(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 702 910 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.03.2014 Bulletin 2014/10

(51) Int Cl.:
A47J 36/38 *(2006.01)* ***F24C 15/20*** *(2006.01)*

(21) Application number: **12182017.9**

(22) Date of filing: **28.08.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Electrolux Home Products Corporation N.V.**
1130 Brussel (BE)

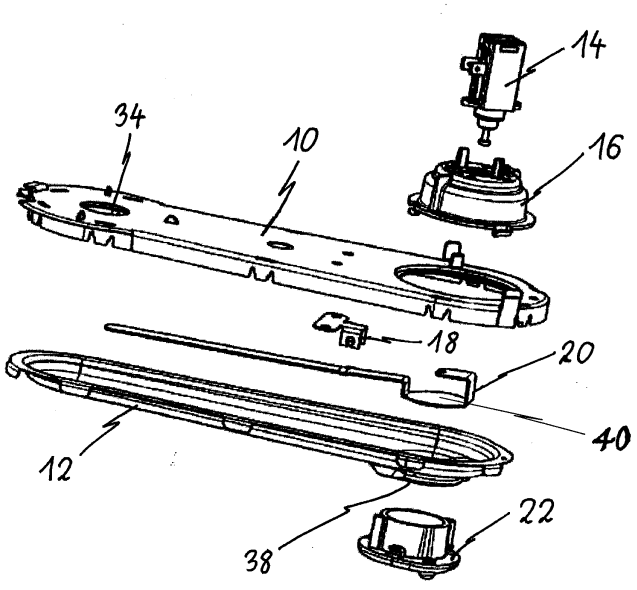
(72) Inventors:
- **Schlötterer-Fratoianni, Klaus**
  91541 Rothenburg ob der Tauber (DE)
- **Häuslein, Bianca**
  91541 Rothenburg ob der Tauber (DE)

(74) Representative: **Röder, Richard**
Electrolux Dienstleistungs GmbH
Group Intellectual Property
90327 Nürnberg (DE)

(54) **A steam channel for an exhaust system of a steam appliance**

(57) The present invention relates to a steam channel for an exhaust system of a steam appliance. The steam channel includes an elongated housing (10, 12) provided for a horizontal arrangement above a cavity (24) of the steam appliance. An inlet (38) is formed in a bottom side of one end portion of the housing (10, 12) and is connected or connectable to the cavity (24) of the steam appliance. An outlet (34) is formed in a top side of another end portion of the housing (10, 12). An elongated flap (20) is arranged inside the housing (10, 12). The flap (20) is pivoting fastened inside the housing (10, 12) and comprises two lever arms. A pivoting axis of the flap (20) extends horizontally and perpendicular to the longitudinal axis of the flap (20). The flap (20) comprises a cover element (40) for opening and closing the inlet (38). The lever arms of the flap (20) generate a torque, so that the inlet (38) is closed or closable by the gravity of the cover element (40) on the one hand and the inlet (38) is opened or openable by an overpressure in the cavity (24) on the other hand. The steam channel includes an actuator (14) for pivoting the flap (20), so that the inlet (38) is opened or openable by the actuator (14).

FIG 1



EP 2 702 910 A1

Description

[0001] The present invention relates to a steam channel for an exhaust system of a steam appliance. Further, the present invention relates to an exhaust system for a steam appliance. Moreover, the present invention relates to a steam appliance.

[0002] A steam appliance, for example a steam cooking appliance, comprises typically an exhaust system with a steam channel. Usually, said steam channel is arranged between a cavity and an air channel. The steam channel is provided for discharging steam from the cavity via the air channel out of the appliance. The steam channel has to be closed during the steaming phase. However, the steam channel has to be opened, if an overpressure occurs in the cavity. The overpressure has to be released in order to avoid an opening of the cavity door. Further, the steam channel has to be opened for activating the de-steaming phase after the steaming phase.

[0003] FIG 7 illustrates a perspective exploded view of the steam channel for the exhaust system according to the prior art. The exhaust system of the prior art is also provided for the steam appliance. The elongated steam channel extends horizontally and is provided for an arrangement above a cavity of the steam appliance.

[0004] The steam channel includes an upper channel part 50 and a lower channel part 52. The upper channel part 50 and the lower channel part 52 form the housing of the steam channel. The steam channel includes an adapter 60 at a bottom side of the lower channel part 52. The adapter 60 is provided for connecting an inlet 64 to the cavity of the steam appliance. Further, the steam channel includes a wax actuator 54 and an actuator housing 56 on a top side of the upper channel part 50. The wax actuator 54 and the actuator housing 56 are arranged above the inlet 64. The wax actuator 54 is connected to a valve head 58 for closing the inlet 64. The inlet 64 is formed in the bottom side of the lower channel part 52. An outlet 62 is formed in the top side of the upper channel part 50. The outlet 62 is connected to an air channel. The opening and closing of the steam channel is performed by a linear motion of the wax actuator 54.

[0005] FIG 8 illustrates a sectional side view of the steam channel in a closed state according to the prior art. In the closed state the valve head 58 is pressed down by the wax actuator 54, so that the valve head 58 closes the inlet 64.

[0006] FIG 9 illustrates a sectional side view of the steam channel in an open state according to the prior art. In the open state the valve head 58 is retracted by the wax actuator 54, so that the inlet 64 is open.

[0007] The process of opening and closing the steam channel requires about one minute. During the steaming phases the steam channel is closed. Only in the de-steaming phase the steam channel is open. In the de-steaming phase the steam will be sucked out of the cavity through the steam channel up to the air channel and out of the appliance by a fan in the air channel. The valve head 58 comprises a number of holes, so that an overpressure in the cavity can be released in the closed state. However, these holes are always open and cause a permanent loss of steam. The lost steam has to be produced additionally by the steam generator, so that the energy consumption increases.

[0008] It is an object of the present invention to provide a steam channel for an exhaust system of a steam appliance, wherein the energy consumption is reduced.

[0009] The object of the present invention is achieved by the steam channel for an exhaust system of a steam appliance according to claim 1.

[0010] The present invention relates to a steam channel for an exhaust system of a steam appliance, wherein

- the steam channel includes an elongated housing provided for a horizontal arrangement above a cavity of the steam appliance,
- an inlet is formed in a bottom side of one end portion of the housing,
- the inlet is connected or connectable to the cavity of the steam appliance,
- an outlet is formed in a top side of another end portion of the housing,
- an elongated flap is arranged inside the housing,
- the flap is pivoting fastened inside the housing and comprises two lever arms,
- a pivoting axis of the flap extends horizontally and perpendicular to the longitudinal axis of the flap,
- the flap comprises a cover element for opening and closing the inlet,
- the lever arms of the flap generate a torque, so that the inlet is closed or closable by the gravity of the cover element on the one hand and the inlet is opened or openable by an overpressure in the cavity on the other hand, and
- the steam channel includes an actuator for pivoting the flap, so that the inlet is opened or openable by the actuator.

[0011] The main idea of the present invention is the pivoting flap, which lever arms generate approximately a balance, so that the inlet is closable by the gravity of the cover element on the one hand and the inlet is openable by a small overpressure in the cavity on the other hand. Additionally, the inlet is openable by the actuator. The opening by the actuator requires no overpressure. The opening by the actuator is preferably used for activating the de-steaming phase. At all, there are two methods for opening the steam channel and one method for closing said steam channel. The opening times of the steam channel are very short. There is no loss of steam, when the steam channel is closed. Only the steam effecting overpressure is lost. The heating up time of the steam appliance is reduced.

[0012] Preferably, the elongated flap extends in parallel to the longitudinal axis of the housing. The flap may be relative long, so that the torque can be exactly adjust-

ed.

[0013] In particular, the cover element is arranged at one end of the flap.

[0014] For example, the cover element is formed as a circular disk.

[0015] Preferably, the flap and the cover element form a single-piece part.

[0016] Further, the steam channel may include a support element arranged inside the housing, wherein said support element and the flap form a hinge.

[0017] For example, the torque generated by the lever arms of the flap causes a force between 0.01 N and 0.02 N, in particular 0.012 N, which has to be overcome by the overpressure in the cavity in order to open the inlet. The small force allows a short time for opening and closing the inlet of the steam channel.

[0018] In particular, the actuator is an electric actuator including at least one servo motor.

[0019] Further, the closing of the inlet by the gravity of the cover element is blocked, if said inlet is opened by the actuator.

[0020] Moreover, the present invention relates to an exhaust system for a steam appliance. The exhaust system includes a steam channel and air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel, and wherein the exhaust system includes the steam channel mentioned above.

[0021] In particular, the air channel comprises at least one fan.

[0022] Preferably, the air channel is arranged above the steam channel and connected to the outlet of said steam channel.

[0023] At last, the present invention relates to a steam appliance including an exhaust system with a steam channel and an air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel, and wherein the steam appliance includes the steam channel described above.

[0024] In a similar way, the present invention relates to a steam appliance including an exhaust system with a steam channel and an air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel, and the steam appliance includes the exhaust system mentioned above.

[0025] In particular, the steam appliance is a steam cooking appliance.

[0026] Novel and inventive features of the present invention are set forth in the appended claims.

[0027] The present invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a perspective exploded view of a steam channel for the exhaust system according to a preferred embodiment of the present invention,

FIG 2 illustrates a sectional side view of the steam channel for the exhaust system according to the preferred embodiment of the present invention,

FIG 3 illustrates a sectional side view of a part of the steam channel in a closed state according to the preferred embodiment of the present invention,

FIG 4 illustrates a sectional side view of a part of the steam channel in a first operation mode according to the preferred embodiment of the present invention,

FIG 5 illustrates a sectional side view of the steam channel in a second operation mode according to the preferred embodiment of the present invention,

FIG 6 illustrates a sectional side view of a part of the steam channel in the second operation mode according to the preferred embodiment of the present invention,

FIG 7 illustrates a perspective exploded view of the steam channel for the exhaust system according to the prior art,

FIG 8 illustrates a sectional side view of the steam channel in a closed state according to the prior art, and

FIG 9 illustrates a sectional side view of the steam channel in an open state according to the prior art.

[0028] FIG 1 illustrates a perspective exploded view of a steam channel for the exhaust system according to a preferred embodiment of the present invention. The exhaust system is provided for a steam appliance. The elongated steam channel extends horizontally and is provided for an arrangement above a cavity 24 of the steam appliance.

[0029] The steam channel includes an upper channel part 10 and a lower channel part 12. The upper channel part 10 and the lower channel part 12 enclose the interior 36 of the steam channel. A support element 18 and an elongated flap 20 are arranged in the interior 36 of the steam channel. The steam channel includes an adapter 22 at a bottom side of the lower channel part 12. Further, the steam channel includes an actuator 14 and an actuator housing 16 on a top side of the upper channel part 10. The actuator 14 and the actuator housing 16 are arranged above the adapter 22. An inlet 38 is arranged in the one end portion of the steam channel, and an outlet 34 is arranged in the other end portion of the steam channel. The inlet 38 is formed in the bottom side of the lower channel part 12. The outlet 34 is formed in the top side

of the upper channel part 10.

[0030] The support element 18 is fastened at a central portion of a bottom side of the upper channel part 10. The flap 20 is pivoting at said support element 18. The support element 18 and the flap 20 form a hinge. The flap 20 extends substantially in parallel to the interior 36 of the steam channel. A pivoting axis of the flap 20 is horizontal and extends perpendicular to its longitudinal axis. The flap 20 includes a cover element 40 at one end. Said cover element 40 corresponds with the inlet 38 of the lower channel part 12. The inlet 30 is opened and closed by pivoting the flap 20. In the closed state the cover element 40 covers the inlet 38. In the open state the cover element 40 is lifted up from the inlet 38.

[0031] The actuator housing 16 is fastened on the top side of the upper channel part 10. The actuator 14 is arranged inside the actuator housing 16. The actuator 14 is provided for pivoting the flap 20, so that the cover element 40 is lifted up from the inlet 38 and the steam channel is opened. Preferably, the actuator 14 is an electric actuator including a servo motor. The adapter 22 is provided for connecting the inlet 38 to the cavity of the steam appliance.

[0032] FIG 2 illustrates a sectional side view of the steam channel for the exhaust system according to the preferred embodiment of the present invention. FIG 2 clarifies the arrangements of the components of the steam channel. In FIG 2 the flap 20 is in an open state.

[0033] The steam from the cavity 24 enters the interior 36 of the steam channel through the inlet. The cover element 40 of the flap 20 is spaced from the inlet 38, so the steam can pass said cover element 40. The steam flows horizontally in the interior 36 of the steam channel. In FIG 2 the steam flows from the right hand side to the left hand side. The steam leaves the interior 36 of the steam channel through the outlet 34.

[0034] The steam channel is arranged between the cavity 24 and an air channel 26. The main function of the steam channel is the control of the presence and the amount of the steam in the cavity 24. Usually, the steam appliance has several operation phases, in which the steam is partly or completely used. When the flap 20 is open, then a fan in the air channel 26 sucks the steam out of the cavity 24 through the interior 36 of the steam channel. Subsequently, the steam is blown out through the air channel 26 to the environment.

[0035] FIG 3 illustrates a sectional side view of a part of the steam channel in a closed state according to the preferred embodiment of the present invention. FIG 3 clarifies the arrangement of the steam channel between the cavity 24 and the air channel 26.

[0036] The inlet 38 of the steam channel is connected to the cavity 24 via the adapter 22. The outlet 34 of the steam channel is directly connected to the air channel 26. The air channel 26 includes a fan motor 28 and a fan wheel 30.

[0037] In FIG 3 the flap 20 is in a closed state. The cover element 40 covers the inlet 38 of the steam channel. The closed state of the flap 20 is caused by the gravity of the cover element 40, but not by the actuator 14. The complete amount of the steam remains in the cavity 24. A steam generator is activated and deactivated in dependence of the temperature in the cavity 24. When the temperature in the cavity 24 falls below a predetermined value, then the steam generator is activated. The generation of steam leads to an increasing temperature and pressure. In order to avoid a critical over pressure in the cavity 24, the flap 20 is pivoted by the pressure, so that the cover element 40 is lifted up in order to open the inlet 38 of the steam channel.

[0038] FIG 4 illustrates a sectional side view of a part of the steam channel in a first operation mode according to the preferred embodiment of the present invention. The first operation mode is the open state caused by the overpressure in the cavity 24.

[0039] The pivotable flap 20 comprises two lever arms generating torques. The difference between said torques is very small, so that a small overpressure in the cavity 24 is sufficient to lift up the cover element 40 immediately. The force for lifting up the cover element 40 is between 0.01 N and 0.02 N, in particular about 0.012 N. When the steam channel is open, then the overpressure will be released. When the overpressure is reduced below the critical value, then the flap 20 is closed again by the gravity of the cover element 40.

[0040] The pivotable flap 20 allows a very fast opening and closing of the steam channel. The fast opening of the steam channel allows that the turn-on phases of the steam generator are reduced. This results in a significant reduction of the energy consumption by the steam generator. Compared with the prior art shown in FIG 7 to FIG 9, the energy consumption of the steam generator is reduced about 15 %.

[0041] FIG 5 illustrates a sectional side view of the steam channel in a second operation mode according to the preferred embodiment of the present invention.

[0042] Two arcuated arrows 32 represent the pivoting motions of the flap 20. In the second operation mode the steam channel is opened by the actuator 14. The actuator 14 pivots the flap 20, so that the cover element 40 is lifted up. In the second operation mode the opening and closing of the steam channel is independent of the pressure in the cavity 24. The second operation mode allows a permanently open steam channel.

[0043] FIG 6 illustrates a sectional side view of a part of the steam channel in the second operation mode according to the preferred embodiment of the present invention. FIG 6 clarifies the arrangement of the steam channel between the cavity 24 and the air channel 26.

[0044] The permanently open steam channel is provided for a de-steaming phase during or in the end of the steaming process. Preferably, the de-steaming phase starts in the end of the steaming process. In the de-steaming phase the steam will be sucked out of the cavity 24 through the steam channel up to the air channel 26 and out of the appliance. The fan motor 28 in the air

channel 26 is running during the whole steaming process, the de-steaming phase and an additional time in order to cool down the cavity 24 to a predetermined temperature.

[0045] The steam channel according to the present invention is closed by the gravity of the flap 20, so that the cover element 40 closes the inlet 39 of said steam channel. Further, the steam channel according to the present invention is opened either by the overpressure in the cavity 24 or by the actuator 14. The opening of the steam channel by the overpressure in the cavity 24 is normally of short duration in order to release said overpressure. The opening of the steam channel by the actuator 14 is preferably used for activating the de-steaming phase.

[0046] The steam channel according to the present invention has several advantages. The opening time of the steam channel is very short. There is no loss of steam, when the steam channel is closed. Only the steam effecting overpressure is lost. The heating up time of the steam appliance is reduced. In particular, the steam channel comprises two different opening modes, the one by overpressure and the other one by the actuator. The reaction time for opening and closing can be modified by the relation between the lever arms of the flap 20.

[0047] FIG 7 illustrates a perspective exploded view of the steam channel for the exhaust system according to the prior art. The exhaust system of the prior art is also provided for the steam appliance. The elongated steam channel extends horizontally and is provided for an arrangement above a cavity of the steam appliance.

[0048] The steam channel includes an upper channel part 50 and a lower channel part 52. The upper channel part 50 and the lower channel part 52 form the housing of the steam channel. The steam channel includes an adapter 60 at a bottom side of the lower channel part 52. The adapter 60 is provided for connecting an inlet 64 to the cavity of the steam appliance. Further, the steam channel includes a wax actuator 54 and an actuator housing 56 on a top side of the upper channel part 50. The wax actuator 54 and the actuator housing 56 are arranged above the inlet 64. The wax actuator 54 is connected to a valve head 58 for closing the inlet 64. The inlet 64 is formed in the bottom side of the lower channel part 52. An outlet 62 is formed in the top side of the upper channel part 50. The outlet 62 is connected to an air channel. The opening and closing of the steam channel is performed by a linear motion of the wax actuator 54.

[0049] FIG 8 illustrates a sectional side view of the steam channel in a closed state according to the prior art. In the closed state the valve head 58 is pressed down by the wax actuator 54, so that the valve head 58 closes the inlet 64.

[0050] FIG 9 illustrates a sectional side view of the steam channel in an open state according to the prior art. In the open state the valve head 58 is retracted by the wax actuator 54, so that the inlet 64 is open.

[0051] The process of opening and closing the steam channel requires about one minute. During the steaming phases the steam channel is closed. Only in the de-steaming phase the steam channel is open. In the de-steaming phase the steam will be sucked out of the cavity through the steam channel up to the air channel and out of the appliance by a fan in the air channel. The valve head 58 comprises a number of holes, so that an overpressure in the cavity can be released in the closed state.

[0052] Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to that precise embodiment, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0053]

10	upper channel part
12	lower channel part
14	actuator
16	actuator housing
18	support element
20	flap
22	adapter
24	cavity
26	air channel
28	fan motor
30	fan wheel
32	arcuated arrow
34	outlet
36	interior of the steam channel
38	inlet
40	cover element
50	upper channel part
52	lower channel part
54	actuator
56	actuator housing

58 valve head
60 adapter
62 outlet
64 inlet

Claims

1. A steam channel for an exhaust system of a steam appliance, wherein

- the steam channel includes an elongated housing (10, 12) provided for a horizontal arrangement above a cavity (24) of the steam appliance,
- an inlet (38) is formed in a bottom side of one end portion of the housing (10, 12),
- the inlet (38) is connected or connectable to the cavity (24) of the steam appliance,
- an outlet (34) is formed in a top side of another end portion of the housing (10, 12),
- an elongated flap (20) is arranged inside the housing (10, 12),
- the flap (20) is pivoting fastened inside the housing (10, 12) and comprises two lever arms,
- a pivoting axis of the flap (20) extends horizontally and perpendicular to the longitudinal axis of the flap (20),
- the flap (20) comprises a cover element (40) for opening and closing the inlet (38),
- the lever arms of the flap (20) generate a torque, so that the inlet (38) is closed or closable by the gravity of the cover element (40) on the one hand and the inlet (38) is opened or openable by an overpressure in the cavity (24) on the other hand, and
- the steam channel includes an actuator (14) for pivoting the flap (20), so that the inlet (38) is opened or openable by the actuator (14).

2. The steam channel according to claim 1,
characterized in that
the elongated flap (20) extends in parallel to the longitudinal axis of the housing (10, 12).

