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

(72) Inventors:
- **Dal Ben, Diego**
  33080 Porcia (PN) (IT)
- **Lorenc, Marcin**
  33080 Porcia (PN) (IT)
- **Santarossa, Marco**
  33080 Porcia (PN) (IT)
- **Vian, Alessandro**
  33080 Porcia (PN) (IT)

(74) Representative: **Nardoni, Andrea et al**
Electrolux Italia S.p.A.
Corso Lino Zanussi, 30
33080 Porcia (PN) (IT)

(54) Laundry treating machine

(57) The present invention relates to a laundry treating machine (1) comprising a casing (2) accommodating a laundry chamber suitable for receiving the laundry to be treated, a bottom part (16) comprising a basement (14) and a bottom closing element (7; 57; 77) applicable to the basement (14) in a side thereof (17) facing the floor where the machine (1) rests. The bottom closing element (7; 57; 77) comprises an air passage (12; 82, 83) allowing an air flow to pass therethrough. The bottom closing element (7; 57; 77) comprises a grid-like structure (40; 60; 85, 86) at least partially closing such air passage (12; 82, 83).

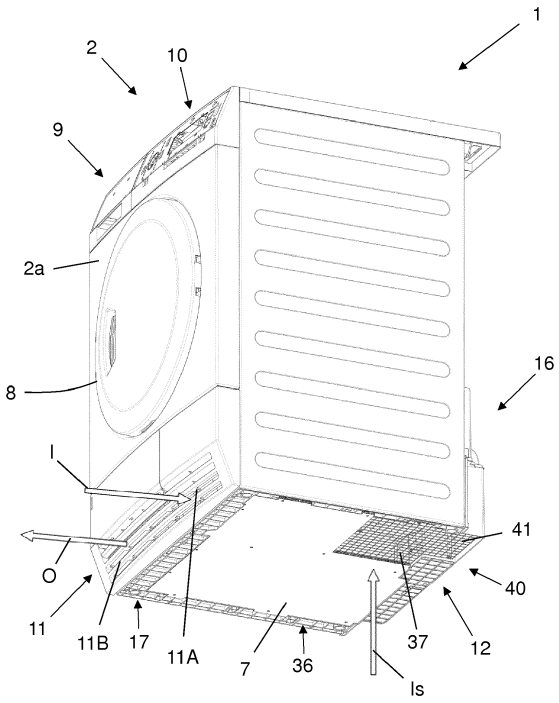

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns the technical field of laundry treating machines. In particular, the present invention refers to laundry washing and/or drying machines..

BACKGROUND ART

[0002] Laundry treating machines capable of carrying out a drying process on laundry generally comprise a casing that houses a laundry container, like a rotating drum, where laundry to be treated is received, and an air circuit for carrying out drying operation by circulating hot air through the laundry container. Air circulating means and heating means are provided in the air circuit for circulating and heating drying air, respectively. In condenser type dryers, condensing means are further provided in the air circuit for removing moisture from drying air passing through articles to be treated thereby allowing said air to be recirculated cyclically within the air circuit. Moisture removed from articles is either collected in a tank periodically emptied by a user or it is directly exhausted by a pipe connected to a waste water net.

[0003] Washing and drying machines, i.e. machines provided for performing articles washing and drying operations in a single machine are also known and generally comprise a water circuit including pumping means for allowing washing water to be supplied to a laundry treating chamber and a drying arrangement as described before for drying laundry.

[0004] In the following description the invention will be disclosed with particular reference to a machine suitable for carrying out a drying operation on laundry such as a laundry drying machine or a washing and drying machine of condenser type.

[0005] However, in general, principles of the invention may be applied to a laundry treating appliance, such as a washing machine, for example in cases when an air flow is needed to cool machine operating devices or part thereof. The invention may be equivalently applied to a vented dryer, i.e. a dryer wherein drying air is exhausted from the machine.

[0006] In a known condenser type laundry dryer, means for condensing moisture removed by articles are configured in many different ways.

[0007] Typical examples comprise an air-air heat exchanger or an evaporator of a heat pump circuit incorporated within the dryer. Such condensing means or components thereof require to be cooled in order to constantly provide a cold surface where moisture removed from laundry and contained in the drying air can be condensed or to remove heat produced by said components, like a compressor in a heat pump circuit. Normally, air taken from dryer machine surroundings is used as cooling means of a condenser or components thereof.

[0008] In dryers of known type the cooling air is usually taken from the bottom part of the dryer itself. For this reason a bottom closing panel is provided with a plurality of inlet openings. The bottom closing panel may then be further provided with a plurality of outlet openings through which the air is expelled.

[0009] However, such known opening configuration that has been described above pose some drawbacks.

[0010] A first drawback of this known technique is constituted by the fact that objects resting around the machine may be sucked inside the machine thus damaging the components arranged therein, such as the fan and the moisture condensing unit. Another drawback posed by this known technique is constituted by the high noise generated by air mass moved through the openings. This undesired noise is particularly disadvantageous because prevents the machine to be used during night hours and/or to be placed close to rooms where silent is needed, such as bedrooms.

[0011] Another drawback posed by this known technique is constituted by the reduced strength of the closing panel due to the openings formed therein.

[0012] The main object of the present invention is therefore to overcome said drawbacks.

[0013] In particular, it is one object of the present invention to provide a laundry treating machine with an increased reliability with respect to the machines of known type. Another object of the present invention is to provide a laundry treating machine with improved safety.

[0014] A further object of the invention is to provide a laundry treating machine producing a low noise during working operation compared to laundry treating machines of known type.

[0015] Still another object of the present invention is to provide a laundry treating machine having components with higher strength compared to laundry treating machines of known type.

[0016] Advantages, objects, and features of the invention will be set forth in part in the description and drawings which follow and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention.

DISCLOSURE OF INVENTION

[0017] The applicant has found that by providing a laundry treating machine comprising a casing accommodating a laundry chamber suitable for receiving the laundry to be treated, a bottom part, a bottom closing element having an air passage and applicable to said bottom part in a side thereof facing the floor where said machine rests and by providing a protective element at least partially closing the air passage is possible to obtain a laundry treating machine having an increased reliability with respect to the machines of known type.

[0018] The present invention relates, therefore, a laundry treating machine comprising a casing accommodating a laundry chamber suitable for receiving the laundry

to be treated, a bottom part comprising a basement and a bottom closing element applicable to said basement in a side thereof facing the floor where said machine rests, said bottom closing element comprising an air passage allowing an air flow to pass therethrough; wherein said bottom closing element comprises a grid-like structure at least partially closing said air passage.

