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(71) Applicant: **Electrolux Home Products Corporation N.V.**
1930 Zaventem (BE)

(72) Inventors:
- **Pillot, Sergio**
  I-33087 Pasiano di Pordenone (PN) (IT)
- **Sartor, Luciano**
  I-31015 Conegliano (TV) (IT)
- **Lorenc, Marcin**
  I-33077 Sacile (PN) (IT)

(74) Representative: **Maccalli, Marco**
Maccalli & Pezzoli S.r.l.,
Via Settembrini, 40
20124 Milano (IT)

(54) Improvements to laundry machines

(57) A laundry machine **(100)** comprises an external cabinet **(105)** provided with a laundry loading opening **(115)** for accessing a laundry treatment chamber and a loading door **(125)** associated with the laundry loading opening for selectively closing or opening the same. The cabinet further comprises a swivable door **(140)** hinged at one side **(143)** thereof and openable to allow access to an inner region of the machine behind the cabinet, and a lock **(155)** operable to keep the swivable door in a closed position. A stiffening means **(315)** is coupled to an inner side of the swivable door, the stiffening means exerting on the swivable door a flexural action towards the rear or the front of the machine in order to ensure that, when closed, the swivable door is essentially flush with the cabinet surface.

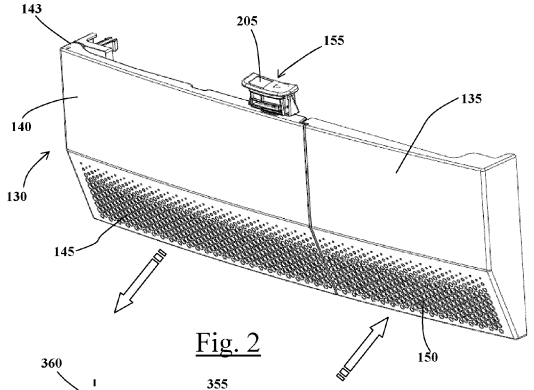

Fig. 2

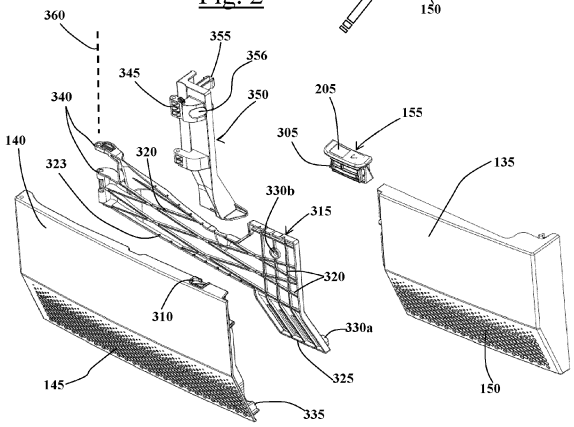

Fig. 3

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Description

Field of the invention

[0001] The present invention relates in general to household appliance for treating laundry, i.e. laundry machines like laundry washing and/or drying machines.

Overview of the related art

[0002] In laundry machines like laundry washer-dryers and dryers, one known solution calls for accommodating the drying air moisture condensing system in the bottom part of the appliance, below the tumbler or (in the case of washing and drying machines) the tub. The moisture condensing system may comprise an air-air heat exchanger where the moisture-laden drying air, which during the drying operation comes from the laundry treatment chamber, is cooled down by a flow of cooling air taken in from the outside environment, so as to cause condensation of the moisture.

[0003] The bottom part of the appliance cabinet (i.e. the plinth) is perforated so as to enable the cooling air to be taken in and expelled.

[0004] The plinth advantageously comprises an openable plinth door, typically hinged at one side to the remaining of the appliance cabinet or to the machine frame, for enabling the access to the inner region of the cabinet and, in particular, to the moisture condensing system, e.g. in order to empty the condense water collection tank, for cleaning the condensing system or generally for maintenance purposes. A lock device is provided, for keeping the plinth door closed, and operable to unlock the plinth door. Advantageously, the lock device (which is arranged inside the appliance cabinet) is operable by a user via a release member such as a slider or button or similar device, which is conveniently located in the rim of the machine laundry loading door (in this way, being the release member hidden when the loading door is closed, the appliance aesthetic is not impaired, and also it is ensured that when the loading door is closed and the appliance is operating, the user can not inadvertently open the plinth door and access the moisture condensing system); the release button actuates a locking element such as a tooth that engages/disengages a corresponding seat formed in the plinth door at the top thereof, proximate to the upper corner of the free side thereof (i.e., the side of the plinth door that is not hinged to the appliance cabinet).

