 41 of any convenient form, though conveniently it comprises a spirally wound heating element closely coupled to the pipe 70 to promote excellent thermal contact between the

heater device 40 and the pipe 70. Moreover, the brewing station may or may not incorporate an arrangement for changing the strength (or aroma) of the brew. It is also known to provide a valve arrangement at the outlet of the brewing station 50 configured to permit brewed coffee to flow out
5 of the station 50 only when the jug or carafe 60 is properly positioned to receive it.

It will be appreciated that such features, and others like them, are usable if desired in coffee makers according to the invention, but that neither
10 their inclusion, nor their particular form if included, has any special bearing upon the subject invention or its operation.

This invention is concerned with controlling the flow of water from the tank 20 through the heater 40 to the brewing station 50 in such a way as
15 to ensure that, however much water the tank 20 contains, the heater 40 is able to heat it sufficiently prior to its delivery to the brewing station 50.

In the embodiment of the invention now to be described, and as shown in more detail in Figure 2, the flow control valve 30 is mounted in a well 21
20 at the base of the water tank 20, and comprises a housing 31 and a piston 32 which is resiliently urged upwards by a spring 33 and which, depending upon its vertical position, can block or uncover an aperture 34 in an internal wall 35 of the housing 31. The spring 33 is supported on, centred and located by a pin 36 which extends into a bore 37 formed
25 centrally through the shaft 38 and extending up into the head 39 of the piston 32, and which is set in a bore 22 formed in the base 23 of the well 21 of the tank 20.

It is well known that, when the heater device 40 is actuated, the heating action creates suction in the pipe 70, tending to draw water from the outlet 24 of the water tank 20; this action being assisted by the weight of the head of water for the time being held in the tank 20. When the tank is full, the combined effects of the suction and the head of water can cause water to be forced past the heater device 40 at such a rapid rate that the water is unable to draw sufficient heat from the device 40 and thus arrives at the brewing station 50 at a temperature which is too low for the taste of some users.

This embodiment of the invention addresses that problem since, in operation, pressure from the head of water in the tank 20, combined with suction from the heater 40, causes the piston 32 to move downwards, against the force exerted by the spring 33, thus closing the aperture 34 and temporarily preventing further flow of water out of the outlet 24, since the closure of aperture 34 means that there is no communication between the interior 25 of the water tank 20 and the outlet 24. As the water in the pipe 70 is heated, the check valve 72 shuts off, thus removing the suction from the base of the tank 20 and allowing the piston 32 to rise under the influence of spring 33 to uncover the aperture 34, thereby re-establishing communication between the interior 25 of the tank 20 and the tank's outlet 24.

Once the heated water has been delivered to the brewing station 50, the check valve 72 re-opens, permitting the suction again to combine with the

weight of the head of water to overcome the force exerted by spring 33 and moving the piston 32 downwards again to shut off the aperture 34.

These cycles of operation repeat during at least the early stages of the
5 brewing operation, and the oscillations executed by the piston 32 thus regulate the flow of water to and through the heater 40, to ensure that it is adequately heated. As the tank 20 empties, the head of water (and thus its weight) reduces and the piston tends to remain longer, and eventually remains consistently, at its uppermost position, thus allowing unrestricted
10 flow from the tank outlet for the reduced forces of water flow associated with the reduced amount of water in the tank.

Although the invention has been described herein with reference to a specific embodiment, various modifications will be evident to those
15 skilled in the art, and the scope of protection provided hereby is not intended to be limited to the aforesaid specific embodiment.

Claims:

1. In or for a coffee maker having a water tank, a heater and a brewing station, a valve arrangement configured to operate in conjunction
5 with heater-induced suction to slow down a flow of water from the tank when the tank is full, but which provides little or no impedance to the water flow as the tank empties.

2. A valve arrangement according to claim 1, including a flow control
10 valve mounted in a well at the base of the water tank.

3. A valve arrangement according to claim 2, wherein the flow control valve comprises a housing, having an aperture formed in a wall thereof and communicating with the tank interior and with an outlet from
15 the tank, and a piston resiliently urged toward a first position clear of said aperture and permitting communication between the interior of the tank and its outlet; said piston being movable, against the resilient force, toward a further position in which it blocks said aperture and prevents communication between the interior of the tank and said outlet.

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4. A valve arrangement according to claim 3, wherein, in operation, the heating action creates suction tending to draw water from the outlet of the water tank; this action being assisted by the weight of a head of water for the time being held in the tank.

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5. A valve arrangement according to claim 4 wherein, in operation and when the tank is full, the combined effects of the suction and the

head of water cause the piston to move toward said further position, thereby to close said aperture and temporarily prevent further flow of water out of the tank outlet.

- 5 6. A valve arrangement according to claim 5, further comprising a check valve configured to block a flow of water into the heater as the water is heated, thereby removing the suction from the tank outlet and allowing said resilient force to return the piston to the first position to re-open the aperture.

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7. A valve arrangement according to claim 6, wherein the check valve is configured to re-open once the heated water has been delivered to the brewing station, thus permitting the suction again to combine with the weight of the head of water to overcome the resilient force and moving
15 the piston again to said further position to shut off the aperture.

8. A valve arrangement substantially as herein described with reference to and/or as shown in the accompanying drawings.

- 20 9. A coffee maker incorporating a valve arrangement according to any preceding claim.



For Innovation

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Examiner: Vaughan Phillips

Claims searched: 1-9

Date of search: 7 December 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 2 and 9 at least	US 6405637 B1 (HOUSEWARE) see abstract
X	1, 2 and 9 at least	US 6374725 B1 (SIMATELEX) see abstract
X	1, 2 and 9 at least	US 6224755 B1 (BRAUN) see abstract
X	1, 2 and 9 at least	US 5647055 A (BUNN-O-MATIC) see abstract

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

F2V

Worldwide search of patent documents classified in the following areas of the IPC

A47J; F16K

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC