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(54) Electric device for washing and/or drying articles

(57) An electric device for washing and/or drying articles, preferably for household use, comprises: an outer containment structure (2); a compartment (3) inside the outer containment structure (2); means (4) for supporting the articles to be washed and/or dried, in at least one configuration the supporting means (4) being housed in the inner compartment (3); functional means for washing and/or drying the articles placed in the supporting means (4); a door (6) which opens and closes, allowing the user access to the supporting means (4) located in the inner compartment (3) and, at least in a closed configuration, partly delimiting the inner compartment (3); an active particle emitter (70), the particles performing an anti-odour and/or sanitising action; means (71) for conveying the active particles into the inner compartment (3), the conveying means (71) comprising at least one active particle outlet (712) in fluid communication with the emitter (70), the outlet leading into the inner compartment (3) when the door (6) is in the closed configuration. The active particle emitter (70) and said at least one outlet (712) are integral with the door (6).

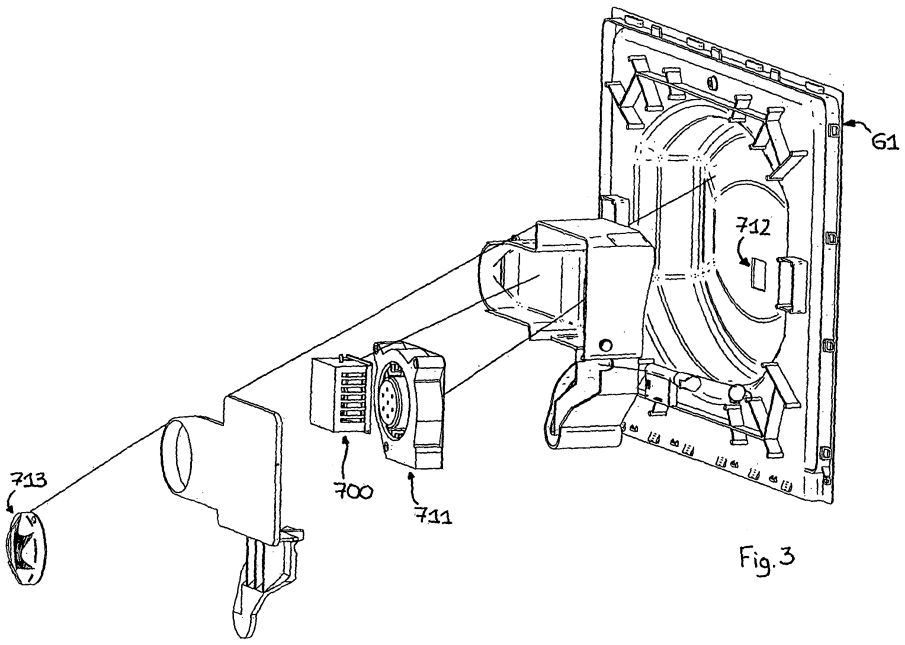

Fig.3

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Description

[0001] The present invention relates to an electric device for washing and/or drying articles. For example said device may be a washing machine, a washer - drier, a tumble drier, a dishwasher. The device is equipped with an active particle emitter, said particles performing an anti-odour and sanitising function. For example, this allows laundry to be refreshed, eliminating odours and bacteria linked to sweat, smoke, etc.

[0002] Such devices are used in particular at household level.

[0003] There are prior art tumble driers comprising:

- a first inner compartment housing a drum designed to receive the laundry to be dried;
- an ozone generator, said gas being used to perform an anti-odour action.

[0004] The tumble drier comprises a second inner compartment housing the ozone generator, the second inner compartment being positioned above the first inner compartment. The ozone generator is located along the path of an air flow used by the tumble drier. The ozone is conveyed into the drum by means of an air flow which passes through the perforated cylindrical lateral wall of the rotary drum.

[0005] The tumble drier described above has several disadvantages.

[0006] In particular, the ozone is generated close to means for heating the air flow (for example, an electric heating element) and at a predetermined distance from the drum. Moreover, to reach the inside of the drum, the air flow with ozone particles passes through the perforated walls of the drum. However, ozone is a very aggressive substance and its generation close to the metal means for heating the air flow could result in premature oxidation of said heating means. Similarly, the drum or the metal walls located along the path of the air flow could be subject to oxidation.

[0007] Moreover, due to interaction with the above-mentioned metal walls, the quantity of ozone which is ultimately available in the drum to perform the desired anti-odour action is very limited.

[0008] The present invention has for an aim to overcome the above-mentioned disadvantages by providing an electric device for washing and/or drying articles, being equipped with an anti-odour and/or sanitising device, the electric device allowing a reduction in oxidation of the device components.

[0009] The present invention also has for an aim to provide an electric device for washing and/or drying articles, being equipped with an anti-odour and sanitising device, the electric device allowing optimisation of the efficiency with which the active particles generated are used.

[0010] Another aim of the present invention is to provide an electric device for washing and/or drying articles, being equipped with an anti-odour and sanitising device, the electric device facilitating maintenance work.

[0011] These aims and others, which are more apparent in the description which follows, are achieved, in accordance with this invention, by an electric device for washing and/or drying articles having the structural and functional characteristics described in the independent claims herein. Alternative embodiments of the device are described in the dependent claims.

[0012] The invention is described in more detail below, with reference to the accompanying drawings, which illustrate a preferred non-limiting embodiment of the invention, and in which:

- Figure 1 is a schematic view of an electric device for washing and/or drying articles in accordance with the present invention;
- Figure 2a is a front view of a component of a device for washing and/or drying articles in accordance with the present invention;
- Figures 2b - 2d illustrate the component of Figure 2a with some parts cut away to better illustrate others;
- Figure 2e is a side view of the component of Figure 2a;
- Figure 3 is an exploded view of the elements of Figure 2c;
- Figure 4 is an enlarged perspective view of an element of Figure 2c;
- Figure 5 illustrates several elements of Figure 4 with some parts cut away to better illustrate others;
- Figure 6 is a cross-section according to the plane A - A of Figure 5.

[0013] With reference to the accompanying drawings, the numeral 1 denotes an electric device for washing and/or drying articles, preferably for household use.

[0014] Said electric device 1 may be a washing machine or a washer - drier or a tumble drier and in such a case may perform its action on laundry such as household linen, bed sheets, clothes, shoes, etc.

[0015] Said electric device 1 may be a dishwasher, in which case it can perform its action on dishes, saucepans, cutlery, etc.

[0016] The electric device 1 comprises:

- an outer containment structure 2;
- a compartment 3 inside the outer containment structure 2;
- means 4 for supporting the articles to be washed and/or dried, in at least one configuration the supporting means 4 being housed in the inner compartment 3;
- functional means for washing and/or drying the articles placed in the supporting means 4;
- a door 6 which opens and closes, allowing the user access to the supporting means 4 located in the inner compartment 3 and, at least when the door 6 is in a closed configuration, partly delimiting the inner com-

partment 3;

- an active particle emitter 70, the particles performing an anti-odour and/or sanitising action;
- means 71 for conveying the active particles into the inner compartment 3. The conveying means 71 comprise at least one active particle outlet 712. Said outlet 712 is in fluid communication with the emitter 70.

[0017] The functional means may comprise for example the means for heating the washing or drying operating fluid (typically comprising an electric heating element), as well as the ducts and guide and control devices for the fluid (typically comprising a pump or a fan).

[0018] The device 1 may implement a sanitising and/or anti-odour treatment cycle for the articles placed in the supporting means 4, said treatment cycle involving at least the active particle emitter 70 and the means 71 for conveying said active particles. The device 1 comprises a user interface 100 which allows the user to select and start the treatment cycle, and if necessary also to monitor treatment cycle progress, supplying information and/or messages by means of a screen or a set of LEDs.

[0019] The emitter 70 may be disabled when the functional washing and/or drying means are active. Advantageously, the sanitising and/or anti-odour treatment cycle is carried out on the laundry when it is already dry.

[0020] The active particles comprise, or coincide with, positive and/or negative ions.

[0021] The active particles comprise, or coincide with, ozone molecules.

[0022] Advantageously, the active particle emitter 70 comprises an active particle generator 700. Alternatively, the active particle emitter 70 could comprise an active particle tank, for example an ozone tank, although this embodiment is not preferable. Ozone is quite unstable, making its preservation in pressurised cylinders complex. The active particle generator 700 may be connected to an emitter of perfumes and/or fragrances.

[0023] The active particle generator 700 normally simultaneously generates both ozone and ions.

[0024] For example the active particle generator 700 may carry out its action using the corona effect. In one particular embodiment, the particle generator 700 carries out its action using a non-concentrated corona effect which uses the delocalisation of the charge exploiting the technology known in scientific literature as "non-thermal plasma technology". A similar particle generator 700 is described in patent document DE10254135.

[0025] Alternatively, the particle generator carries out its action using a concentrated corona effect which exploits the localisation of the charge. Said type of active particle generator 700 is also known and therefore not described in further detail.

[0026] In another embodiment an active particle generator 700 could be used which carries out its action using UV rays (for example a UV lamp). Said type of active particle generator 700 is also known and therefore not described in further detail.

[0027] As already indicated, the active particle generator 700 generates both ozone and ions. The ozone carries out above all an anti-odour action, whilst the ions carry out above all an action against germs and therefore they allow good sanitisation. The ions (usually H^+ and OH^-) deactivate germ breeding sites.

[0028] In contrast, the ozone breaks up the ketonic or aldehydic compounds responsible for the odours which are found on laundry or which are in the volatile state in the inner compartment 3. By interacting with the above-mentioned odorous compounds, ozone frees pure oxygen and a free radical which attacks the odorous molecules formed mainly from oxygen, hydrogen, carbon, mainly creating CO_2 and H_2O.

[0029] The active particle emitter 70 and said at least one outlet 712 are characterised in that they are integral with the door 6 at least during door opening and closing. When the door 6 is in the closed configuration, said at least one outlet 712 leads into the inner compartment 3.

[0030] The door 6 which opens and closes houses the active particle emitter 70 and said at least one outlet 712.

[0031] Advantageously, the door 6 which opens and closes can move with a rotary motion relative to the containment structure 2.

[0032] Above all in the case of washing machines, the door 6 comprises an opaque frame and a transparent central portion (normally consisting of a glass inspection window). In such a case the active particle emitter 70 and the conveying means 71 are advantageously made at the frame.

[0033] The means 71 for conveying the active particles into the inner compartment 3 comprise a pipe 710, at least part of which is integral with the door 6 and extends between the emitter 70 and the outlet 712. Advantageously, the pipe 710 extends between a fluid intake 713 and the outlet 712. The intake 713 may suck in air from the outside environment or (embodiment not illustrated) from the inner compartment 3. The active particle emitter 70 is preferably located along the pipe 710.

[0034] The conveying means 71 comprise means 711 for moving a fluid which are in fluid communication with the pipe 710 and which, if activated, generate a fluid flow suitable for drawing the active particles along the pipe 710 from the emitter 70 to the outlet 712. Relative to the flow of the fluid flow in the pipe 710, the movement means 711 may be downstream (as illustrated in the accompanying drawings) or upstream of the active particle emitter 70. The movement means 711 usually comprise a fan, preferably made of plastic material.

[0035] Advantageously, the fluid flow, generated along the pipe 710 by the fluid movement means 711, is an air flow, and in particular said air is preferably drawn from the environment outside the outer containment structure 2.

[0036] The conveying means 71 also comprise a pipe 710 outlet 712 which, at least when the door 6 is closed, leads into the inner compartment 3. Experimentation has shown that ozone and ions tend to interact above all with

materials which conduct electricity, such as metals, whilst their interaction with plastic materials is much more limited.

[0037] For this reason, the pipe 710, at least between the active particle emitter 70 and the outlet 712, is made entirely of an electrically insulating material, to minimise interaction with the active particles conveyed into the inner compartment 3. This means that oxidation of the pipe 710 can be avoided and system efficiency can be increased, since the active particles, not reacting with the conveying means 71, will be more concentrated when they reach the inside of the inner compartment 3 where they will carry out their action.

[0038] The conveying means 71 comprise a gate 8 which opens/closes the pipe 710. The gate 8 is located either between the active particle emitter 70 and the outlet 712 or at the outlet 712.

[0039] The gate 8 is made of an electrically insulating material to minimise interaction with the active particles which are conveyed onto the articles placed in the supporting means 4 housed in the inner compartment 3.

[0040] The gate 8 is closed when the fluid movement means 711 are disabled, to limit the risk of foreign bodies, which enter through the outlet 712, reaching the active particle emitter 70 (for example, in the case of a tumble drier or washer - drier said foreign bodies could be fluff generated by the laundry during the drying treatment). Obviously, when the fluid movement means 711 are active it is the fluid flow in the inner compartment 3 that prevents the flying foreign bodies from reaching the active particle emitter 70. The gate 8 allows a hermetic seal. The gate 8 may be moved by an electric motor which opens it when the emitter 70 or the fluid movement means 711 are activated and closes it when the emitter 70 or the fluid movement means 711 are disabled. Alternatively, the gate 8 is elastically operated for example by an elastic spring 80. Consequently, when the fluid movement means 711 are active, the pressure they generate causes the gate 8 to open, but when the pressure drops the gate 8 closes. Alternatively, the gate 8 is activated by a wax actuator, a well-known component in technical literature.