Summary of the invention

[0005] The Applicant has noticed that due to the lock device being in such a location and the locking element seat being located at the top of the plinth door, the locking action is exerted only at the upper side of the plinth door. The lower part of the plinth door that is far from, opposite to the hinge is thus essentially free, unrestrained. The plinth door, which is generally made of plastic, is not particularly stiff, and it may happen that, when closed, the plinth door is not flush with the remaining of the appliance cabinet, and remains partially open.

[0006] This is disadvantageous under several respects: the aesthetic of the appliance is impaired; the user may beat against the protruding portion of the plinth door when cleaning the appliance cabinet, with the possibility of harms and/or breakage of the plinth door; from a functional viewpoint, the fact that the plinth door remains partially open may cause an intermixing of fresh cooling air being taken in with warmer cooling air being exhausted to the environment: this reduces the efficiency of the heat exchanger.

[0007] Thus, the Applicant has faced the problem of preventing the plinth door from not being perfectly closed.

[0008] According to an aspect of the present invention, a laundry machine is provided, comprising an external cabinet provided with a laundry loading opening for accessing a laundry treatment chamber and a loading door associated with the laundry loading opening for selectively closing or opening the same.

[0009] The cabinet advantageously comprises a swivable door hinged at one side thereof and openable to allow access to an inner region of the machine behind the cabinet. A lock is advantageously provided, operable to keep the swivable door in a closed position.

[0010] A stiffening means is advantageously coupled to an inner side of the swivable door. The stiffening means advantageously exerts on the swivable door a flexural action towards the rear or the front of the machine in order to ensure that, when closed, the swivable door is essentially flush with the cabinet surface.

[0011] In an embodiment of the invention, the stiffening means comprises a stiffening part shaped so as to be adapted to substantially adhere to a surface of the inner side of the sviwable door.

[0012] In an embodiment of the invention, the stiffening part has a first portion and a second portion, each one apt to be coupled to a corresponding, matching portion of the inner side surface of the swivable door. The second portion is for example farther from the swivable door hinge and from the lock than the first portion.

[0013] In an embodiment of the invention, the stiffening part second portion is, in a rest, non-assembled condition, not coplanar with the matching portion of the swivable door, thereby being adapted to exert said flexural action when the stiffening part second portion is fixed to the matching portion of the swivable door.

[0014] The stiffening part may be coupled to the inner side of the swivable door by means of one or more among screws, snap-fit means, clamps, rivets, glue.

[0015] In an embodiment of the invention, the swivable door is located at a plinth of the cabinet.

[0016] The cabinet plinth may comprise said swivable door and a fixed plinth part, arranged one aside the other.

[0017] In an embodiment of the invention, the cabinet plinth is, at the bottom thereof, slanted towards the rear of the machine.

[0018] Said stiffening part second portion may be in correspondence of the portion of the swivable door that is slanted towards the rear of the machine.

[0019] Advantageously, said lock is located behind the cabinet. It may be actuatable through a device accessible at a rim of the laundry loading opening, and advantageously adapted to be hidden by the loading door when the latter is closed.

[0020] In an exemplary embodiment of the invention, the swivable door is openable to enable access to a machine region where at least part of a laundry drying air moisture condensing system is arranged.

[0021] The cabinet plinth may preferably be provided with perforations for the intake/exhaust of the laundry drying air.

[0022] In embodiments of the invention, said stiffening means comprise a plastic part with stiffening ribs.

Brief description of the drawings

[0023] These and other features and advantages of the present invention will better appear from the reading of the following detailed description of an exemplary and non-limitative embodiment thereof, depicted in the annexed drawings, wherein:

Fig. 1 is an isometric view of a laundry machine according to an embodiment of the present invention;
Fig. 2 is an isometric view of a plinth of the machine of **Fig. 1;**
Fig. 3 is an isometric exploded view of the plinth of **Fig. 2;** and
Fig. 4 is a cross section of the plinth in a vertical plane.

