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(54) **A fluid-heating device for a washing machine, in particular a dishwasher**

Flüssigkeitserwärmungsvorrichtung für eine Waschmaschine, insbesondere für eine Geschirrspülmaschine

Dispositif de réchauffement de fluides pour machine à laver, en particulier un lave-vaisselle

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(73) Proprietor: **ELBI International S.p.A.**
10129 Torino (IT)

(72) Inventors:
- **Simondi, Marco**
  I-10137, Torino (IT)
- **Da Pont, Paolo**
  I-10123, Torino (IT)

(74) Representative: **Quinterno, Giuseppe et al**
Jacobacci & Partners S.p.A.
Corso Emilia 8
10152 Torino (IT)

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Description

[0001] The present invention relates to a device for heating a washing liquid in a washing machine, in particular a dishwasher, of the kind defined in the preamble of claim 1.

[0002] FR-A-2 534 438 discloses a device of this kind, integrated in the bottom wall of the washing chamber or tub of the washing machine and comprising two separate electric heaters.

[0003] An object of the present invention is to provide an improved heating device of the initially defined kind.

[0004] This and other objects are achieved, according to the invention, by a device having the features defined in claim 1.

[0005] Further characteristics and advantages of the invention will become clear from the following detailed description which is given purely by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a partial schematic view of a dishwasher provided with a device according to the present invention,

Figure 2 is a perspective view which shows an embodiment of a device according to the invention,

Figure 3 is a partially-exploded perspective view of the device shown in Figure 2, and

Figure 4 is a perspective view of a portion of the device of Figures 2 and 3.

[0006] In Figure 1, a dishwasher, generally indicated DW, comprises, in known manner, a support structure 1 inside which a washing chamber 2 is defined.

[0007] In its lower portion, the washing chamber 2 communicates with a sump 3 for collecting the liquid 4 which forms the washing bath.

[0008] In known manner, an electric feed pump 5 draws a flow of washing liquid from the sump 3 and sends it to a heating device according to the invention, generally indicated 10.

[0009] With reference also to Figures 2 and 3, the device 10 comprises a hollow body 11 which, in the embodiment shown by way of example, has a generally tubular configuration and is formed substantially by two half-shells 12 and 13 which are connected to one another in a fluid-tight manner with the interposition of a thermally-conductive separating wall, indicated 14 in Figures 1, 3 and 4.

[0010] Two passageways or ducts, indicated 15 and 16 in Figure 1, are thus defined in the region inside the body 11 for the passage of a flow of water and a flow of air which are used in the washing chamber 2, respectively.

[0011] The thermally-conductive wall 14 may advantageously be made of aluminium or an alloy thereof. An electrical resistance heater 17 of known type is connected, for example, by means of a welded joint 18 (Figure 4), to the surface of the wall 14 which faces the air duct 16 (crockery-drying air), the ends of the heater 17 with the respective terminals 17a extending outside the body 11.

[0012] As can be seen in Figures 3 and 4 in particular, in the embodiment illustrated, the thermally-conductive wall 14 is substantially flat and extends in a longitudinal plane inside the body 11.

[0013] With reference once again to Figure 1, the duct 16 for the heating of the air that is used to dry the crockery has one or more air-inlet openings, indicated 19, which are constituted, for example, by longitudinal slots formed in the half-shell 13, as can be seen in Figure 2 and 3. This shell also forms an air outlet, indicated 20 in Figures 1 to 3, which is connected to an electric circulation fan, indicated 21 in Figure 1. In operation, the electric fan is intended to convey to the washing chamber 2 an air-flow which is heated beforehand by the heater 17 as that flow passes through the duct 16 of the device 10.

[0014] Still with reference to Figure 1, the duct 15 for the washing liquid is connected to the outlet or delivery of the electric pump 5.

[0015] In the embodiment shown by way of example, the heating device 10 is combined with an associated motorized flow-diverter device, generally indicated 22 in Figures 1 to 3. This device, which is of known type, comprises, basically, a hollow body 23 the interior of which communicates with the duct 15 of the heating device 10 through a passageway indicated 15a in Figure 1. The body 23 forms two outlet connectors 24 and 25 (Figure 1) which are intended to be connected hydraulically to an upper spray rotor and to a lower spray rotor in the washing chamber 2, in known manner.