[0041] Especially in the case of washing machines, washer - driers, tumble driers, the supporting means 4 for the articles comprise a rotary drum 40 for housing the articles to be washed and/or dried. In this case said articles are usually textile articles. The drum 40 has an opening 41 for inserting or removing textile articles. At least when the door 6 is closed, the pipe 710 outlet 712 is opposite the opening 41 in the drum 40. In this way the fluid and the active particles drawn by it are introduced into the inner compartment 3 directly on the articles to be treated and do not have to pass through the metal walls of the rotary drum 40. The rotary drum 40 cannot normally be removed from the inner compartment 3. In this description, the space delimited by the rotary drum 40 must be considered an integral part of the inner compartment 3 which houses the supporting means 4. In addition to the space delimited by the drum 40, the inner compartment 3 comprises an additional space interposed between the rotary drum 40 and the walls delimiting the compartment 3 (allowing the drum 40 to rotate inside the inner compartment 3).

[0042] In the case of dishwashers the supporting means 4 comprise one or more removable racks (of the known type) on which the dishes are placed. Said racks can usually be removed by moving them from the inner compartment 3 through the opening which can be closed by the door 6.

[0043] Whatever the type of household electrical appliance, the door 6 which opens and closes may comprise a first and a second covering element 61, 62 positioned alongside each other and spaced out. Between the first and second covering elements 61, 62 there is a housing 63 in which the fluid movement means 711, the pipe 710 and the active particle emitter 70 may be located. When the door 6 is closed, the first covering element 61 partly delimits the inner compartment 3. Relative to the first covering element 61, the second covering element 62 is on the opposite side of the door 6 and facing towards the outside environment. In the embodiment illustrated in the accompanying drawings, the pipe 710 outlet 712 is made on the first covering element 61. On the second covering element 62 there could be the intake 713 for a fluid which will be conveyed in the pipe 710. In particular said fluid is air drawn from the outside environment (or alternatively, the intake 713 could be made on the first covering element 61: in which case the air is drawn from the inner compartment 3 and made to recirculate along the conveying means 71). At the intake 713 there are also means (for example comprising a grille or a membrane) for filtering out dust or foreign bodies which could damage the active particle emitter 70.

[0044] The electric device 1 comprises means for measuring the concentration of at least one type of said active particles in a fluid. For example, there may be means for measuring the concentration of ozone or the concentration of ions or both. Said measuring means comprise a sensor. The sensor is usually located in the inner compartment 3.

[0045] The measuring means also comprise an electronic control board which activates/disables the emission of active particles in the pipe 710 by the emitter 70, said activation/disabling occurring depending on the information supplied by the measuring means.

[0046] If the concentration of active particles in contact with the articles to be treated were too low, their action could have limited efficiency. Vice versa, if the concentration of active particles in contact with the articles were too high (especially in the case of ozone) there would be the risk of damaging the articles to be treated (for example, the colours of any clothes). For example, in the case of ozone, an optimum concentration is between 0.3 and 0.5 ppm.

[0047] In an alternative embodiment the emitter 70 and the fluid movement means 711 operate continuously for

the entire duration of the sanitising and/or anti-odour treatment cycle. Appropriately, the duration of the treatment is a parameter which is preset in the factory. Alternatively, there may be a plurality of preset parameters representing the duration of the treatment, each guaranteeing a different treatment intensity and/or being specific to the type of load or the type of electric device.

[0048] In general, during use, the articles to be subjected to a sanitising and/or anti-odour treatment cycle are introduced into the inner compartment 3 and placed in the supporting means 4. Then the door 6 is closed and the treatment cycle is started.

[0049] The active particles generated by the emitter 70 are conveyed through the conveying means 71 into the inner compartment 3 where they make contact with the articles to be treated. Said particles will then carry out their action.

[0050] This invention has important advantages.

[0051] First, the position of the emitter 70 and the conveying means 71 in/on the door 6 allows containment of the path that the active particles must follow to reach the articles to be treated. The relatively short journey reduces interactions between the active particles and the walls and anything else along the path. Obviously, said interactions must be avoided because they reduce the number of active particles which will reach the inner compartment 3, in particular inside the drum, and which will therefore interact with the articles to be treated and/or with the atmosphere in which these articles are located. Reducing the path significantly reduces the parts of the electric device 1 which come into contact with the fluid flow rich in active particles. There is also a consequent reduction in the parts of the electric device 1 which must be made of materials that minimise oxidation in contact with the active particles. The shorter the path is, the more limited the zone with a constrained choice of materials will be.

[0052] Another important advantage is that the emitter 70, being applied to the door 6, is positioned in a point which is easily accessible for any maintenance or repair work which may be needed.

[0053] It shall be understood that the invention described may be modified and adapted in several ways without departing from the scope of the inventive concept.

