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(71) Applicant: **Femix di Giannelli Stefano**
22077 Olgiate Comasco (CO) (IT)

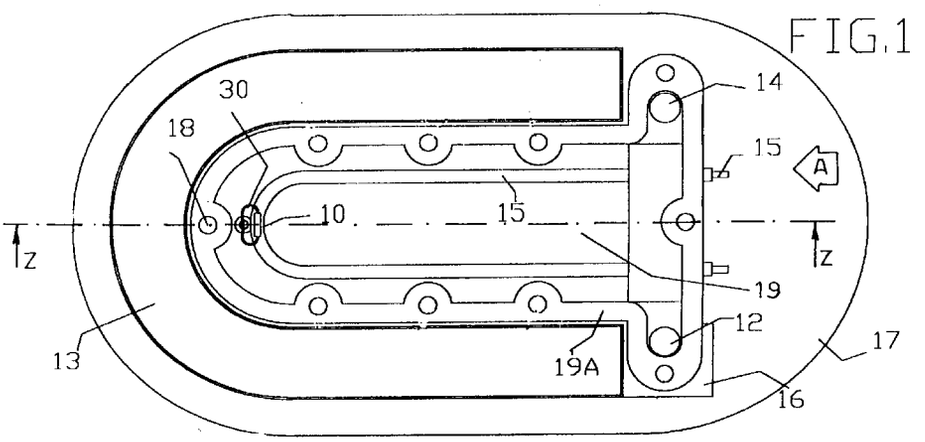
(72) Inventor: **Giannelli, Giuseppe**
22077 Olgiate Comasco (CO) (IT)

(74) Representative: **Luksch, Giorgio, Dr.-Ing. et al**
Ing. A. Giambrocono & C. S.r.l.
Via Rosolino Pilo, 19/b
20129 Milano (IT)

(54) Household electrical appliance for steam generation

(57) A household electrical appliance for steam generation, comprising a boiler (19) into which the water required for steam generation is automatically fed by a micro-pump (21) dipping into a water-containing vessel (13) arranged in U-shape about the boiler (19), in which manner a resistance heating element (15) can operate on a small water mass and hence achieve particularly fast operation of the appliance, even with the use of low electrical power.

FIG.1



EP 0 795 720 A1

Description

This invention relates to a household electrical appliance for steam generation with automatic water feed controlled electronically by a temperature sensor positioned on the resistance heating element.

Household electrical appliances are known using steam generation equipment, such as appliances for ironing, or for cleaning floors, windows etc.

Normally, steam generation equipment for domestic use mainly comprises a boiler consisting of a sealed vessel in which an electrical resistance element is located. The boiler has an aperture, closed by a cap, through which water is fed into the vessel. The electrical resistance element evaporates the water in the vessel until a predetermined boiler pressure is reached. The steam formed in the vessel is withdrawn from it via a solenoid valve operated by an external command, and reaches the user device via a hose. This user device could be a flat-iron provided with an ironing plate comprising holes through which the steam emerges, or could be a lance, from the end of which the steam leaves for cleaning floors, windows, etc.

The said type of steam generator has a negative aspect in the lack of practicality of the fact of having to manually pour the water into the boiler. In particular, if filling is necessary during use, the hot cap of the vessel-boiler must be carefully unscrewed, then after the scalding steam which emerges has died down, the vessel is filled with water.

Although these precautions enable scalding by hand contact with steam or boiling water splashes to be avoided, the said feeding of cold water into a very hot vessel creates thermal shock to the boiler structure, so prejudicing its soundness with time.

It is therefore clear that current systems for directly filling the boiler manually are neither of maximum safety nor rapid in their implementation.

An object of the present invention is to provide a household electrical appliance for steam generation which allows water to be rapidly fed into the boiler without danger to the operator. A further object is to implement said water feed in a gradual manner which prevents thermal shock to the boiler.

These and further objects will be seen to have bean attained on reading the following detailed description of a household electrical appliance for steam generation, characterised by possessing a boiler into which the water required fur steam generation is automatically fed by a micro-pump dipping into a water-containing vessel arranged in U-shape about the boiler, in which manner a resistance heating element can operate on a small water mass and hence achieve particularly fast operation of the appliance, even with the use of low electrical power.

The invention is illustrated by way of non-limiting example on the accompanying drawings, in which Figures 1, 2 and 3 are three conventional views, of which:

Figure 1 is a top view of the appliance without the boiler and vessel covers;

Figure 2 is a front view of the appliance complete with cover, pump and solenoid valve;

Figure 3 is a lateral section through the appliance on the line ZZ, this section specifically showing the sensor on the top of the electrical resistance element, the water levels present in the boiler and vessel, and the manner in which the electric pump draws water from the well of the vessel to feed it to the boiler;

Figure 4 shows the drawing sump used by the pump to draw water from the vessel, the sectional walls being particularly evident;

Figures 5, 6, 7, 8, 9 show the boiler in the standard views indicated;

Figure 10 shows an electronic circuit suitable for controlling the appliance functions.

With reference to said Figure 1, a boiler 19 is housed within a U-shaped vessel 13 provided with a base 17 extending to also accommodate the plan outline of the boiler.

Within the boiler 19 there is provided an electrical resistance hearing element 15 and a temperature sensor 10 for measuring the external temperature of said resistance element 15.

Said boiler is provided with a lower hole 12 acting as a seat for fixing to a micro-pump 21. In the opposite position the boiler is provided with another similar lower hole 14 acting as a seat for fixing to a solenoid valve 31.

Along the edges 19A of the boiler there are provided holes 18 to match holes 36 in a closure cover 20 for the two parts, which is clamped by usual bolts.

The tops of the holes housing said pump 21 and said solenoid valve. 31 are also covered in this manner, thee latter having their bodies external to the boiler, as indicated by Figure 2. This figure shows the position of a hole 32 for steam exit from said solenoid valve 31.

In addition to the boiler 19 and the electrical resistance element 15, the partial section of Figure 3 also shows the particular location of the temperature sensor 10 on top of the typical round structure of the electrical resistance element 15. Said location senses excessive temperature attained by the resistance element 15 when uncovered by reduction in water level, consequent on steam consumption. The electric cables 30 of the temperature sensor 10 emerge via a usual gasket 29.

The electric pump 21 dips into a suitable sump 16, its relationship with the base 17 being shown in Figure 4.

From Figure 3 it can be shown that the water within the boiler 19 has a level 22, whereas the water external to the boiler, ie in the vessel 13, has a different level 23, hence demonstrating their mutual independence.

In the sump region 16 there is a cover 26 which enables the intake region to be inspected following its removal, this being achieved by unscrewing a screw 27 which clamps a gasket 37 to seal the sump.

The sump 16 communicates with the vessel 13. At the top of the pump 21 there is a discharge chamber 25 for the electric pump 21, provided between the cover 20 and an edge of the boiler 19. From Figure 4, which illustrates this, it can therefore be seen how the pump 21 transfers water from the vessel 13 to the boiler 19.

Figure 5 shows the holes 36 in the cover 20, through which the bolts pass for closing the boiler.

Figure 6 is a bottom view of the boiler, showing a hole 33 housing the top of the electric pump 21, a hole 34 housing the top of the solenoid valve 31, and holes 18 in the boiler body which match the holes 36 in the cover 20 to allow the required clamping between the parts by usual bolts.

In Figure 8, of the electrical resistance element 15 there can be seen, in the form of circles, two typical terminals 35 which emerge from the boiler 19 via usual water and steam seals.

Figure 7 is a rear view of the boiler 19.

From Figure 8, which is a front view of the boiler 19, there can be seen a region 33 in which the electric pump 21 is located, and a region 34 in which the solenoid valve 31 is located.