[0019] In a preferred embodiment of the invention, the grid-like structure comprises a grid removably or fixedly connected to the bottom closing element.

[0020] In a further preferred embodiment of the invention, the grid-like structure is integrally made with said bottom closing element.

[0021] Preferably, the basement is suitable for receiving at least one operational device for carrying out a treatment on said laundry and comprises at least one air flow path for conveying air to and/or from said at least one operational device. According to a preferred embodiment of the invention, the operational device comprises an air-air heat exchanger and the at least one air flow path comprises a cooling air flow for cooling such heat exchanger.

[0022] Opportunely, the at least one air flow path comprises an air path provided for conveying moist air coming from the laundry chamber to the heat exchanger. Further opportunely, the air flow path is in fluid communication with the air passage provided on the bottom closing element.

[0023] Preferably, at least one operational device comprises a heat pump system and the at least one air flow path comprises an air path provided for conveying moist air coming from the laundry chamber to the heat pump system

[0024] Preferably, the at least one air flow path is formed in a lower side of the basement and the bottom closing element closes in a substantially air-tight manner the air flow path.

[0025] In a preferred embodiment of the invention, the bottom closing element is obtained from a plastic sheet subjected to a thermoforming process.

[0026] In a further preferred embodiment of the invention, the bottom closing element and the grid-like structure are obtained from a plastic sheet subjected to a thermoforming process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate possible embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In particular:

- Figure 1 shows a perspective bottom view of a laundry drying machine with a bottom closing element according to a preferred embodiment of the invention;
- Figure 2 shows a partially exploded view of Figure 1;
- Figure 3 shows a perspective bottom view of the basement of the laundry drying machine of Figure 1 with the bottom closing element applied thereto;
- Figure 4 shows a perspective exploded view of Figure 3;
- Figure 5 shows a perspective bottom view of a laundry drying machine with a bottom closing element according to a second embodiment of the invention;
- Figure 6 shows a partially exploded view of Figure 5;
- Figure 7 shows an exploded view of the basement of the laundry drying machine and of the bottom closing element of Figure 5;
- Figure 8 shows a perspective bottom view of a laundry drying machine with a bottom closing element according to a third embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] The present invention has proved to be particularly successful when applied to a laundry drying machine of condenser type provided with an air-air heat exchanger; however it is clear that the present invention can be applied to any type of laundry treating machine, such as laundry washing machines, laundry washing and drying machines, or laundry dryers having a heat pump system for condensing moisture removed from laundry by an air flow circulating from/to the drum and for heating such drying air.

[0029] With reference to Figure 1, reference number 1 indicates as a whole a laundry drying machine 1, hereinafter referred to as dryer.

[0030] The dryer 1 preferably comprises, though not necessarily, a substantially parallelepiped-shaped outer boxlike casing 2 which is preferably structured for resting on the floor and a preferably, though not necessarily, substantially cylindrical rotatable drum (not shown) which is structured for housing the laundry to be dried.

[0031] The drum preferably has its front opening directly facing a laundry loading/unloading pass-through opening provided in the front upright side wall 2a of the boxlike casing 2. A front door 8, pivotally coupled to the front upright side wall 2a, is provided for allowing access to the drum interior region to place laundry to be dried therein.

[0032] An extractable moisture tank in the form of a drawer 9 is slidably arranged on the top of the casing 2, for being periodically emptied by a user in case the dryer cannot be connected to a waste water net through a pipe. A user control interface 10 is arranged on the top of the casing 1 near the drawer 9 for input of laundry treatment programs and displaying machine working conditions.

[0033] The dryer 1 also comprises a hot-air-generating device (not shown) for generating a drying air stream passing through the laundry drum to dry the laundry.

[0034] The dryer 1 of the invention is of the condenser type, i.e. of the type in which drying air is re-circulated

through the drum in a closed loop, and comprises a condensing device, not illustrated, arranged along the drying air path downstream the laundry drum considering the direction of the drying air flow. The hot air produced by the hot-air-generating device removes moisture from laundry in the drum and the moist air then passes through the condensing device.

[0035] Preferably, the condensing device is in the form of an air-air cross-flow type heat exchanger. The moist air passing through the condensing device is cooled by a cooling air flow passing through the condensing device itself. The cooled and also dehumidified air is then conveyed again to the hot-air-generating device. According to a different arrangement, the moisture condensing device may be a refrigerant fluid evaporator of a heat pump system.

[0036] The bottom part 16 of the dryer 1 preferably comprises a basement 14 arranged inside the casing 2. Such basement 14 is better illustrated in Figures 3 and 4 separated from the rest of the machine 1.

[0037] The basement 14 is preferably made by two portions, an upper shell 14a and a lower shell 14b, which are properly connected one to the other, preferably by means of screws or snap-in connections.

[0038] A bottom closing element 7 is removably mounted onto a lower side 36 of the bottom part 16 of the dryer 1, as illustrated in Figure 1. The lower side 36 of the bottom part 16 of the dryer 1 is the side of the bottom part 16 which faces the floor on which the dryer 1 is installed.

[0039] In a preferred further embodiment, the bottom closing element 7 is removably mounted directly onto the casing 2.

[0040] More preferably, as illustrated for example in Figure 3, the bottom closing element 7 is removably mounted onto a lower side 17 of the basement 14. The lower side 17 of the basement 14 is the side of the basement 14 which faces the floor on which the dryer 1 is installed. The bottom closing element 7 preferably closes, in a substantially air-tight manner, the lower part of air paths 31, 32 formed in the basement 14. The air paths 31, 32 allow circulation of a cooling air flow from the external environment to the inner region of the casing 2, i.e. inside the machine body, and the exhaustion of such air flow outside the machine. The air paths 31, 32 being in fluid communication with the air passage 12.

[0041] The basement 14 is preferably made of polymeric material and further preferably it is made by an injection moulding process.

[0042] The basement 14 advantageously comprises a seat, not visible, where the air-air heat exchanger is arranged.

[0043] The basement 14 is opportunely shaped so as to create air paths for conveying moist air coming from the laundry chamber, i.e. the drum inner region, to the air-air heat exchanger and also the air 31, 32 paths for the cooling air flow, as said before.

[0044] On the bottom part 16 of the dryer 1, and preferably in its front upright side wall 2a an air passage 11 is provided for draining air from/to the dryer 1. In the exemplary embodiment of the invention disclosed in the Figures, air passage 11 is divided into two portions 11A, 11B for allowing cooling air to enter and exit the casing 2, as indicated by arrows "I" and "O" in Figure 1, in order to cool the condensing device arranged in the basement 14. If desired, portions 11A and 11B of air passage 11 may be arranged on different upright side walls 2 other than the dryer front wall.