[0054] Moreover, all the details of the invention may be substituted by other technically equivalent elements.

[0055] In practice, all the materials used, as well as the dimensions, may be changed to meet specific needs.

Claims

1. An electric device for washing and/or drying articles, preferably for household use, comprising:

   - an outer containment structure (2);
   - a compartment (3) inside the outer containment structure (2);
   - means (4) for supporting the articles to be washed and/or dried, in at least one configuration the supporting means (4) being housed in the inner compartment (3);
   - functional means for washing and/or drying the articles placed in the supporting means (4);
   - a door (6) which opens and closes, allowing the user access to the supporting means (4) located in the inner compartment (3) and, at least in a closed configuration, partly delimiting the inner compartment (3);
   - an active particle emitter (70), the particles performing an anti-odour and/or sanitising action;
   - means (71) for conveying the active particles into the inner compartment (3), the conveying means (71) comprising at least one active particle outlet (712) in fluid communication with the emitter (70);

   the device being **characterised in that** the active particle emitter (70) and said at least one outlet (712) are integral with the door (6), and when the door (6) is in the closed configuration, the outlet (712) leading into the inner compartment (3).

2. The device according to claim 1, **characterised in that** the door (6) which opens and closes houses the active particle emitter (70) and said at least one outlet (712).

3. The device according to either of the foregoing claims, **characterised in that** the active particles comprise, or coincide with, positive and/or negative ions or the active particles comprise, or coincide with, ozone molecules.

4. The device according to any of the foregoing claims, **characterised in that** the means (71) for conveying the active particles into the inner compartment (3) comprise:

   - a pipe (710), at least part of which is integral with the door (6) and extends between the emitter (70) and the outlet (712);
   - fluid movement means (711) in fluid communication with the pipe (710) and which, if active, generate an air flow suitable for drawing the active particles along the pipe (710) from the emitter (70) to the outlet (712); the fluid movement means (711) being located upstream or downstream of the active particle emitter (70) relative to the air flow in the pipe (710).

5. The device according to claim 4, **characterised in that** the pipe (710), at least between the active particle emitter (70) and the outlet (712), is made entirely of an electrically insulating material, to minimise in-

teraction with the active particles conveyed into the inner compartment (3).

6. The device according to claim 4 or 5, **characterised in that** the conveying means (71) comprise a gate (8) which opens/closes the pipe (710), the gate (8) being:

- located either between the active particle emitter (70) and the outlet (712) or at the outlet (712);
- made of an electrically insulating material to minimise interaction with the active particles which are conveyed onto the articles placed in the supporting means (4) housed in the inner compartment (3);
- closed when the fluid movement means (711) are disabled, to limit the risk of foreign bodies, which enter through the outlet (712), reaching the active particle emitter (70).

7. The device according to any of the foregoing claims, **characterised in that** the supporting means (4) for the articles comprise a rotary drum (40) for supporting the articles, the rotary drum (40) having an opening (41) for inserting or removing the articles to be washed and/or dried, the outlet (712) being opposite the rotary drum (40) opening (41) when the door (6) is closed.

8. The device according to any of the foregoing claims, **characterised in that** it comprises:

- means for measuring the concentration of at least one type of said active particles, the measuring means comprising a sensor located in the inner compartment (3);
- an electronic control board which activates/disables the emission of active particles in the pipe (710) by the emitter (70), said activation/disabling occurring depending on the information supplied by the measuring means.

9. The device according to any of the foregoing claims, **characterised in that** the door (6) comprises an opaque frame and a transparent central portion, the emitter (70) and the conveying means (71) being made at the frame.

10. The device according to any of the foregoing claims, **characterised in that** the active particle emitter (70) comprises an active particle generator (700).

11. The device according to claim 10, **characterised in that** the active particle generator (700) simultaneously generates both ozone and ions using the corona effect.

12. The device according to claim 10, **characterised in that** the active particle generator (700) carries out its action using UV rays.

13. The device according to any of the foregoing claims, **characterised in that** the emitter (70) is disabled when the functional means for washing and/or drying are active.

14. The device according to any of the foregoing claims, **characterised in that** it implements an anti-odour and sanitising treatment cycle for the articles placed in the supporting means (4), said treatment cycle involving at least the active particle emitter (70) and the means (71) for conveying said active particles.

15. The device according to any of the foregoing claims, **characterised in that** it is a washing machine or a washer - drier or a tumble drier or a dishwasher.