Detailed description of an exemplary embodiment of the invention

[0024] Referring to the drawings, **Fig. 1** is an isometric view of a laundry machine according to an embodiment of the present invention. The laundry machine referred in the following description, globally denoted as **100,** may be a laundry dryer or a laundry washer/dryer, but it should be understood that the invention may be applied to a laundry washing machine as well. The laundry machine **100** has an external casing or appliance cabinet **105,** inside which structural and functional parts of the machine are accommodated, such as a tumbler **110** (or, in the case of a laundry washer/dryer, a drum rotatable within a tub), a moisture condensing system for demoisturizing the drying air, fans, pumps, valves, motors, vibration dampening devices, electronics. A load opening **115** is formed in a front panel **120** of the cabinet **105,** for allowing access to the inner space of the tumbler (or drum) **110;** a laundry loading door **125** is provided for closing the load opening **115.**

[0025] Below the load opening **115,** the front panel **120** terminates and the bottom region of the appliance cabinet **105** is formed by a plinth **130.** The plinth **130** is a cover for a bottom part of the laundry machine **100** where the moisture condensing system is, at least partly, located, for example an air-air heat exchanger where the moisture-laden drying air, coming from the laundry treatment chamber, is cooled down by a flow of cooling air taken in from the outside environment, so as to cause condensation of the moisture.

[0026] The plinth **130** is for this purpose preferably perforated, so as to enable the cooling air to be taken in and expelled.

[0027] The plinth **130** is advantageously formed of two parts, one aside the other along the front of the machine; for example, a first part **135** of the plinth covers the right-hand part of the machine basement and a second part **140** of the plinth covers the remaining, left-hand part (right-hand and side-hand as seen looking the appliance frontally). The first plinth part **135** may be fixedly attached, for example by means of screws or clamps or snap-fit engagement means. Advantageously, the second plinth part **140** is swivably coupled to the appliance frame (or to the remaining of the appliance cabinet **105)** so as to be openable and allow access to the area behind, and closable when the area behind is not to be accessed. For example, the second plinth part **140** is hinged, at its left-hand side **143,** to the appliance frame or to the left side panel of the cabinet **105** and form a plinth door **140** that can be opened (by the user or by a repairer) for accessing the moisture condensing system, e.g. a tank for collecting the condense water released by the drying air in order to empty it. Both the first and the second plinth parts **135** and **140** are preferably perforated, at a bottom band thereof; cooling air for the moisture condensing system is for example taken in (by means of a fan, not visible in the drawings) though the perforations **150** in the first plinth part **135,** and expelled through the perforations **145** in the plinth door **140.**

[0028] As visible in **Fig. 1, Fig. 2** and **Fig. 3,** a lock device **155** is provided for keeping the plinth door **140** closed and unlocking it for opening the plinth door **140** when desired. Advantageously, the lock device **155** is housed behind the cabinet front panel **120** and protrudes - for being accessible to a user/operator - from an opening in the lower part of the circumferential rim of the load opening **115,** in such a way to be hidden when the loading door **125** is closed, being actuatable only when the loading door **125** is open. As better visible in **Fig. 2** and **Fig. 3,** the lock device **155** comprises a slider **205** coupled to a lock member, for example a tooth **305,** which can engage a seat **310** formed in the plinth door **140,** advantageously in a top border thereof, and by action on the slider **205** can be disengaged from the seat **310,** enabling the opening of the plinth door **140.**

[0029] The plinth **130,** i.e. the first and second plinth parts **135** and **140** are for example in plastic material (although other materials can be used, such as sheet metal) and are so shaped that while an upper band thereof is essentially flush with the front panel **120,** their lower

band, where the perforations **145** and **150** are present, is slanted towards the rear of the machine.

[0030] According to the present invention, in order to avoid that the plinth door **140,** even when closed, is not flush with the first plinth part **135,** a stiffening means is coupled to the plinth door **140,** advantageously on the inner side thereof so as not to be visible from the outside and not impair the aesthetic of the appliance.