[0016] The flow-diverter device 22 comprises an electric motor 26 the rotor of which can rotate a disk 27 which is provided with openings through which the washing liquid that is heated as it passes through the duct 15 of the heating device 10 can be supplied selectively to one and/or the other outlet connector 24 and/or 25 and hence selectively to one and/or the other spray rotor.

[0017] With reference to Figures 2 and 3, the flow-diverter device 22 may advantageously be provided with an electrical device of known type, indicated 28, for detecting the turbidity of the washing liquid.

[0018] Again with reference to Figures 2 and 3, two openings or seats 29, 30 are advantageously formed in the half-shell 12 of the heating device 10; respective diaphragm and microswitch pressure sensors 31 and 32 for detecting the presence of water in the duct 15 are connected to the openings 29, 30.

[0019] In operation, each time a flow of heated water is to be supplied to the spray rotors, the operative control unit of the machine (the unit is not shown but is of known type) brings about activation of the electric pump 5 and the supply of a current to the resistance heater 17. Owing to thermal conduction through the thermally-conductive separating wall 14, the heater brings about rapid heating of the flow of washing liquid in the duct 15 as it passes

through the duct. The diverter 22 supplies the heated washing liquid to the spray rotors.

[0020] When, upon completion of a washing cycle, the crockery is to be dried, the control unit of the machine activates the electric fan 21 which draws a flow of air into the duct 16 through the openings or slots 19. The unit also causes a current to flow through the heater 17 which heats the air-flow passing through the duct 16.

[0021] In a manner not illustrated, an electric temperature sensor and/or an electric humidity sensor may be associated with the heating device 10 to supply electrical signals indicative of the temperature and of the degree of humidity, respectively, of the air-flow used for drying the crockery and the control unit of the machine is advantageously arranged to control the activation of the resistance heater 17 and optionally also of the electric fan 21 according to the signals supplied by those sensors.

[0022] In embodiments not shown in the drawings, the body of the heating device 10 may comprise a substantially tubular outer wall and a thermally-conductive inner wall which is also tubular and extends longitudinally inside the outer wall. The inner, thermally-conductive wall defines a first duct in its interior and, jointly with the outer wall, defines a second, annular duct extending around the first duct. In one embodiment, a flow of washing liquid may pass through the inner duct and an air-flow for drying the crockery is then intended to flow through the outer duct. In another embodiment, the air-flow for drying the crockery is intended to flow through the inner duct and the flow of washing liquid is intended to flow through the outer duct. In both of the embodiments just described, the resistance heater is disposed in the duct through which the air-flow is intended to pass, in an arrangement for exchanging heat with the thermally-conductive wall which separates the two ducts.

[0023] Finally, it is pointed out that, although this description relates to a dishwasher as an example of use, a heating device according to the invention could also advantageously be used in machines of other types, for example, in laundry washing/drying machines.

[0024] Naturally, the principle of the invention remaining the same, the forms of embodiment and details of construction may be varied widely with respect to those described and illustrated purely by way of non-limiting example.

Claims

1. A device (10) for heating a washing liquid (4) in a washing machine (1), in particular a dishwasher (1), in which a washing chamber (2) is defined, the device (10) comprising:

a hollow body (11) with a thermally-conductive wall (14) which is to be contacted by a flow of liquid and by a flow of air for use in the washing chamber (2), and with an electrical resistance heater (17) for heating said flows of liquid and air is associated,

the electrical resistance heater (17) connected in a heat exchanging arrangement with said thermally-conductive wall (14);

the device (10) being **characterized in that** inside said body (11), which has a general tubular configuration, are defined a first duct (15) and a further or second duct (16), separated from one another by said thermally-conductive wall (14), for the passage of the liquid flow and the air-flow, respectively; said liquid flow heater (17) being disposed in said further or second duct (16) for the air flow.

2. A device according to Claim 1 in which the body (11) has a generally tubular configuration and the thermally-conductive wall (14) is substantially flat and extends in a longitudinal plane in the body (11), dividing its interior into two regions (15, 16) which are separated from one another in a fluid-tight manner.