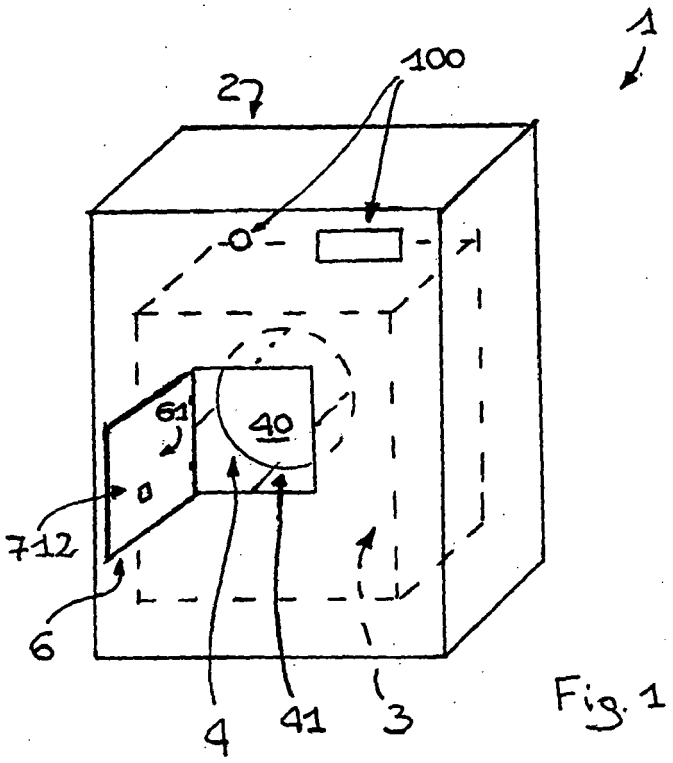

Fig. 1

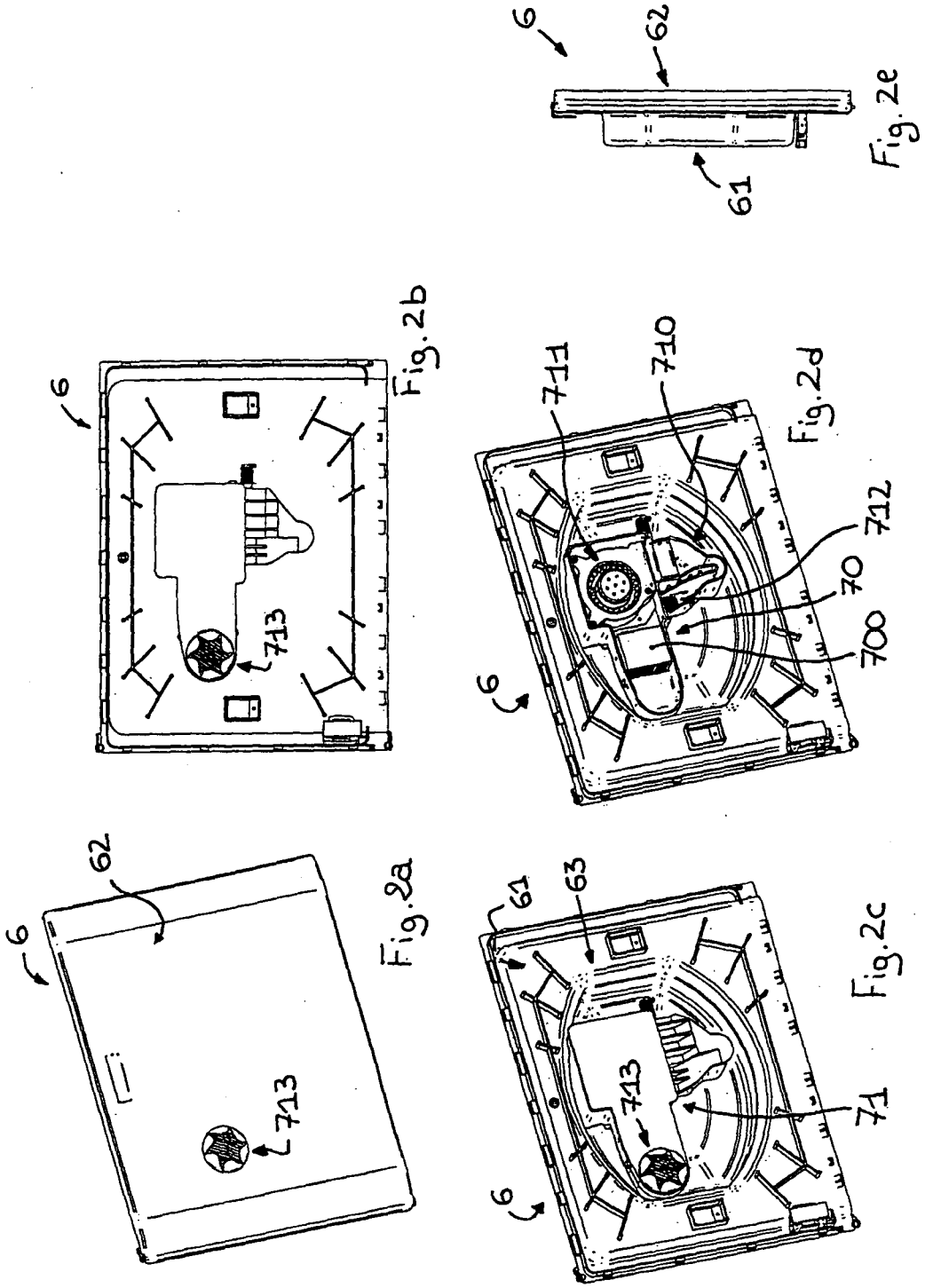

Fig.2e
Fig.2b
Fig.2d
Fig.2a
Fig.2c

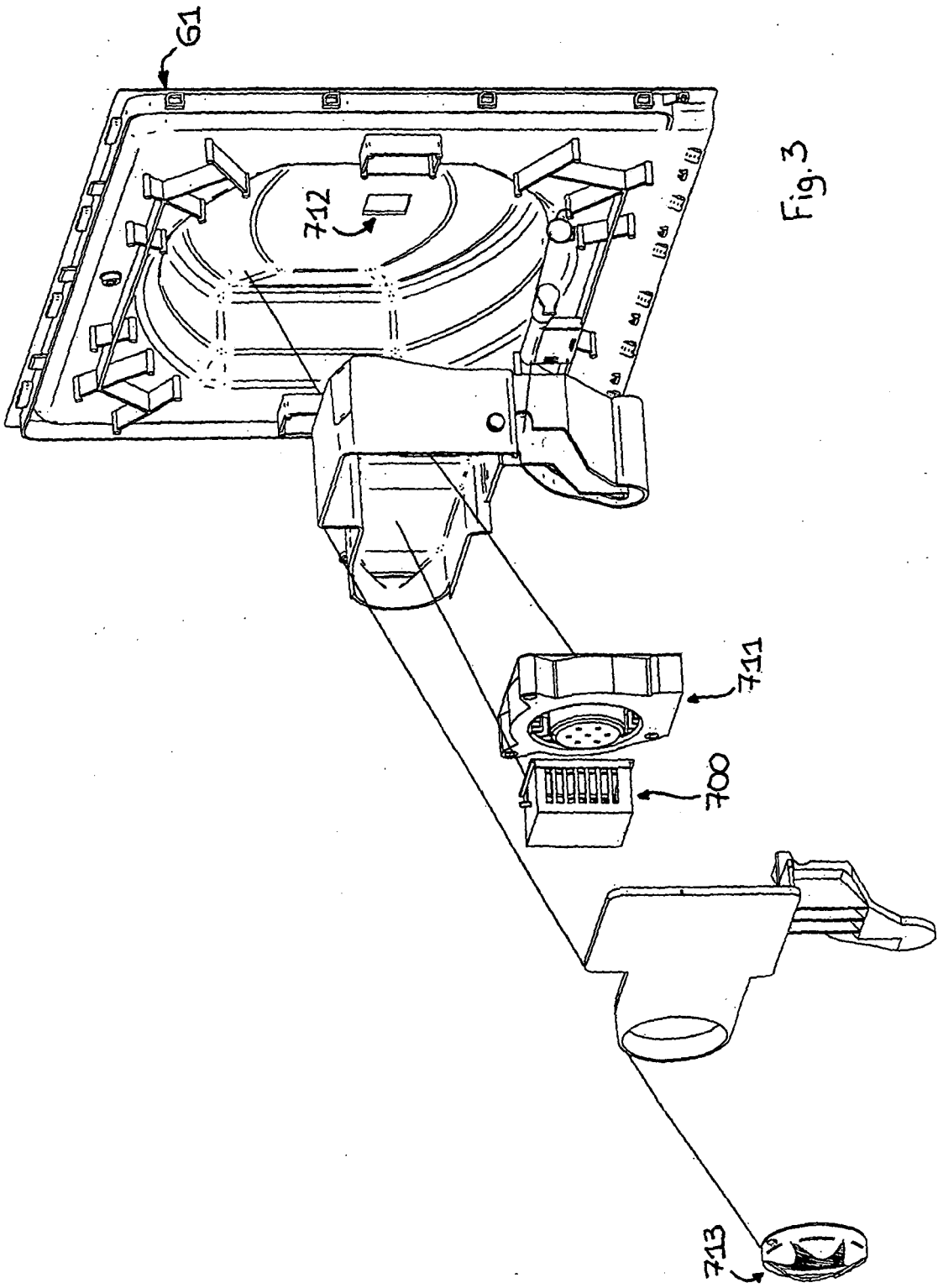

Fig. 3

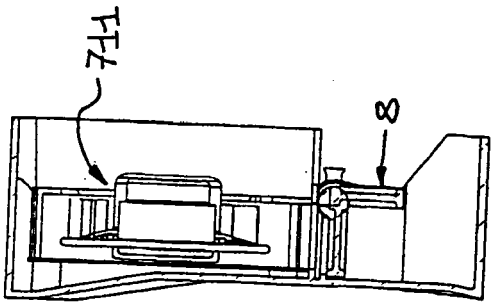

Fig. 6

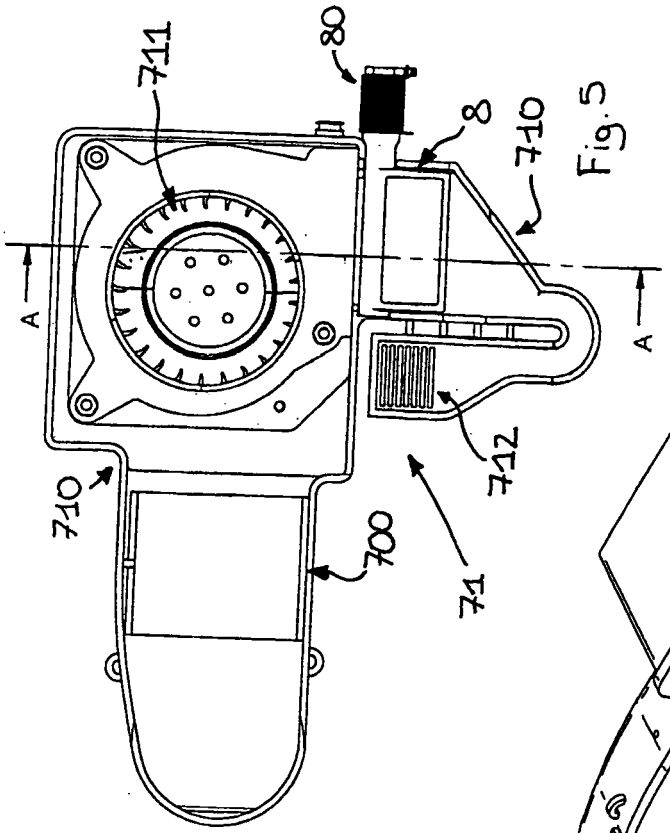