[0045] Furthermore, an air passage 12 is also formed as an opening 37 in the bottom closing element 7. Such air passage 12 is always accessible to air because the bottom closing element 7 extends in a position that is spaced apart and substantially parallel to a floor on which the dryer 1 is placed. The air passage 12 allows a supplemental cooling air to enter the casing 2, as indicated by arrow "Is" in Figures 1 and 3. The distance between bottom closing element 7 and a floor is determined in an adjustable manner through vertically adjustable supports (not illustrated) placed under the casing 2, preferably at the four vertices.

[0046] On the basement 14, and preferably on an upper side 18 of the basement 14, seats are also formed for receiving therein operational devices 5 other than the condensing means, like air pumping means, motor means for powering air pumping means. In practice, basement 14 comprises a lower side forming at least a portion of a first air path wherein the air is drawn in from outside the machine and/or the air is exhausted outside the machine and further comprises an upper side forming at least a portion of a second air path that passes through one or more of said operational devices 5. The first air path is in fluid communication with the passage 12 and it may pass through one or more of said operational devices 5.

[0047] In a further embodiment of a laundry machine according to the invention, said operational devices 5 may comprise other functional devices to carry out a drying treatment on laundry as, for example, heat pump circuit components like fluid compressing means, heat exchanging means, fluid condensing and/or evaporating means. The heat pump circuit is provided to heat the drying air and remove moisture therefrom.

[0048] According to the invention, the opening 37 of the air passage 12 in the bottom closing element 37 preferably comprises a protective element 40.

[0049] The protective element 40 preferably comprises a grid-like element 41. More preferably, the protective element 40 comprises a grid 41. Such a grid 41 may be realized with any suitable material. Preferably the grid 41 is a metallic or a plastic grid.

[0050] In a preferred embodiment of the invention, the grid 41 constitutes a separate element which is removably connected to the bottom closing element 7. Advantageously, the protective element 40 may be easily removed for its replacement or for allowing inspection of the inner region of the basement 14.

[0051] In a further preferred embodiment of the invention, the grid 41 may be fixedly connected to the bottom closing element 7. In this case, the grid 40 may be advantageously and quickly connected to the bottom closing element 7 while it is produced. For example, the bottom closing element 7 and the grid 41 may be co-moulded when the bottom closing element 7 is realized by injection of a plastic material. In this way two different materials may be used for making the bottom closing element 7 and the grid 41.

[0052] The bottom closing element 7 may be alternatively obtained with a thermoforming process. In said thermoforming process a plastic sheet is heated to a pliable forming temperature and then formed to the specific desired shape in a mould. The plastic sheet used in the process preferably comprises a polypropylene panel.

[0053] The provision of the protective element 40 for the air passage 12 on the bottom closing element 7 of the present invention, prevents any object resting around the machine 1 to be sucked inside the basement 14. This avoids damaging of the components arranged inside the basement 14, like the condensing device, the operational devices 5, etc..

[0054] The grid-like structure of the protective element 40 may also contribute to reduce the noise generated by the air mass moved through the opening 37. The machine may therefore to be placed and operated close to rooms where low noise or silent is required or even during night hours.

[0055] Furthermore, the grid-like structure of the protective element 40 increases strength of the bottom closing element 7, thus increasing reliability of the dryer 1.

[0056] The bottom closing element 7 preferably closes almost the entire surface of the lower side 17 of the basement 14, and in general the lower side 16 of the dryer 1. In further embodiments, nevertheless, the bottom closing element could have a different extent, for example partially closing of the lower side 16 of the dryer 1. With reference to Figures from 5 to 7, a construction variant of the bottom closing element 57 is described.

[0057] Said embodiment differs from the first embodiment previously described in that the bottom closing element 57 is obtained in a single piece construction with the protective element 60. The protective element 60 comprises, advantageously, a grid-like structure 61. The bottom closing element 57 and the protective element 60 therefore define a completed, integral, unitary member.

[0058] The bottom closing element 57 is preferably obtained with a thermoforming process. In said thermoforming process a plastic sheet is heated to a pliable forming temperature and then formed to the specific desired shape and with the specific desired grid-like structure. The plastic sheet used in the process preferably comprises a polypropylene panel.

[0059] Advantageously, the realization of the bottom closing element 57 with a thermoforming process is cost saving.

[0060] With reference to Figure 8, a further construction variant of the bottom closing element 77 is described.

[0061] Such embodiment differs from the embodiments previously described in that the bottom closing element 77 is provided with two air passages 82, 83 formed as openings, each comprising a protective element 85, 86.

[0062] The first opening 82 preferably allows cooling air to enter the casing 2 and the second opening 83 preferably allows cooling air to exit the casing 2, as indicated by arrows "I" and "O" in Figure 8.

[0063] The protective elements 85, 86 preferably comprise a grid-like structure.

[0064] In the embodiment here illustrated, the bottom closing element 77 is obtained in a single piece construction with the protective elements 82, 82. The bottom closing element 77 and the protective elements 82, 83 therefore define a completed, integral, unitary member.

[0065] The bottom closing element 77 is preferably obtained with a thermoforming process.

[0066] It is clear that in different embodiments each of the protective elements may be obtained in a different way, for example it may comprise a metallic or a plastic grid.

[0067] Clearly, changes may be made to the bottom closing element and the protective element as described herein. For example any suitable shape for the protective element may be provided.

[0068] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, it makes it possible to obtain a laundry treating machine with an increased reliability with respect to the machines of known type. Although illustrative embodiments of the present invention have been described herein with reference to the accompany drawings, it is to be understood that the present invention is not limited to the specific embodiments illustrated and described herein, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope 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.

Claims

1. A laundry treating machine (1) comprising a casing (2) accommodating a laundry chamber suitable for receiving the laundry to be treated, a bottom part (16) comprising a basement (14) and a bottom closing element (7; 57; 77) applicable to said basement (14) in a side thereof (17) facing the floor where said machine (1) rests, said bottom closing element (7; 57; 77) comprising an air passage (12; 82, 83) allowing an air flow to pass therethrough; **characterized in that** said bottom closing element (7; 57; 77) comprises a grid-like structure (40; 60; 85, 86) at least partially closing said air passage (12; 82, 83).

2. A machine (1) according to claim 1, **characterized in that** said grid-like structure (40) comprises a grid (41) removably or fixedly connected to said bottom closing element (7).

3. A machine (1) according to claim 1, **characterized in that** said grid-like structure (60; 85, 86) is integrally made with said bottom closing element (7).

4. A machine (1) according to any preceding claim, **characterized in that** said basement (14) is suitable for receiving at least one operational device (5) for carrying out a treatment on said laundry and comprises at least one air flow path (31, 32) for conveying air to and/or from said at least one operational device (5).