3. A device according to Claim 1 in which the body has a substantially tubular outer wall and a likewise tubular, thermally-conductive inner wall which defines an inner duct and extends longitudinally inside the outer wall defining, relative thereto, a second, annular duct outside the first duct.

4. A device according to Claim 3 in which the flow of liquid is intended to pass through the inner duct and the air-flow is intended to pass through the outer duct.

5. A device according to Claim 3 in which the air-flow is intended to pass through the inner duct and the flow of liquid is intended to pass through the outer duct.

6. A device according to any one of the preceding claims in which the heater comprises an electrical resistor (17) welded to the thermally-conductive wall (14).

7. A device according to any one of the preceding claims, for a dishwasher (1) in which a first and a second washing-liquid spray rotor are provided in the washing chamber (2), and in which the outlet of the first duct communicates with a motorized flow-diverter device (22) which can direct the flow of liquid coming from the first duct (15) selectively towards one and/or the other spray rotor.

8. A device according to any one of the preceding claims, comprising an electrical temperature sensor which can supply electrical signals indicative of the temperature of the air in the second duct (16) or coming therefrom, and control means which can de-ac-

tivate the heater (17) when the temperature exceeds a predetermined value.

9. A device according to any one of the preceding claims, further comprising an electrical humidity sensor which can supply electrical signals indicative of the degree of humidity of the air in the second duct (16) or coming therefrom, and control means which can drive the heater (17) according to the degree of humidity detected.

10. A device according to any one of the preceding claims in which the thermally-conductive wall (14) is made of aluminium or aluminium alloy.

Patentansprüche

1. Vorrichtung (10) zum Erwärmen einer Waschflüssigkeit (4) in einer Waschmaschine (1), insbesondere einem Geschirrspüler (1), in der eine Waschkammer (2) definiert ist, wobei die Vorrichtung (10) umfasst:

einen Hohlkörper (11) mit einer thermisch leitfähigen Wand (14), die von einem Flüssigkeitsstrom und von einem Luftstrom zur Verwendung in der Waschkammer (2) zu kontaktieren ist, und mit einem assoziierten bzw.
verbundenen elektrischen Widerstandsheizer (17) zum Erwärmen des Flüssigkeits- und des Luftstroms,
wobei der elektrische Widerstandsheizer (17) in einer Wärmetauschanordnung mit der thermisch leitfähigen Wand (14) verbunden ist;
e
wobei die Vorrichtung (10) **dadurch gekennzeichnet ist, dass** im Inneren des Körpers (11), der eine im Allgemeinen rohrförmige Konfiguration aufweist, eine erste Leitung (15) und eine weitere oder zweite Leitung (16) definiert sind, die voneinander durch die thermisch leitfähige Wand (14) getrennt sind, und zwar für den Durchgang des Flüssigkeitsstroms bzw. des Luftstroms; wobei der Flüssigkeitsstromheizer (17) in der weiteren oder zweiten Leitung (16) für den Luftstrom angeordnet ist.

2. Vorrichtung nach Anspruch 1, wobei der Körper (11) eine im Allgemeinen rohrförmige Konfiguration aufweist und die thermisch leitfähige Wand (14) im Wesentlichen flach ist und sich in einer Längsebene in dem Körper (11) erstreckt, wobei sie seinen Innenraum in zwei Regionen (15, 16) unterteilt, die flüssigkeitsdicht voneinander getrennt sind.

3. Vorrichtung nach Anspruch 1, wobei der Körper eine im Wesentlichen rohrförmige äußere Wand und eine gleichermaßen rohrförmige, thermisch leitfähige innere Wand aufweist, die eine innere Leitung definiert und sich längs im Inneren der äußeren Wand erstreckt, die relativ dazu eine zweite, ringförmige Leitung außerhalb der ersten Leitung definiert.

4. Vorrichtung nach Anspruch 3, wobei der Flüssigkeitsstrom durch die innere Leitung verlaufen soll und der Luftstrom durch die äußere Leitung verlaufen soll.