3. The steam channel according to claim 1 or 2,
characterized in that
the cover element (40) is arranged at one end of the flap (20) .

4. The steam channel according to any one of the preceding claims,
characterized in that
the cover element (40) is formed as a circular disk.

5. The steam channel according to any one of the preceding claims,
characterized in that
the flap (20) and the cover element (40) form a single-piece part.

6. The steam channel according to any one of the preceding claims,
characterized in that
the steam channel includes a support element (18) arranged inside the housing (10, 12), wherein said support element (18) and the flap (20) form a hinge.

7. The steam channel according to any one of the preceding claims,
characterized in that
the torque generated by the lever arms of the flap (20) causes a force between 0.01 N and 0.02 N, in particular 0.012 N, which has to be overcome by the overpressure in the cavity (24) in order to open the inlet (38).

8. The steam channel according to any one of the preceding claims,
characterized in that
the actuator (14) is an electric actuator including at least one servo motor.

9. The steam channel according to any one of the preceding claims,
characterized in that
the closing of the inlet (38) by the gravity of the cover element (40) is blocked, if said inlet (38) is opened by the actuator (14).

10. An exhaust system of a steam appliance including a steam channel and air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel,
characterized in that
the exhaust system includes the steam channel according to any one of the claims 1 to 9.

11. An exhaust system according to claim 10,
characterized in that
the air channel comprises at last fan (28, 30).

12. An exhaust system according to claim 10 or 11,
characterized in that
the air channel is arranged above the steam channel and connected to the outlet (34) of said steam channel.

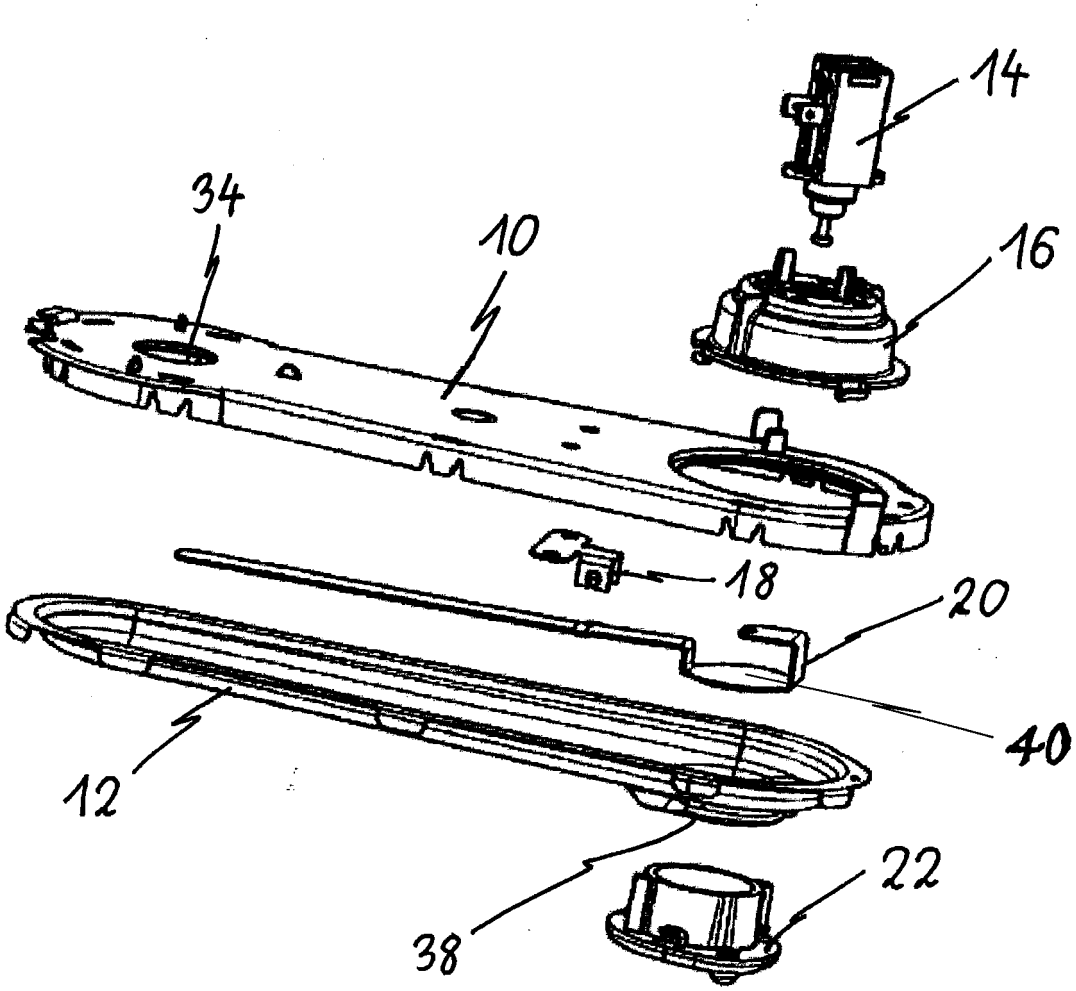
13. A steam appliance including an exhaust system with a steam channel and an air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel,
characterized in that
the steam appliance includes the steam channel according to any one of the claims 1 to 9.

14. A steam appliance including an exhaust system with

a steam channel and an air channel, wherein the steam channel is interconnected between a cavity of the steam appliance and the air channel,
characterized in that
the steam appliance includes the exhaust system according to any one of the claims 10 to 12.

15. The steam appliance according to claim 13 or 14,
characterized in that
the steam appliance is a steam cooking appliance.

FIG 1



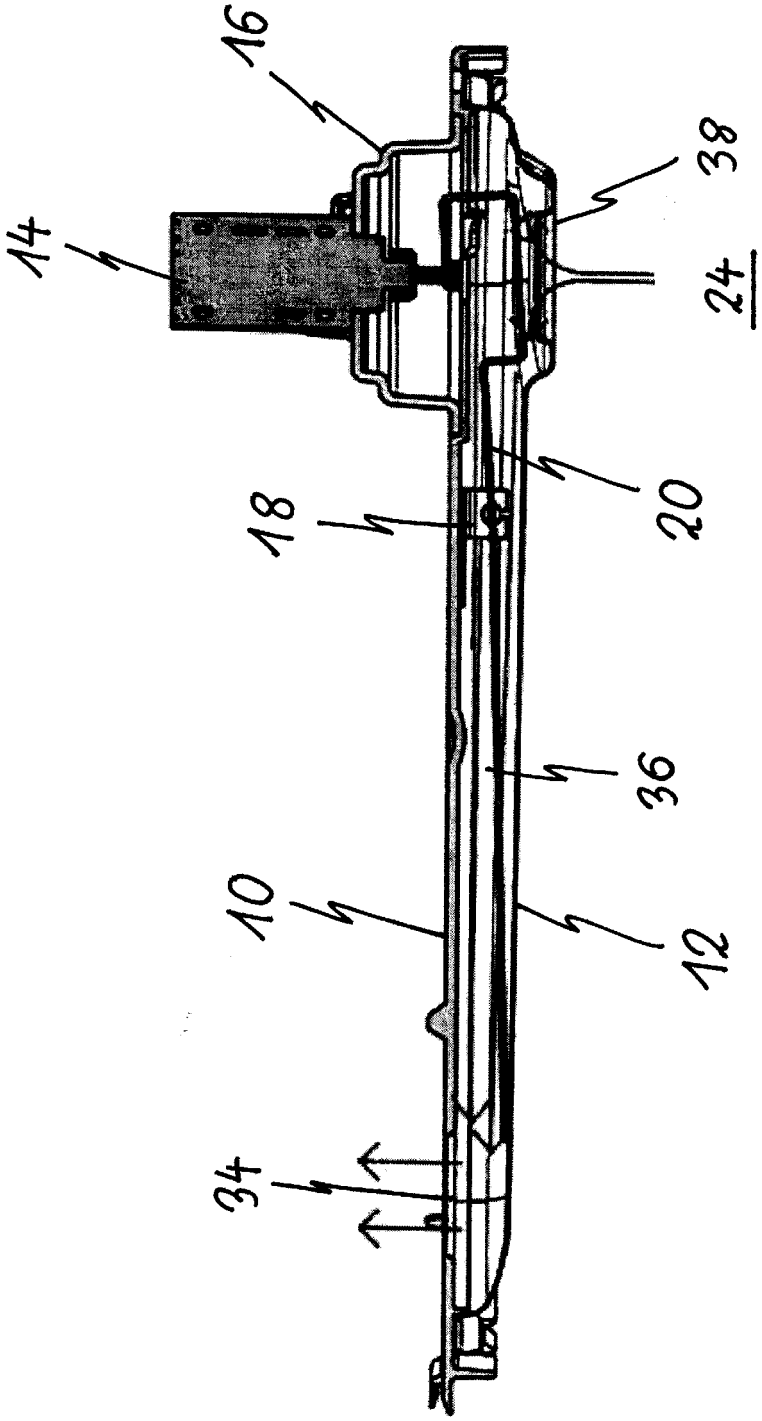


FIG 2

FIG 3

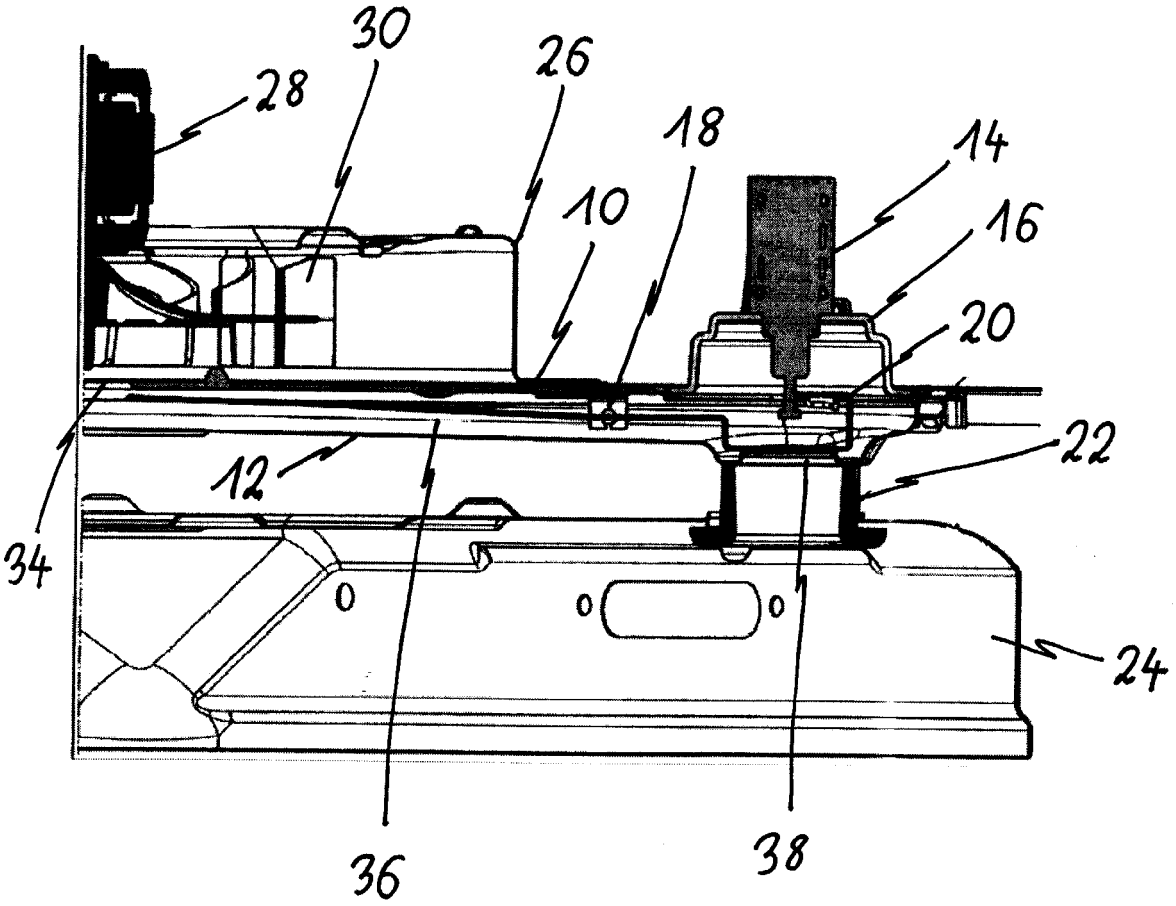
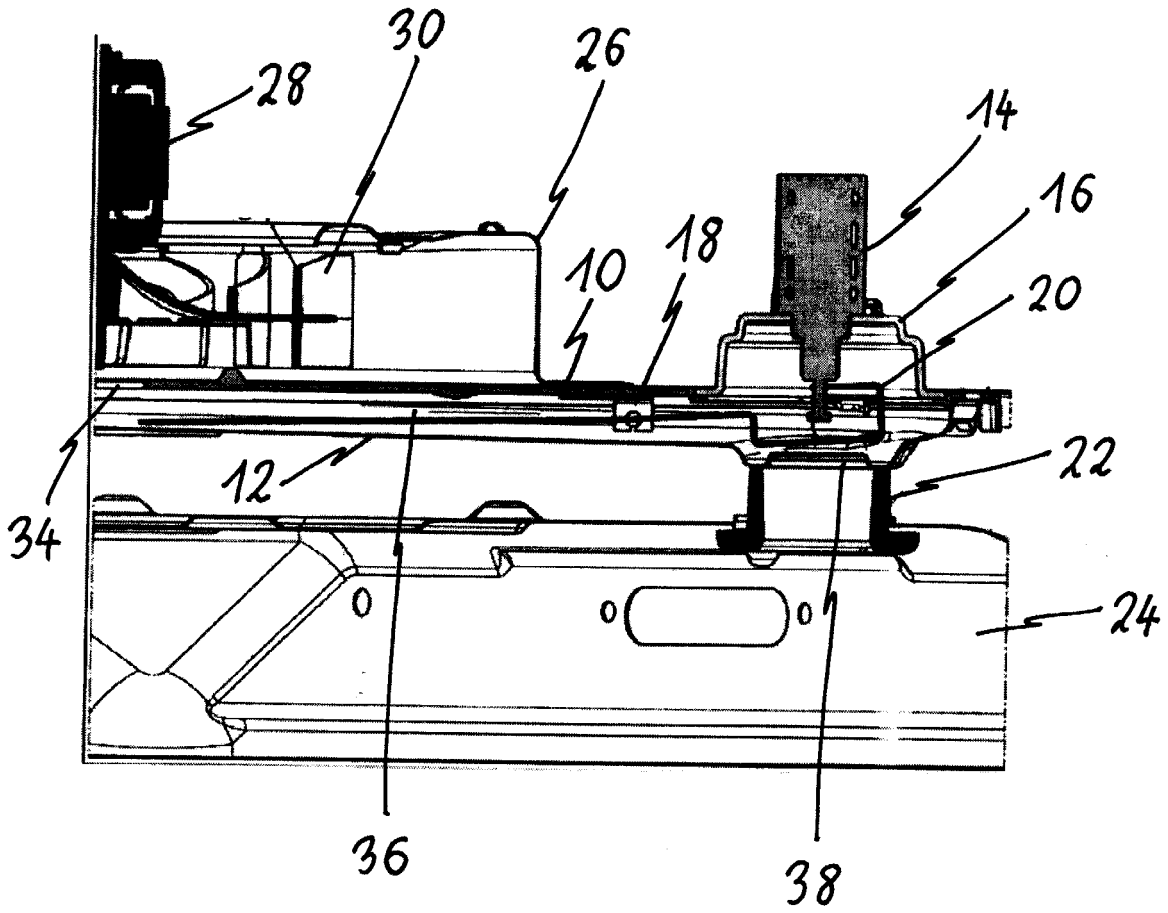