Figure 9, which is a side view of the boiler 19, shows the region 33 accommodating the electric pump 21, and the terminal part of the electrical resistance element 15.

Figure 10 shows an extremely economical, high precision electronic circuit. In this, the reference numeral 10 indicates the sensor positioned on the top of the resistance element ; 41 indicates the electrical change-over switch of the water level measurement circuit and is inserted in the vessel 13; 42 is a trimmer for presetting the circuit; 44 is an operational circuit for controlling the temperature of the electrical resistance element 15 with the aid of the sensor 10; 45 is an operational circuit for controlling the water level 22 with the aid of the sensor 10 positioned on the top of the electrical resistance element 15; 15 is said electrical resitance element for the boiler 19; and 21 is the electric pump. The sensor is of the variable electrical resistance NTC type, and performs two functions: the first is to control the water temperature in the boiler, and the second to control the water level in the boiler. This water level control is indirect. It derives from the fact that an electrical heating resistance element 15 immersed in water never exceeds the temperature of the water mass surrounding it, and the fact that, as soon as the water level falls to uncover a part of said electrical resistance element 15, this uncovered part rapidly increases in temperature. Consequently, by utilizing this phenomenon, this arrangement has been conceived by which not only is the, water level restored as it becomes depleted during the use of the appliance, but the resistance element is prevented from remaining completely uncovered and attaining high temperature, so preventing it undergoing thermal shock. Because of said level control the boiler 19 is never without water, and therefore results in greater appliance reliability.

Claims

1. A household electrical appliance for steam generation, characterised by a boiler (19) into which the water required for steam generation is automatically fed by a micro-pump dipping into a water-containing vessel (13) arranged in U-shape about the boiler, in which manner a resistance heating element (15) can operate on a small water mass and hence achieve particularly fast operation of the appliance, even with the use of law electrical power.

2. A household electrical appliance as claimed in the preceding claim, characterised in that the operation of the pump in transferring water from the vessel (13) to the boiler (19) is controlled by a usual temperature sensor (10) arranged to sense the large difference in the temperature of said electrical resistance element (15) between the condition in which it is completely immersed in water and the condition in which it emerges from the water following the consumption of this latter during use.

3. An appliance as claimed in the preceding claims, characterised in that the pump (21) is located external to the vessel (13) and boiler (19), water intake occurring by the use of a sump (16) which can be inspected (26) from below.

4. An appliance as claimed in the preceding claims, characterised by using to determine the necessary water level an NTC sensor, ie an electrical resistor which varies with varying temperature.

5. An appliance as claimed in the preceding claims, characterized by an electronic circuit which enables the electrical resistance element (15) to be de-activated when the sensor (10) senses the absence of water in the boiler, and enables the indicated functions (Figure 10) to be implemented.