5. Vorrichtung nach Anspruch 3, wobei der Luftstrom durch die innere Leitung verlaufen soll und der Flüssigkeitsstrom durch die äußere Leitung verlaufen soll.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei der Heizer einen elektrischen Widerstand (17) umfasst, der an die thermisch leitfähige Wand (14) geschweißt ist.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, für einen Geschirrspüler (1), bei dem ein erster und ein zweiter Waschflüssigkeitssprüh- bzw. -spritzrotor in der Waschkammer (2) bereitgestellt sind, und in dem der Auslass der ersten Leitung mit einer motorisierten Strom- bzw. Flussumlenkvorrichtung (22) kommuniziert, die den von der ersten Leitung (15) kommenden Flüssigkeitsstrom selektiv zu dem einen und/oder dem anderen Sprüh- bzw. Spritzrotor umlenken kann.

8. Vorrichtung nach einem der vorhergehenden Ansprüche, umfassend einen elektrischen Temperatursensor, der elektrische Signale liefern kann, welche die Temperatur der Luft in der zweiten Leitung (16) oder von dieser kommend angeben, und Steuer- bzw. Regelmittel, die den Heizer (17) deaktivieren können, wenn die Temperatur einen vorbestimmten Wert überschreitet.

9. Vorrichtung nach einem der vorhergehenden Ansprüche, ferner umfassend einen elektrischen Feuchtigkeitssensor, der elektrische Signale liefern kann, die den Feuchtigkeitsgrad der Luft in der zweiten Kammer (16) oder von dieser kommend angeben, und Steuer- bzw. Regelmittel, die den Heizer (17) gemäß dem detektierten Feuchtigkeitsgrad ansteuern.

10. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die thermisch leitfähige Wand (14) aus Aluminium oder einer Aluminiumlegierung besteht.

Revendications

1. Dispositif (10) pour chauffer un liquide de lavage (4)

dans une machine de lavage (1) en particulier un lave-vaisselle (1), dans lequel une chambre de lavage (2) est définie, le dispositif (10) comprenant :

un corps creux (11) avec une paroi thermoconductrice (14) qui est destinée à être en contact avec un flux de liquide e un flux d'air pour l'utilisation dans la chambre de lavage (2) et qui est associée à un chauffage à résistance électrique (17) pour chauffer lesdits flux de liquide et d'air, le chauffage à résistance électrique (17) étant relié dans une configuration d'échange de chaleur avec ladite paroi thermoconductrice (14) ;
le dispositif (10) étant **caractérisé en ce qu'**à l'intérieur dudit corps (11) qui a une configuration généralement tubulaire, sont définis un premier conduit (15) et un autre ou
second conduit (16) séparés l'un de l'autre par ladite paroi thermoconductrice (14) pour le passage respectivement du flux de liquide et du flux d'air; ledit chauffage de flux de liquide (17) étant agencé dans ledit autre ou second conduit (16) pour le flux d'air.

2. Dispositif selon la revendication 1, dans lequel le corps (11) a une configuration généralement tubulaire et la paroi thermoconductrice (14) est sensiblement plate et s'étend dans un plan longitudinal dans le corps (11), divisant son intérieur en deux zones (15, 16) qui sont séparées l'une de l'autre de manière étanche au fluide.

3. Dispositif selon la revendication 1, dans lequel le corps a une paroi extérieure sensiblement tubulaire et une paroi intérieure thermoconductrice également tubulaire qui définit un conduit intérieur et s'étend longitudinalement dans la paroi extérieure définissant par rapport à celui-ci, un second conduit annulaire en dehors du premier conduit.

4. Dispositif selon la revendication 3, dans lequel le flux de liquide est destiné à passer par le conduit intérieur et le flux d'air est destiné à passer par le conduit extérieur.

5. Dispositif selon la revendication 3, dans lequel le flux d'air est destiné à passer par le conduit intérieur et le flux de liquide est destiné à passer par le conduit extérieur.

6. Dispositif selon l'une quelconque des revendications précédentes, dans lequel le chauffage comprend une résistance électrique (17) soudée à la paroi thermoconductrice (14).

7. Dispositif selon l'une quelconque des revendications précédentes, pour un lave-vaisselle (1), dans lequel un premier et un second rotors de pulvérisation de liquide de lavage sont prévus dans la chambre de lavage (2) et dans lequel la sortie du premier conduit communique avec un dispositif de détournement de flux motorisé (22) qui peut diriger le flux de liquide venant du premier conduit (15) sélectivement vers l'un et/ou l'autre rotor de pulvérisation.