5. A machine (1) according to claim 4, **characterized in that** said at least one operational device (5) comprises an air-air heat exchanger and said at least one air flow path comprises a cooling air flow (31, 32) for cooling said heat exchanger.

6. A machine (1) according to any claims 4 or 5 **characterized in that** said at least one air flow path is in fluid communication with the air passage (12, 82, 83).

7. A machine (1) according to according to claim 5, **characterized in that** said at least one air flow path comprises an air path provided for conveying moist air coming from said laundry chamber to said heat exchanger.

8. A machine (1) according to claim 4, **characterized in that** said at least one operational device (5) comprises a heat pump system and said at least one air flow path comprises an air path provided for conveying moist air coming from said laundry chamber to said heat pump system.

9. A machine (1) according to any claims from 4 to 8 **characterized in that** said at least one air flow path is formed in a lower side of said basement (14) and said bottom closing element (7; 57; 77) closes in a substantially air-tight manner said at least one air flow path.

10. A machine (1) according to any preceding claim, **characterized in that** said bottom closing element (7; 57; 77) is obtained from a plastic sheet subjected to a thermoforming process.

11. A machine (1) according to any preceding claim, **characterized in that** said bottom closing element (7; 57; 77) and said grid-like structure (40; 60; 85, 86) are obtained from a plastic sheet subjected to a thermoforming process.