FIG.1

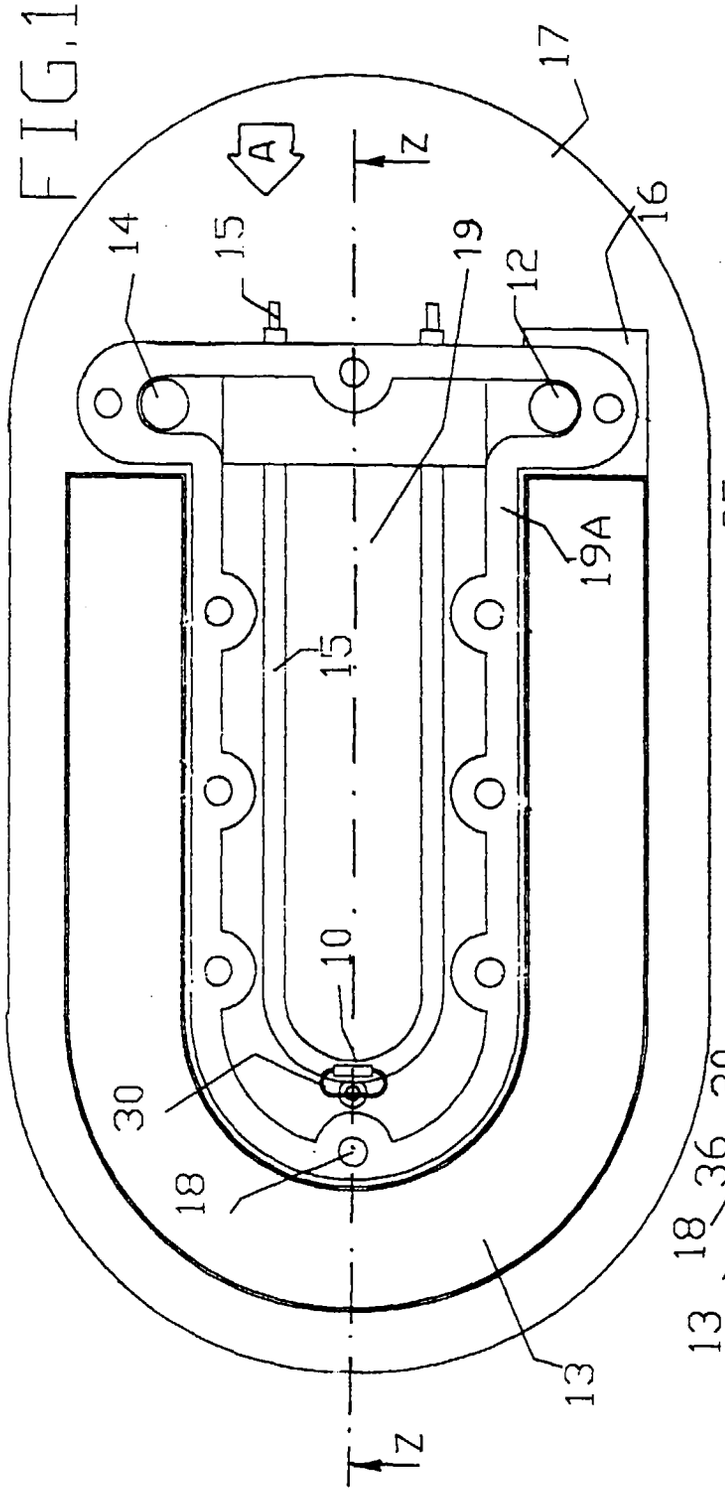

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FIG.3

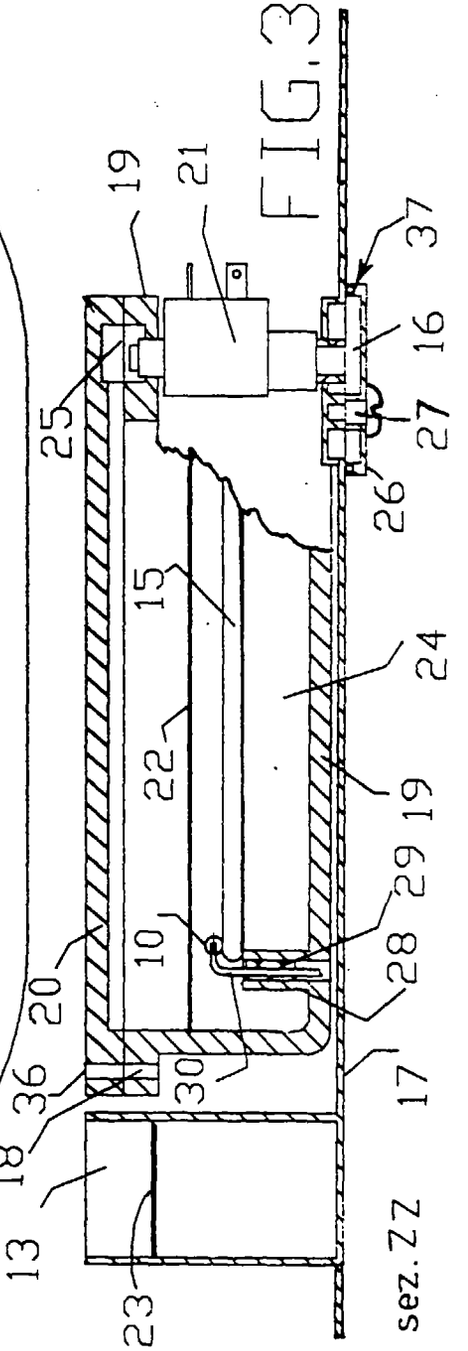
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FIG.2