8. Dispositif selon l'une quelconque des revendications précédentes, comprenant un capteur de température électrique qui peut fournir des signaux électriques indiquant la température de l'air dans le second conduit (16) ou venant de celui-ci, et des moyens de commande qui peuvent désactiver le chauffage (17) lorsque la température excède une valeur prédéterminée.

9. Dispositif selon l'une quelconque des revendications précédentes, comprenant en outre un capteur d'humidité électrique qui peut fournir des signaux électriques indiquant le degré d'humidité de l'air dans le second conduit (16) ou venant de celui-ci, et des moyens de commande qui peuvent activer le chauffage (17) selon le degré d'humidité détecté.

10. Dispositif selon l'une quelconque des revendications précédentes, dans lequel la paroi thermoconductrice (14) est constituée d'aluminium ou d'un alliage d'aluminium.

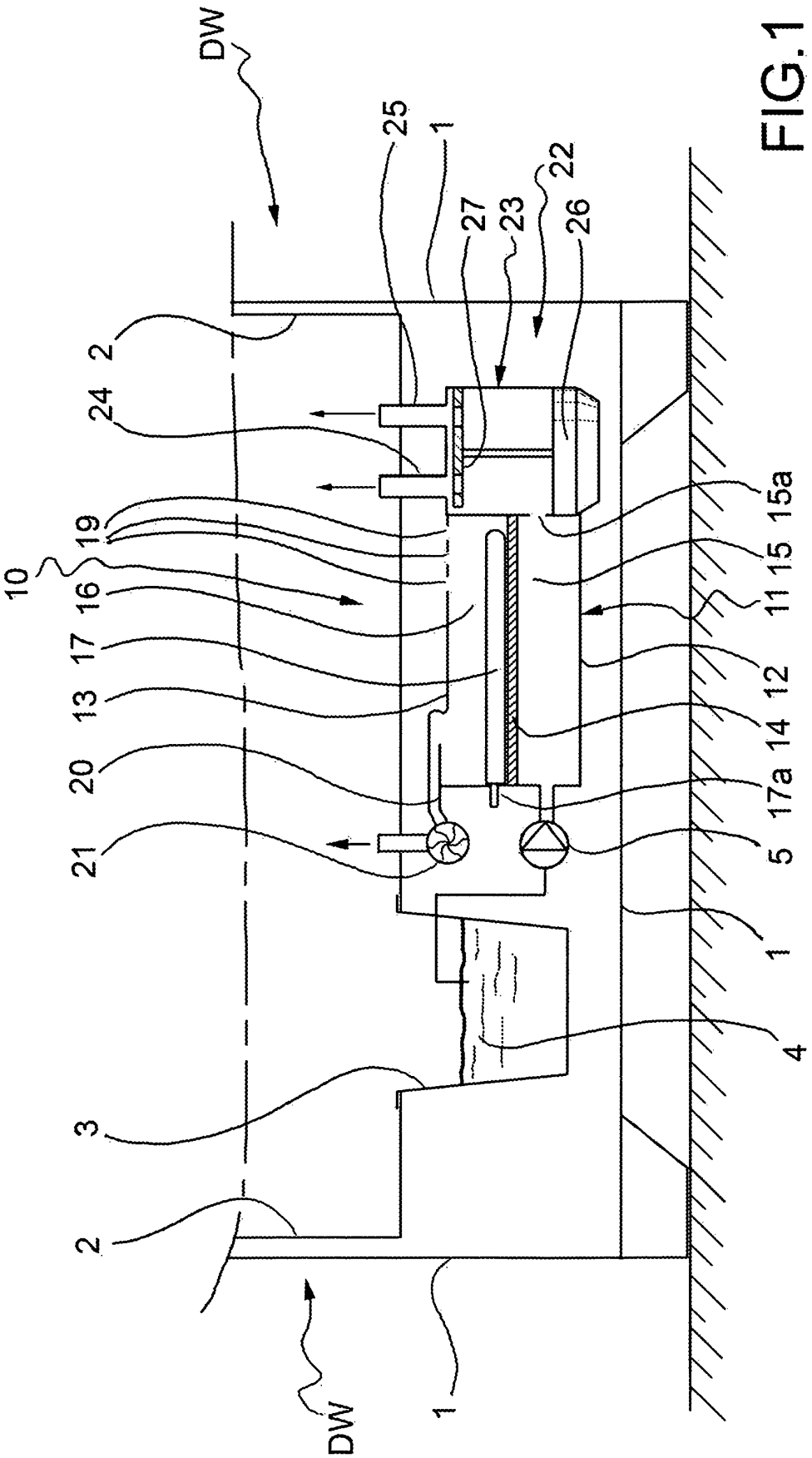

DW
25
1
22
27
23
26
2
24