Fig. 5

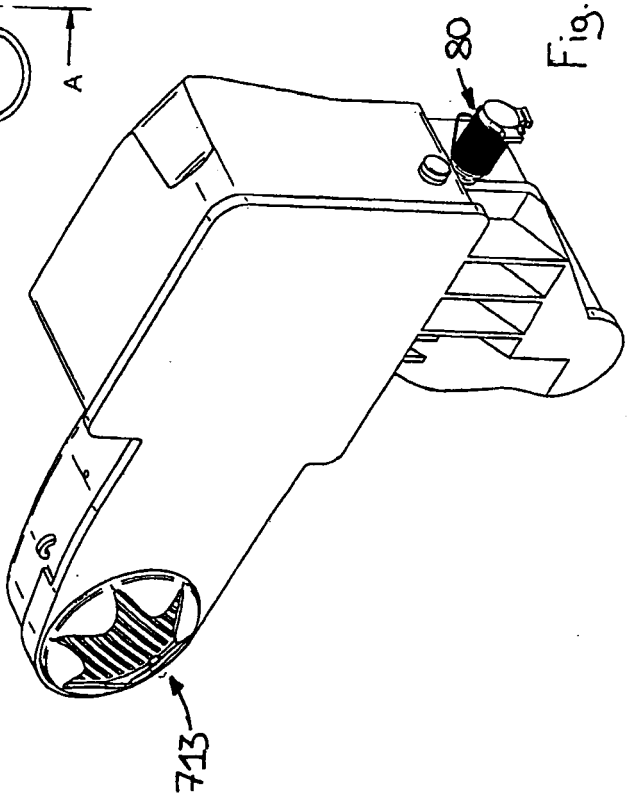

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 08 02 1247

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 2004/046448 A (PROCTER & GAMBLE [US]) 3 June 2004 (2004-06-03) * figures 5,7 *	1,2,7,15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 April 2009	Diaz y Diaz-Caneja

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 02 1247

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
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