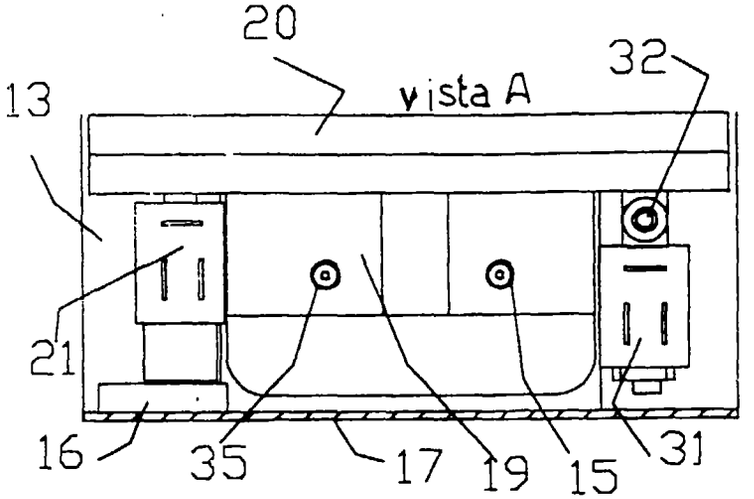
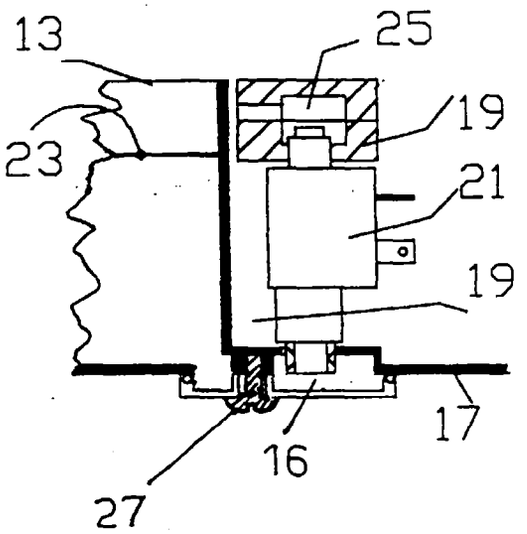