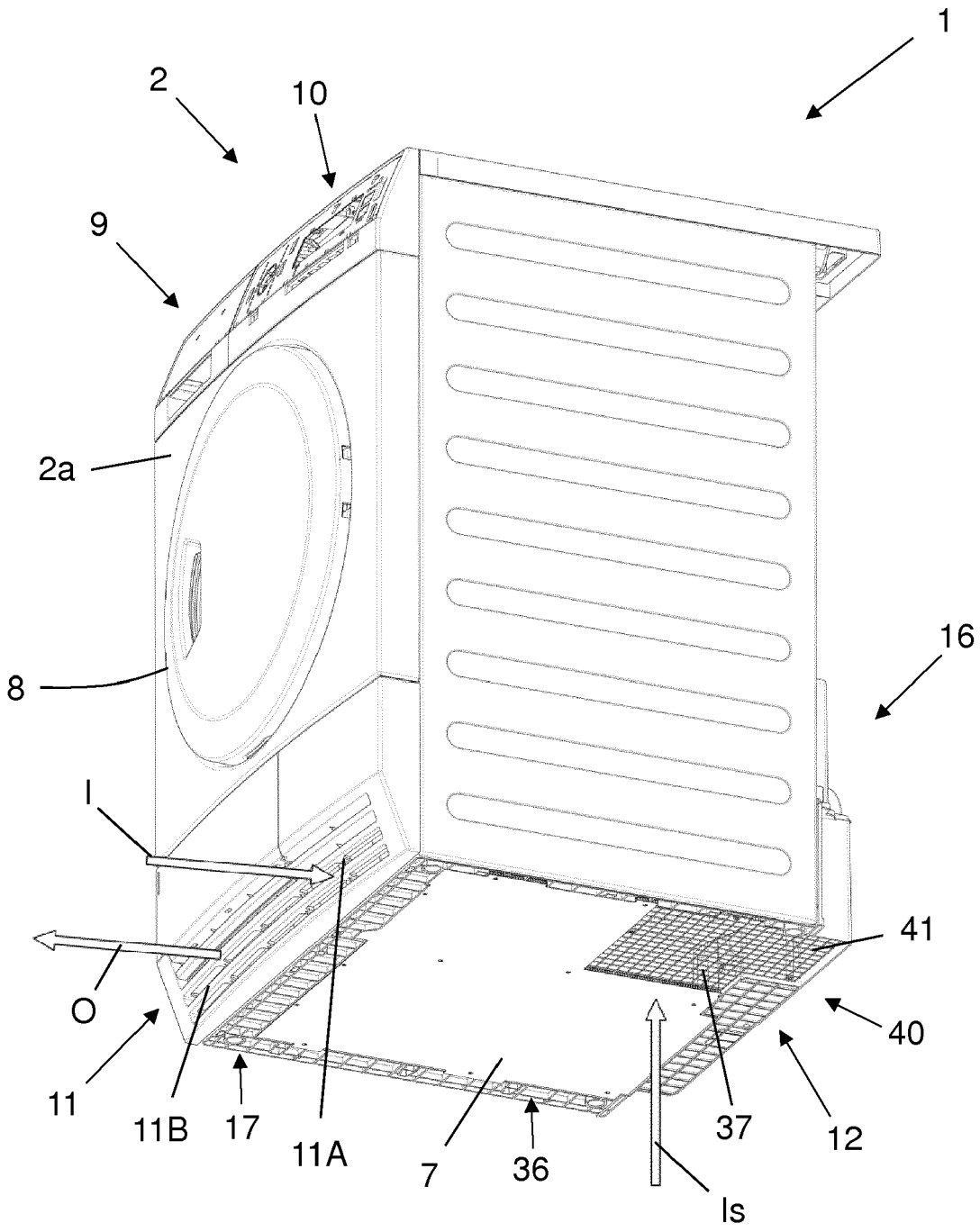

FIG. 1

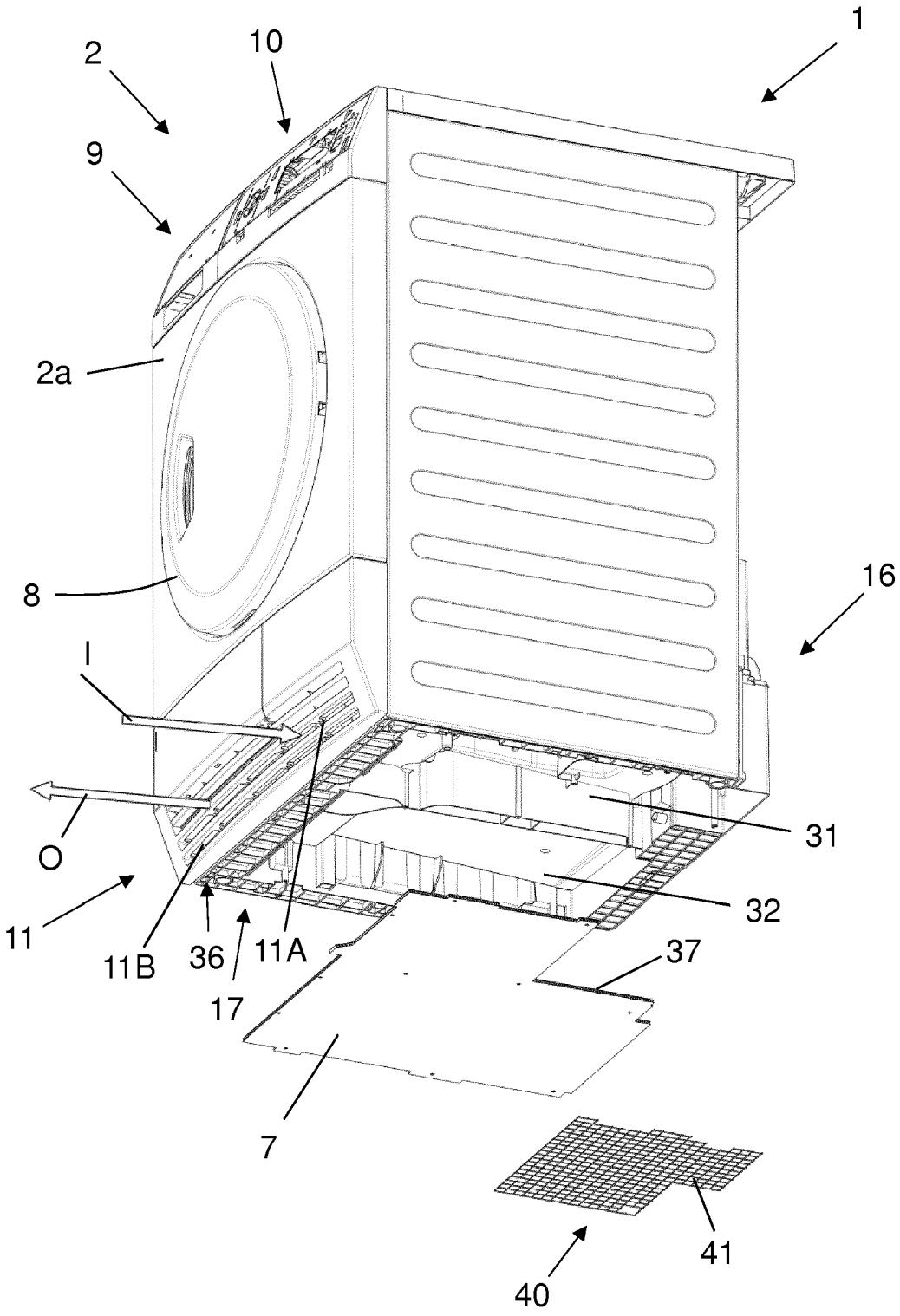

FIG. 2

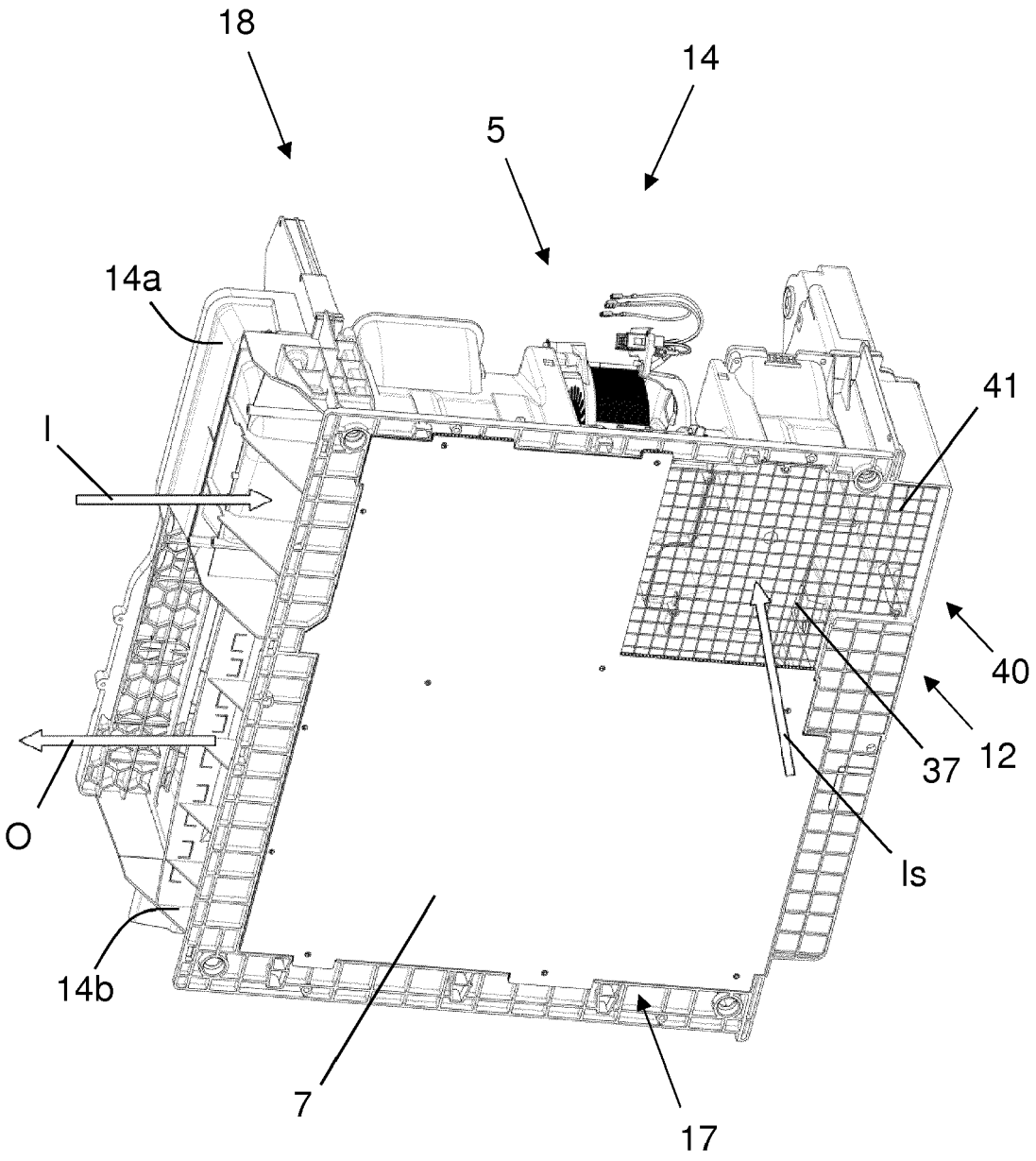

FIG. 3

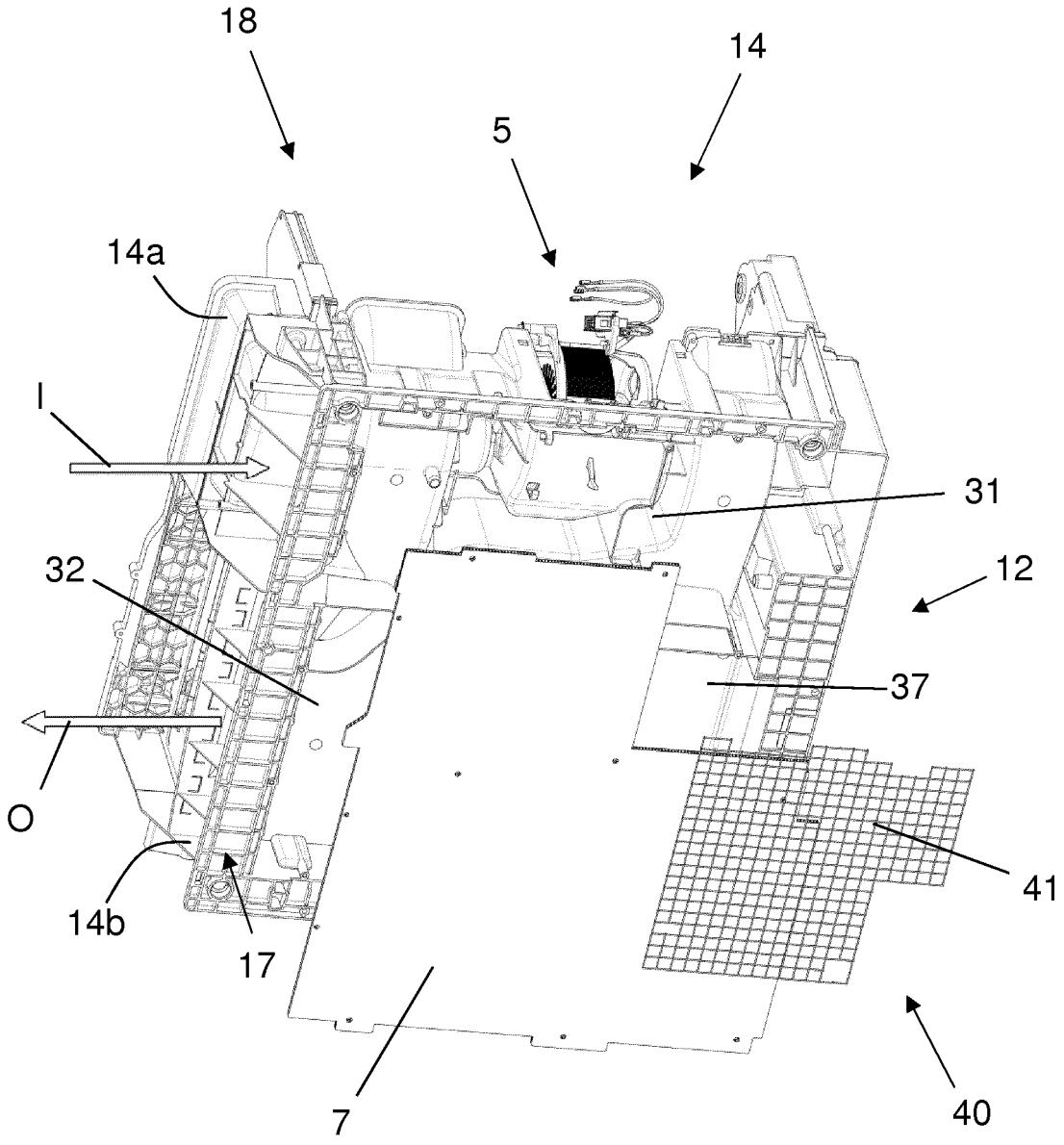

FIG. 4

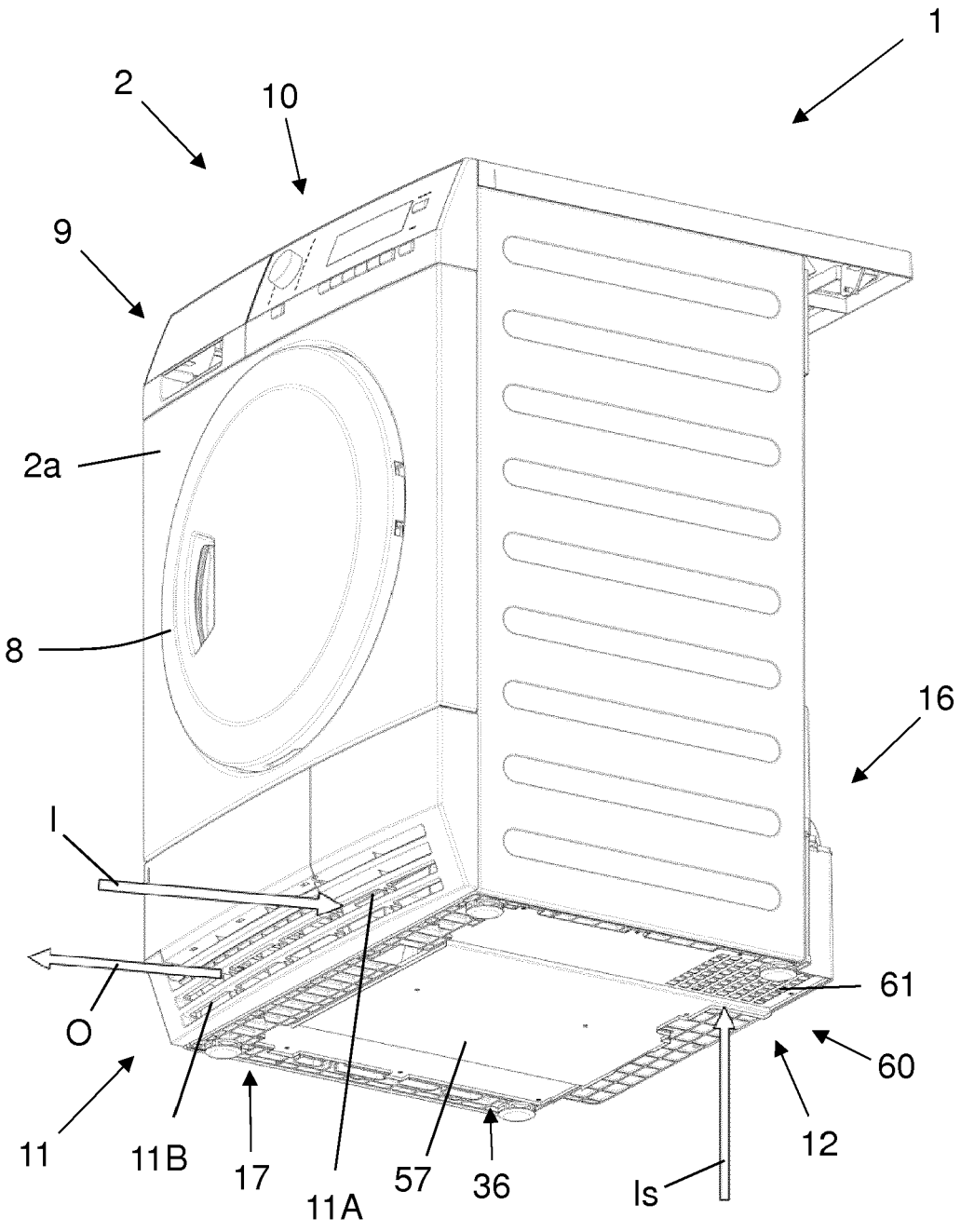

FIG. 5

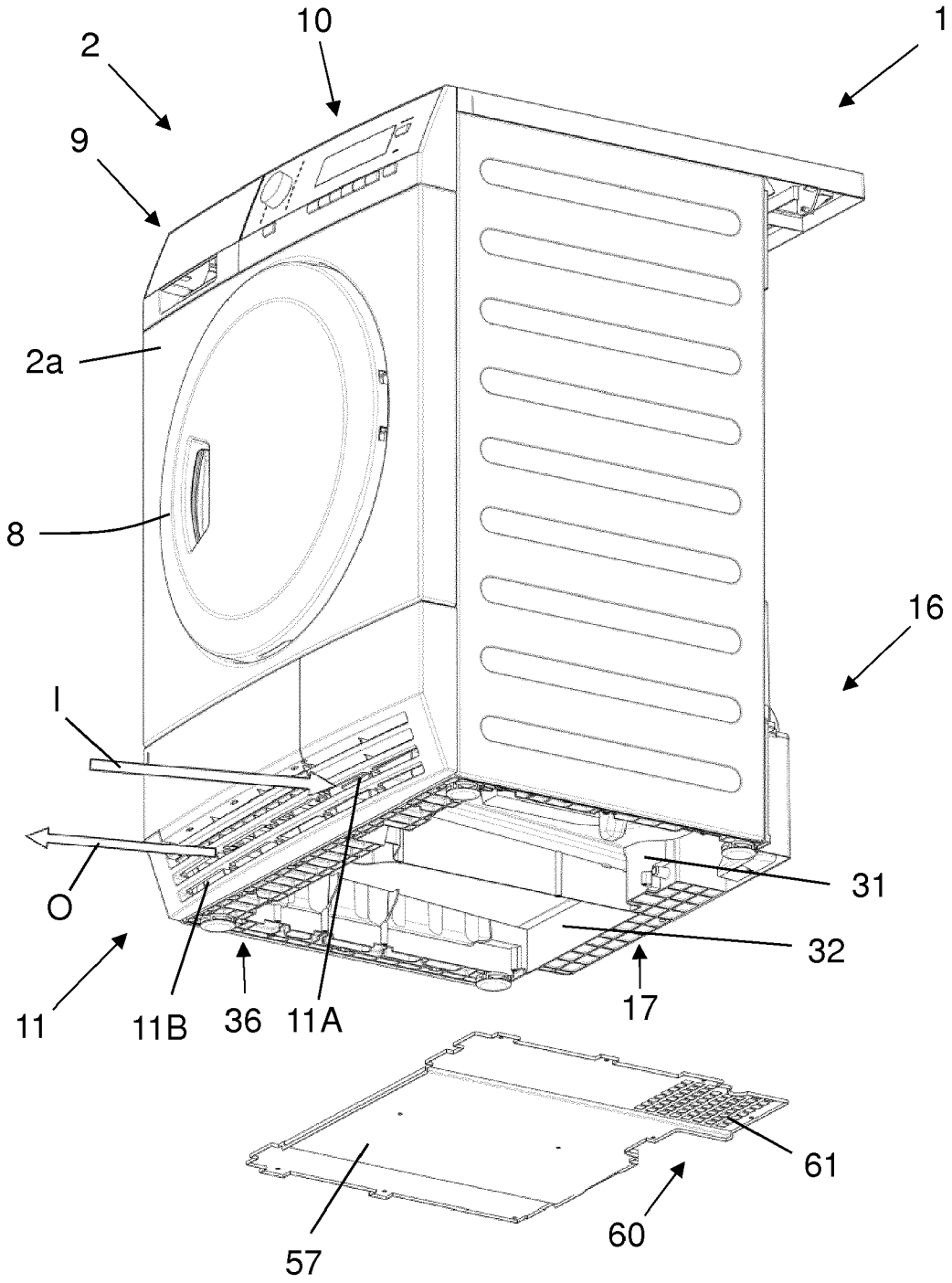

FIG. 6