19
10
16
17
13
20
21
15a
15
11
12
14
17a
5
1
4
3
2
DW
1

FIG.1

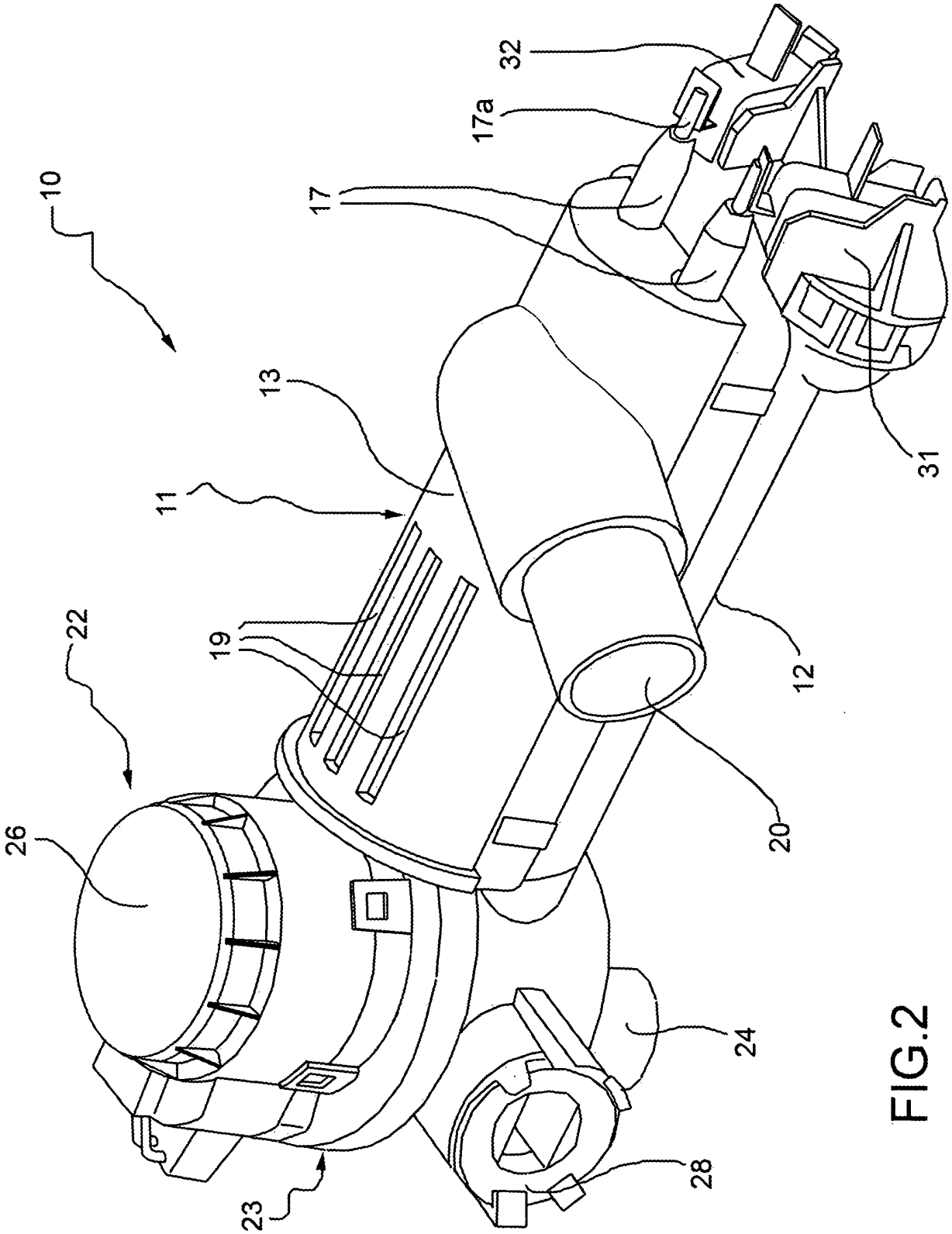


FIG.2

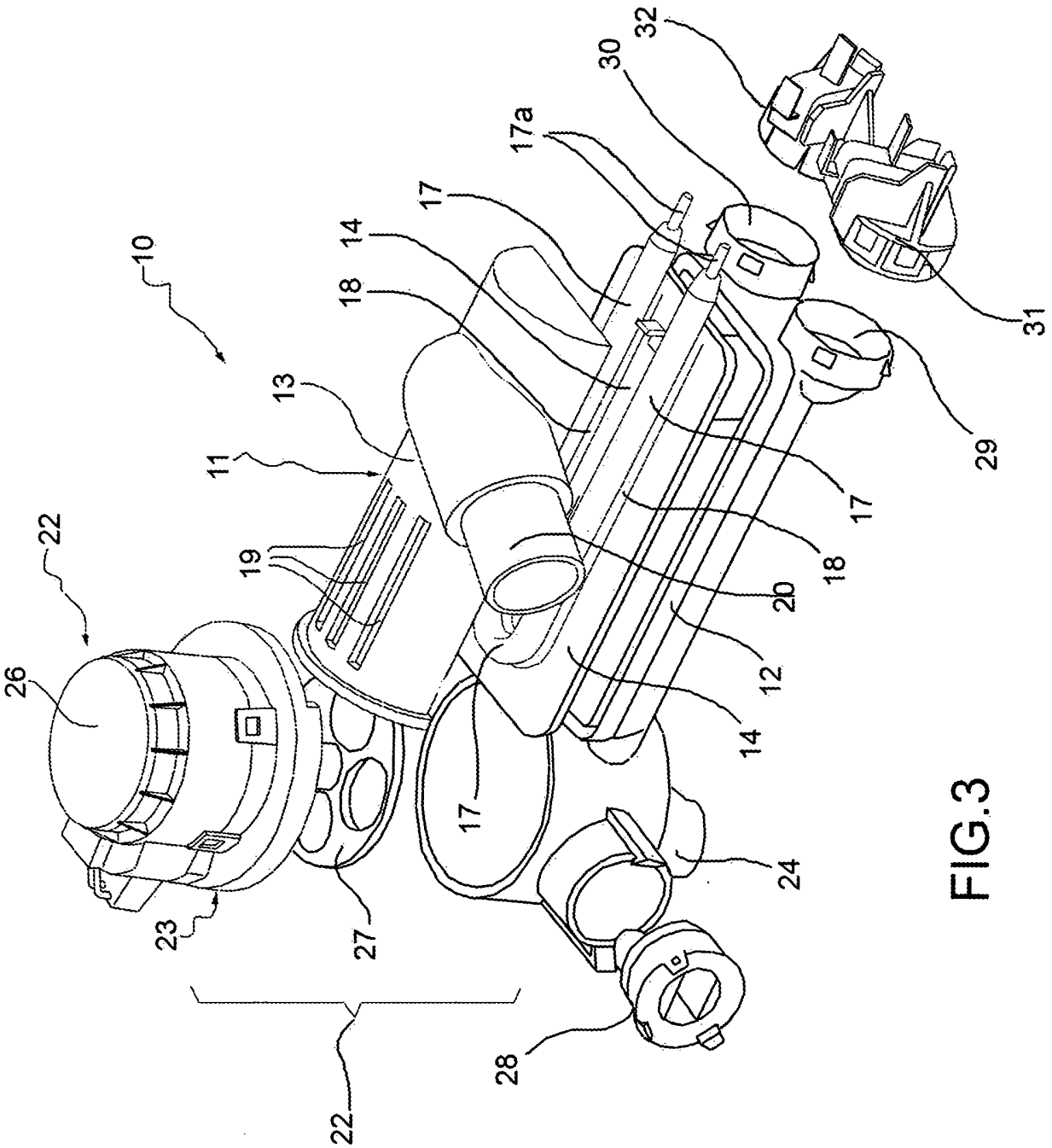
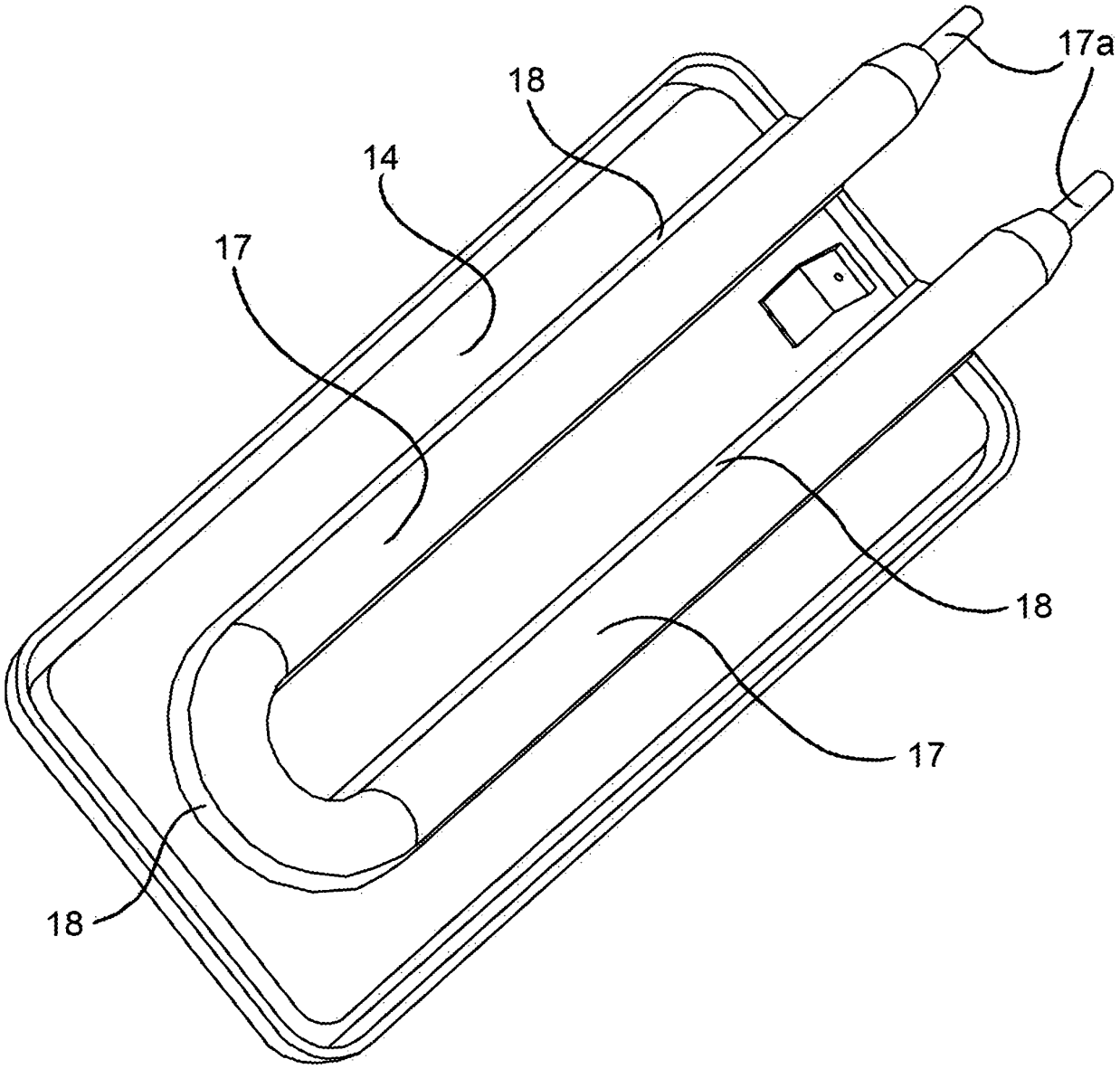


FIG.3


17a
18
14
17
18
17
18

REFERENCES CITED IN THE DESCRIPTION

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