FIG.4



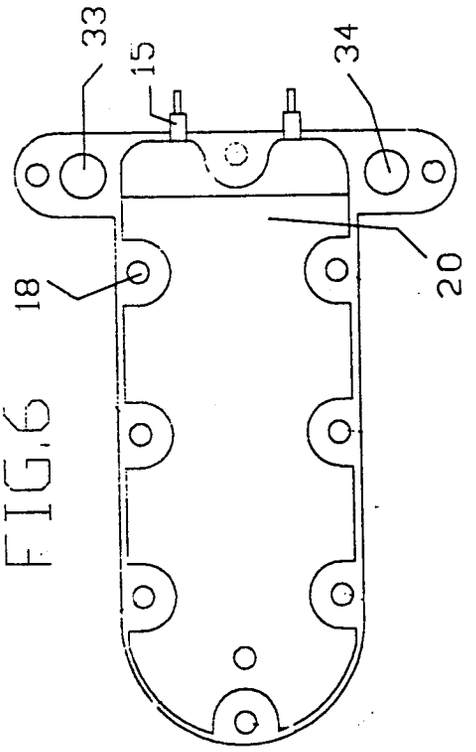


FIG.6

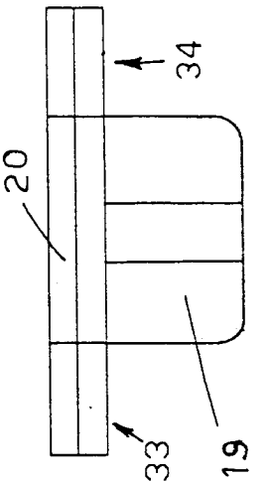


FIG.7

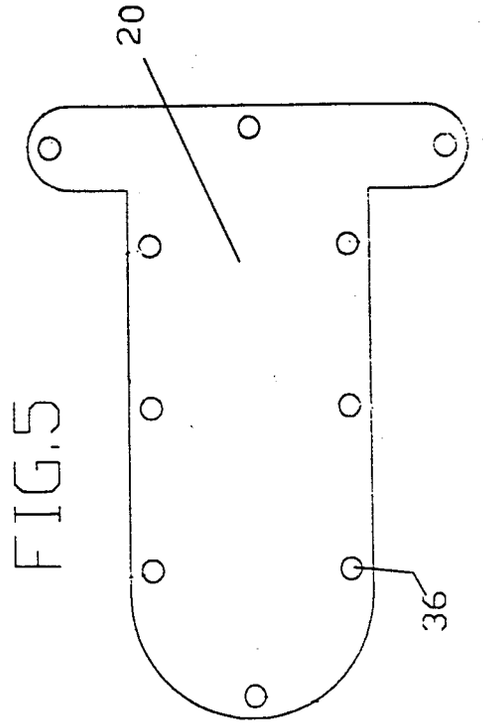


FIG.5

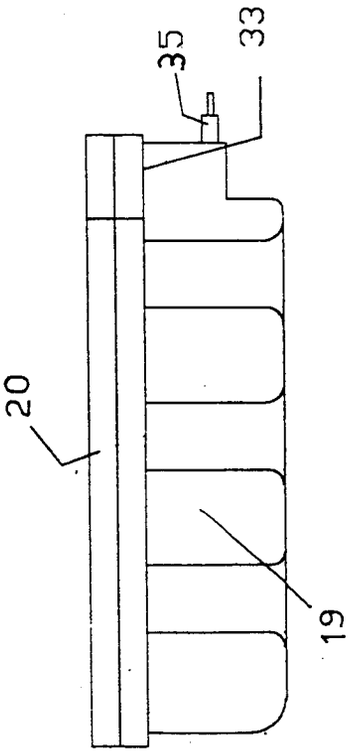


FIG.9

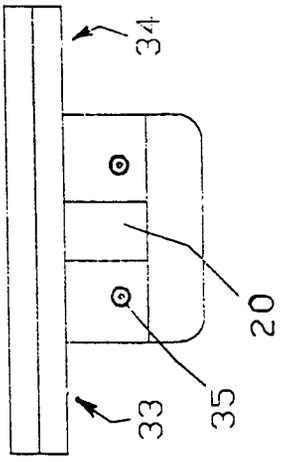


FIG.8

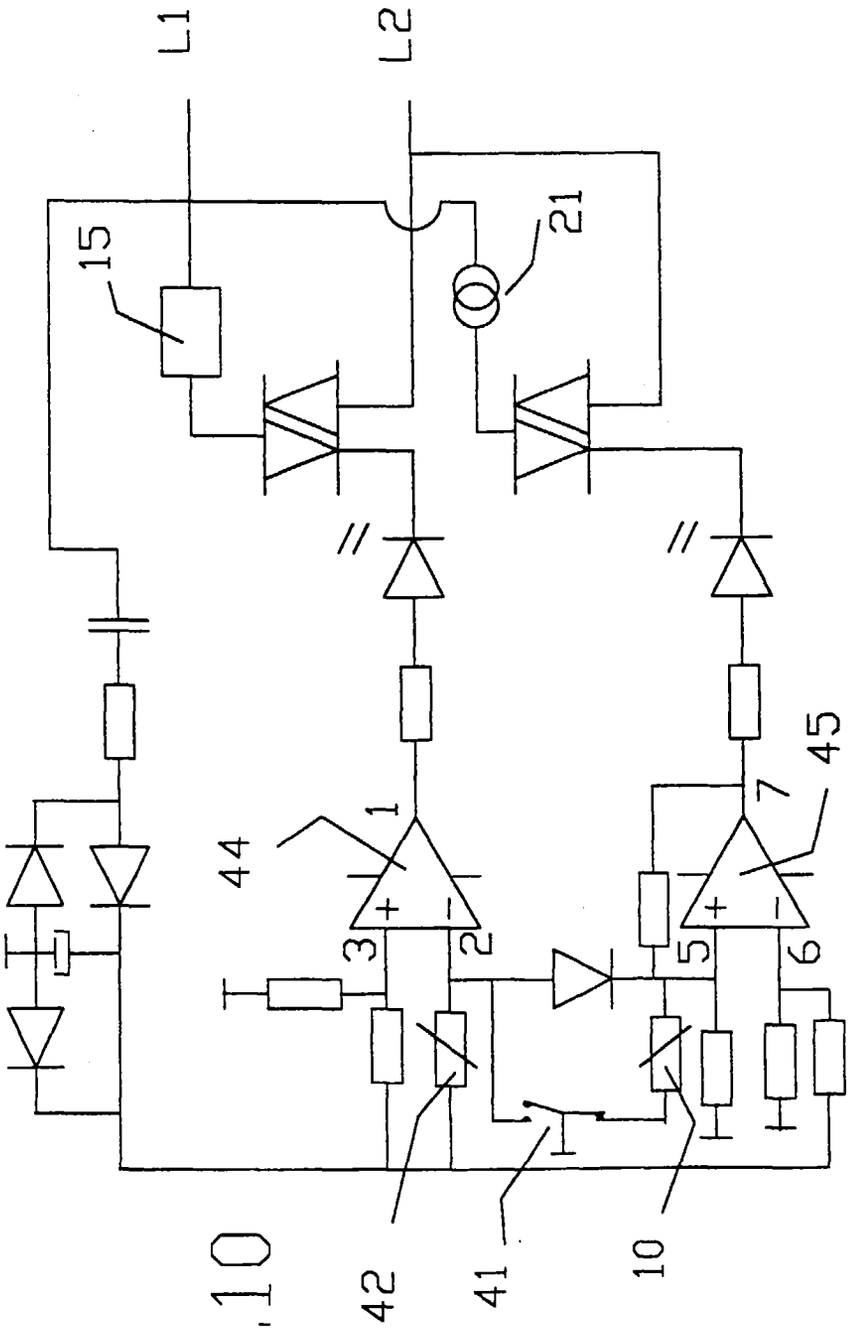


FIG.10

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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 4150

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 89 03496 A (TERMOZETA ELETTRODOMESTICI) * abstract; figures *	1	F22B1/28
A	EP 0 638 767 A (SATIBER) * abstract; figures *	1	
A	DE 37 20 583 A (RIBA) * column 3, last paragraph - column 4, paragraph 2; figures *	1,2,5	
A	DE 43 04 532 A (PLANETA HAUSGERÄTE) * column 2, line 55 - column 4, line 41; figure 1 *	1,2,4	
A	DE 36 27 988 A (TECH MIKROELEKTRONIK FORSCH) 23 April 1987 * column 5, line 34 - column 6, line 14; figures *	1,3,5	
A	US 2 880 300 A (REIMERS) 31 March 1959 * column 4, last paragraph - column 5, paragraph 1; figures *	5	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F22B
D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 June 1997	Van Gheel, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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