FIG 4



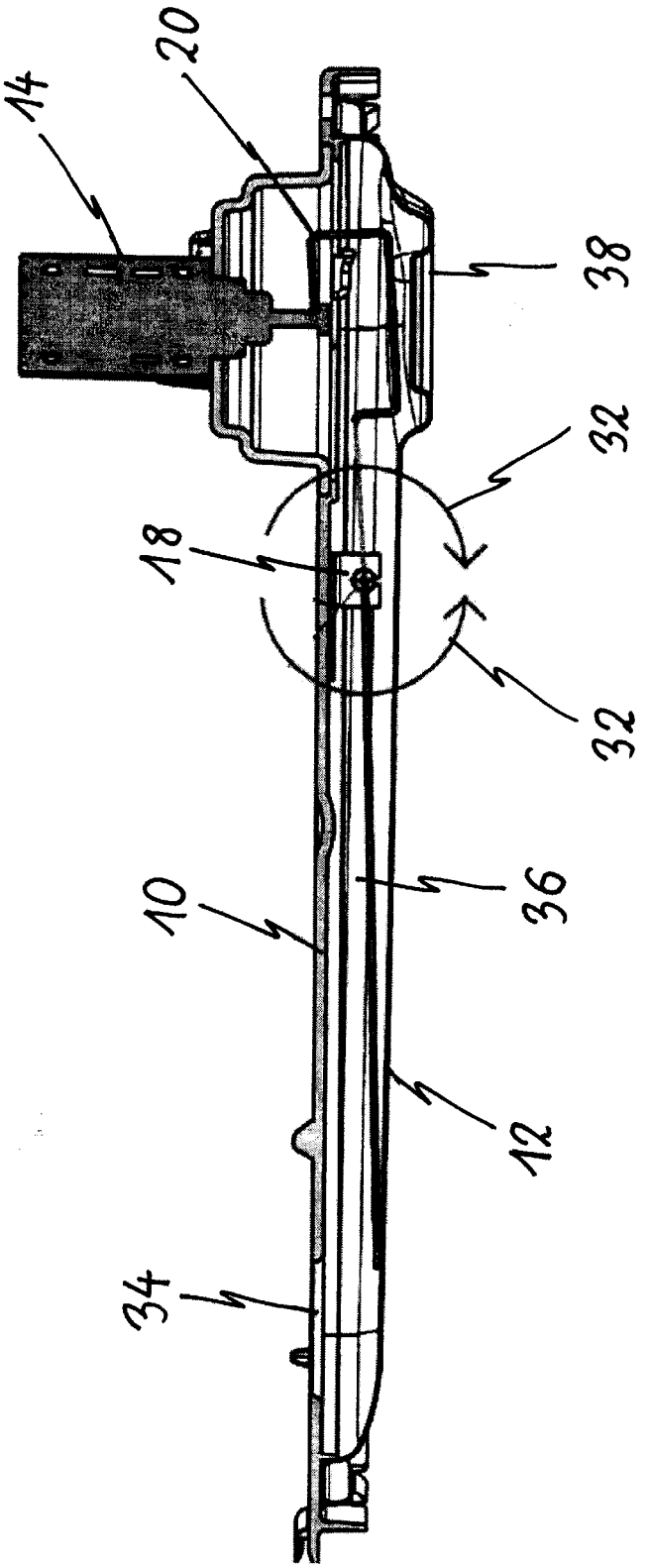


FIG 5

FIG 6

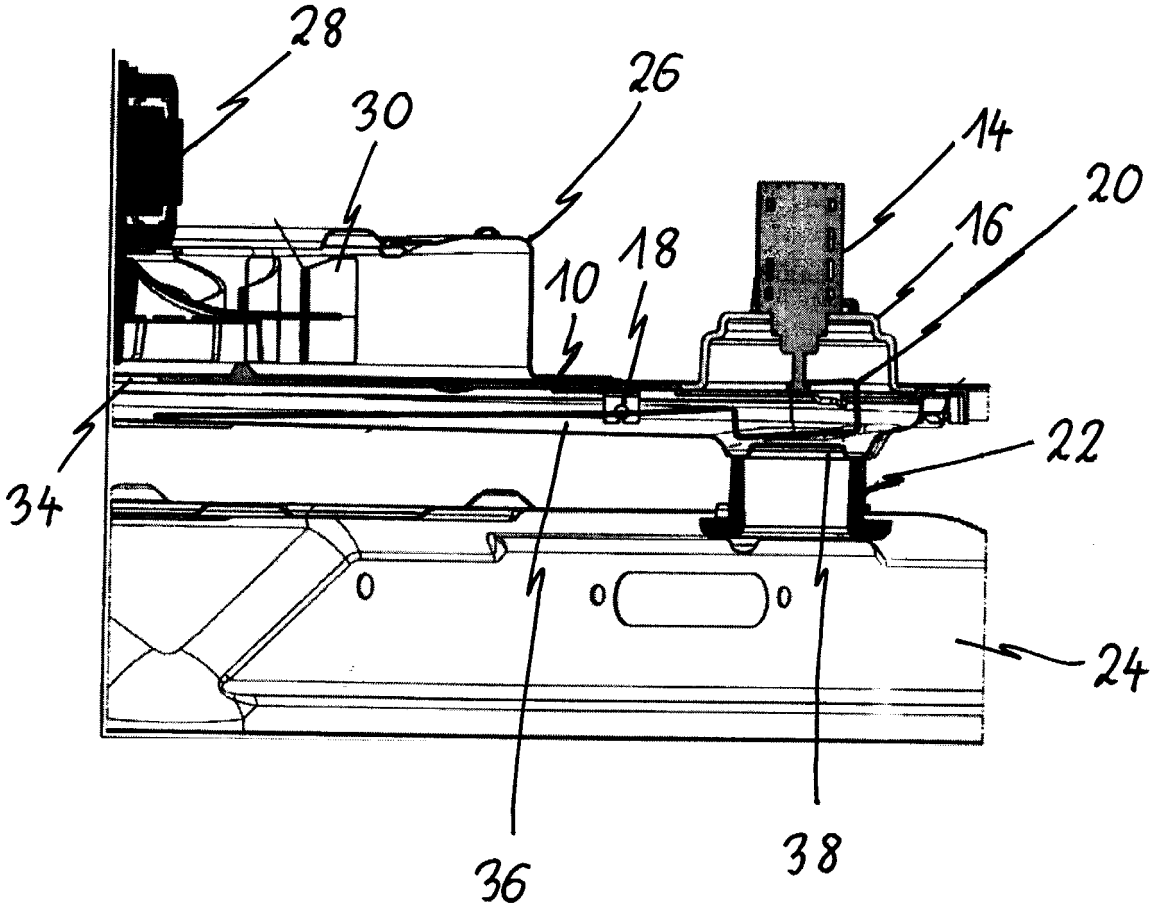


FIG 7

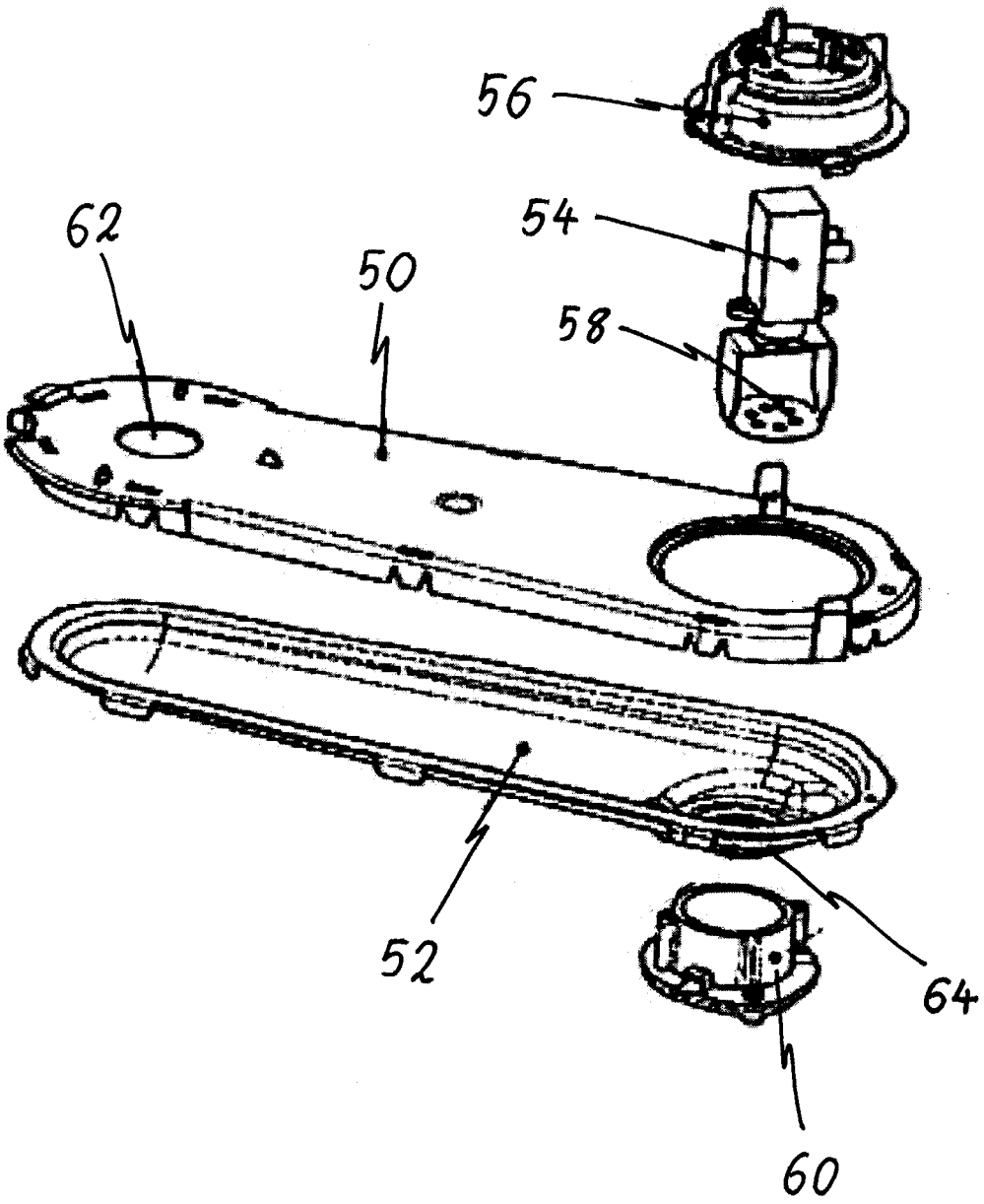


FIG 8

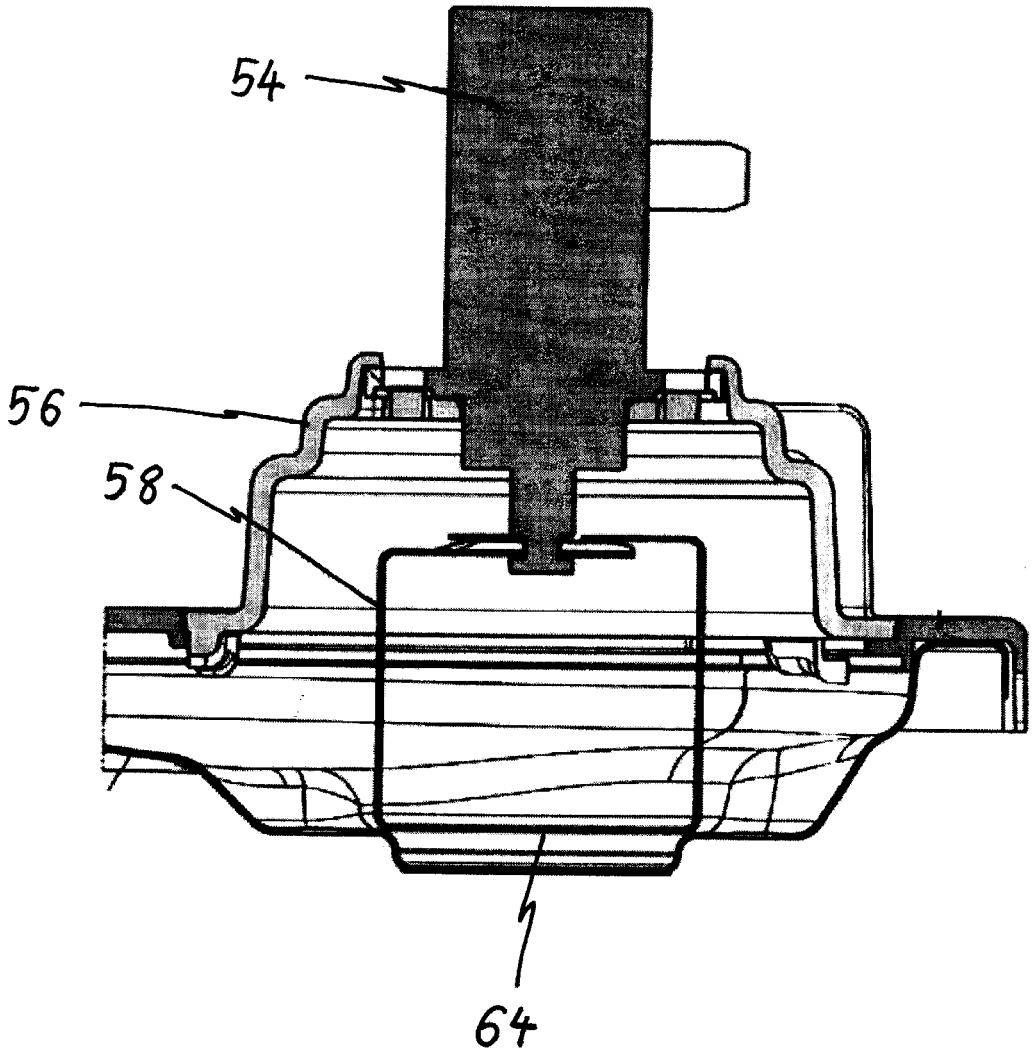
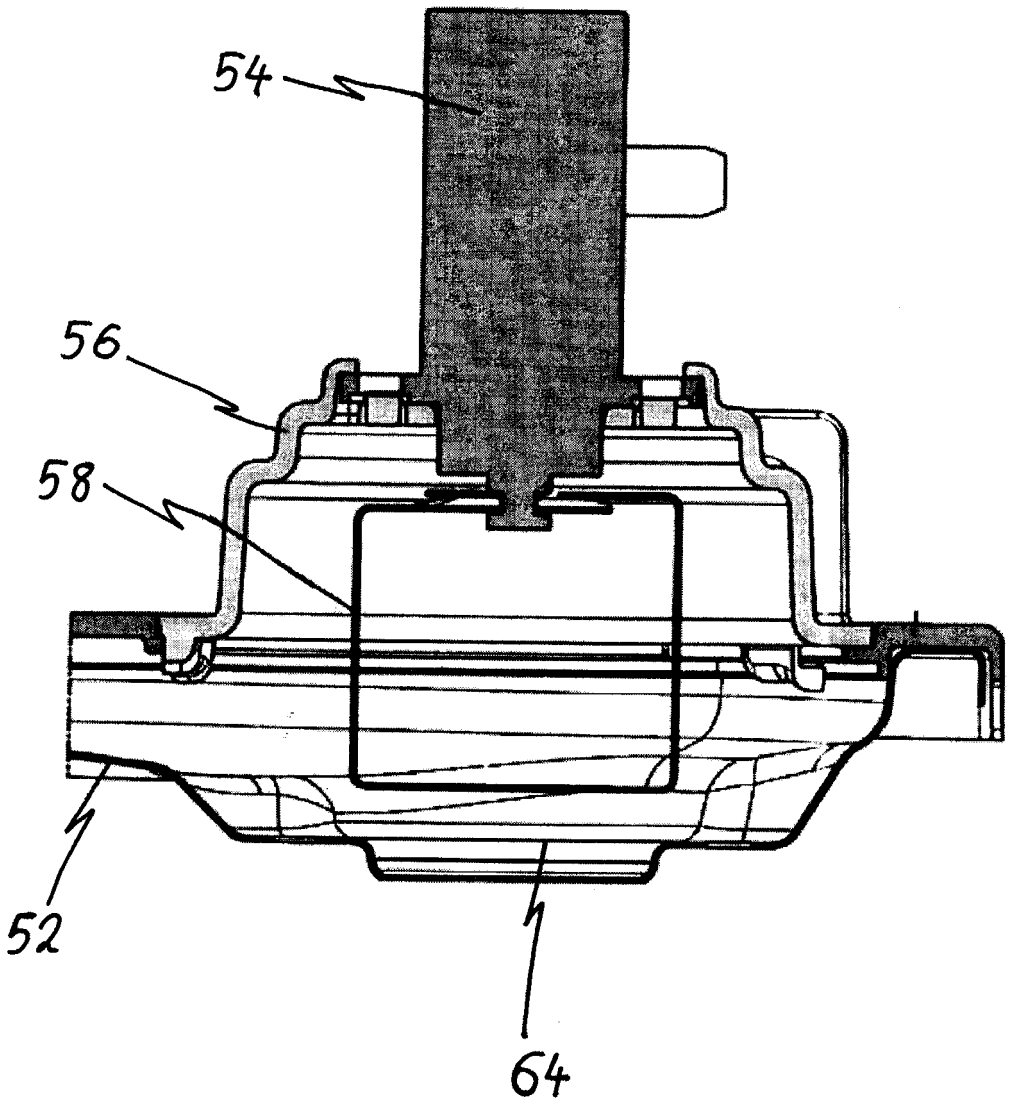


FIG 9



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 18 2017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 975 516 A1 (ELECTROLUX HOME PRODUCTS CORPORATION NV) 1 October 2008 (2008-10-01) * figures 5,6 * -----	1,8,10, 11,13-15	INV. A47J36/38 F24C15/20

TECHNICAL FIELDS SEARCHED (IPC)

A47J
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 September 2012	Reichhardt, Otto

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

2

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 18 2017

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-09-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1975516 A1	01-10-2008	AU 2008234122 A1	09-10-2008
		CA 2669565 A1	09-10-2008
		EP 1975516 A1	01-10-2008
		US 2011186030 A1	04-08-2011
		WO 2008119481 A1	09-10-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82