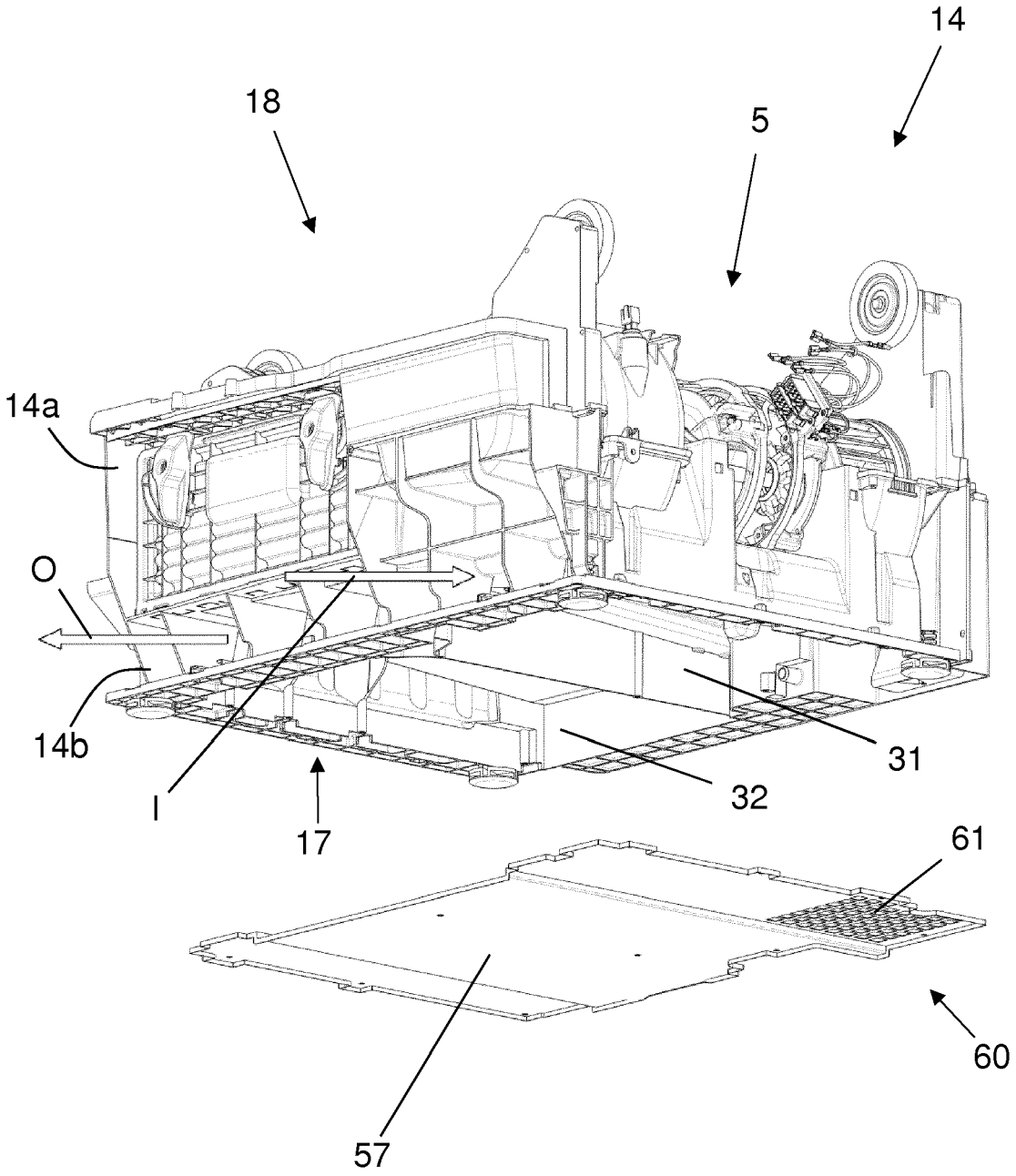

FIG. 7

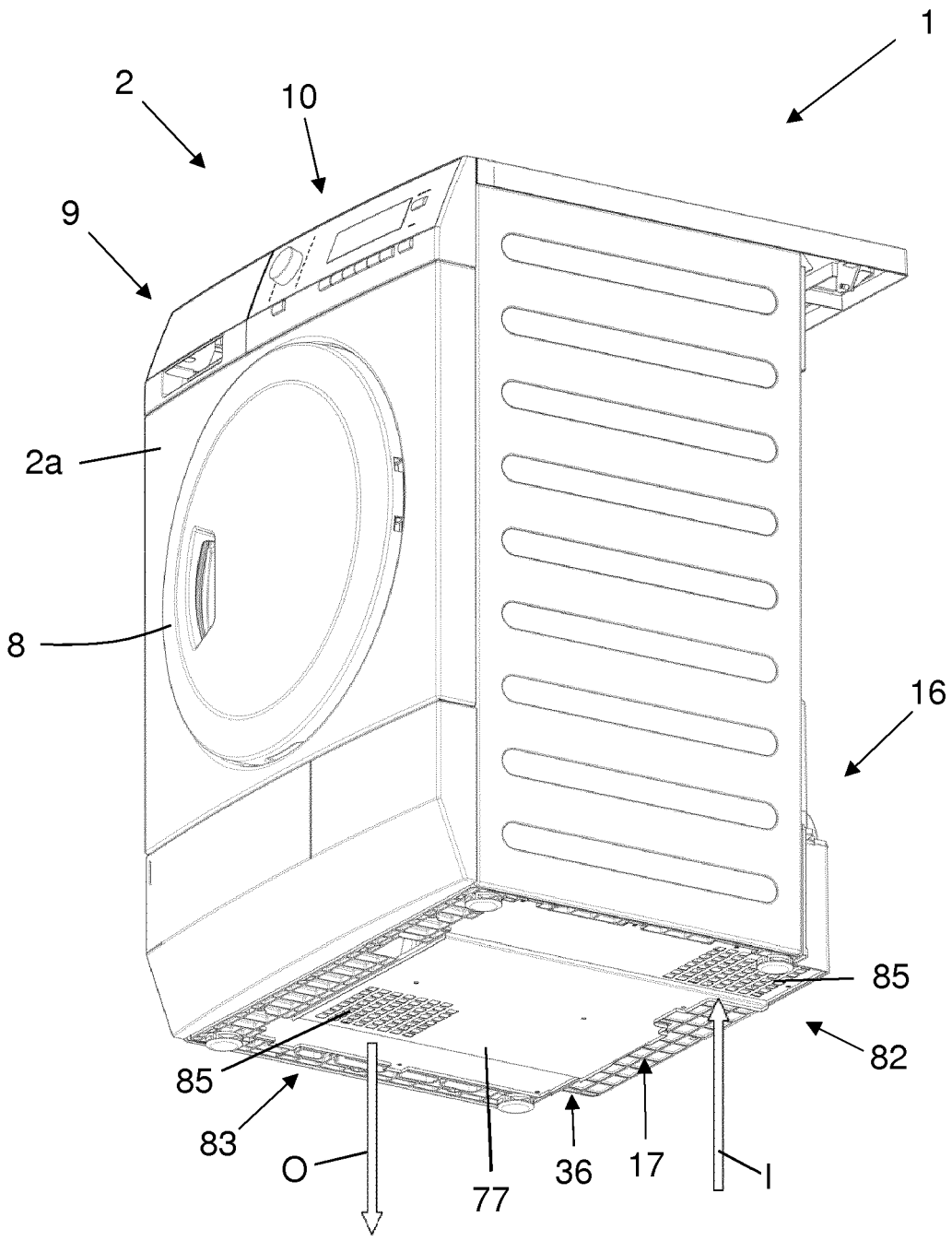

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 9722

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 2 423 376 A1 (ELECTROLUX HOME PROD CORP [BE]) 29 February 2012 (2012-02-29) * paragraph [0039] - paragraph [0043] * -----	1-11	INV. D06F58/24 D06F39/12
A	EP 1 508 636 A2 (LG ELECTRONICS INC [KR]) 23 February 2005 (2005-02-23) * the whole document * -----	1-11	
A	EP 2 166 145 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 24 March 2010 (2010-03-24) * paragraph [0037] * * paragraph [0050] - paragraph [0055] * -----	1-11	

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 August 2012	Jezierski, Krzysztof

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 12 16 9722

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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14-08-2012

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