[0031] Referring to **Fig. 3** and **Fig. 4,** in an embodiment of the present invention, the stiffening means comprise a relatively flat stiffening part **315,** shaped so as to be adapted to substantially adhere to the inner surface of the plinth door **140.** The stiffening part **315** is for example made of plastic; the stiffening part **315** is preferably formed with stiffening ribs **320.** The stiffening part **315** has a first portion **323** which is essentially co- extensive to the plinth door **140** in the longitudinal direction and is high as the upper (non- perforated) band of the plinth door **140;** the stiffening part **140** has a second portion **325** (advantageously in one piece with the first portion **323)** which extends from the first portion **323** downwards starting from an end of the stiffening part **315** that, when the latter is assembled to the plinth door **140** (as described in the following), is close to the free (i.e., not hinged) end of the plinth door **140.** The second portion **325** of the stiffening part **315** is, compared to the first portion **323,** slanted towards the rear of the machine, with a slightly greater slope compared to the slope of the lower, perforated band of the plinth door. In the shown exemplary embodiment of the present invention, the second portion **325** of the stiffening part **315** is not longitudinally co- extensive to the plinth door **140,** being instead limited to a terminal region of the plinth door **140** proximate to the free end thereof.

[0032] The stiffening part **315** is coupled to the inner side of the plinth door **140** by means of fastening means such as screws, as in the shown example. Through holes **330a, 330b** are formed in the stiffening part **315** for the insertion of screws (the screws not being shown in the drawings). Preferably, at least some of the through holes are formed proximate to the end of the stiffening part **135** that, when the latter is assembled to the plinth door **140,** is close to the free (i.e., not hinged) end of the plinth door **140.** Preferably, at least one of the through holes, like the through hole **330a** in the shown example, is formed in the second portion **325** of the stiffening part **315.** Threaded holes for the engagement of the screws are formed on the inner side of the plinth door **140** in positions matching the through holes **330a, 330b** formed in the stiffening part **315;** one of such threaded holes, denoted **335,** matching the through hole **330a** is visible in **Fig. 3** and **Fig. 4.**

[0033] At the opposite end of the stiffening part **315** (i.e., the end located in correspondence of the end **143** of the plinth door **140** that is hinged to the machine frame), the stiffening part **315** comprises a fork **340** (preferably formed in one piece with the first portion **323** of the stiffening part **315)** for accommodating a bushing **345** formed in a hinge body **350** which is attached (for example, clamped, by means of a snap-fit hook **355** and fixed through a screw, not shown in the drawings, received into a seat **356** formed in the hinge body **350)** to the machine frame (not shown); the stiffening part **315** and the plinth door **140** are pivotally mounted to the hinge body **350** by means of a pin **360** (shown only schematically).

[0034] In the assembling phase, the stiffening part **315** is placed with its first portion **323** in abutment against the inner side of the plinth door **140,** and is secured to the plinth door **140** by screwing one or more of the screws into the threaded holes formed in the plinth door. Preferably, the second portion **325** of the stiffening part **315** is initially not tightened to the plinth door **140;** this intermediate assembling condition is depicted in solid lines in **Fig. 4:** it can be seen that the second portion **325** of the stiffening part **315** remains slightly displaced towards the rear from the plinth door **140.** Then, by slightly flexing the stiffening part second portion **325** towards the plinth door **140,** the through hole **330a** of the latter is brought into alignment with the threaded hole **335** in the plinth door, and a screw is inserted into the through hole **330a** and screwed in the threaded hole **335.** At the end, the second portion **325** of the stiffening part **315** is kept flexed with respect to its rest position (the flexed condition is depicted in dashed lines in **Fig. 4).** In this way, the second portion **325** of the stiffening part **315** is kept elastically precharged, so that it exerts onto the plinth door **140** a flexural action, particularly a pulling action towards the rear of the machine (when the assembly is mounted). It is this flexural action exerted by the stiffening part **315** that ensures that the plinth door **140,** when closed, is flush with the first plinth portion **135,** even in its region far from the top of the plinth door where the locking action is exerted, i.e. at the bottom.

[0035] If needed, the stiffening part **315** may be arranged such that, when it is not tightened to the plinth door **140,** it remains slightly displaced towards the front from the plinth door **140.** Then, when the stiffening part second portion **325** is slightly flexed towards the rear of the machine, through hole **330a** of portion **325** is brought into alignment with the threaded hole **335** in the plinth door, and a screw is inserted into the through hole **330a** and screwed in the threaded hole **335.** In this way, the second portion **325** of the stiffening part **315** is kept elastically pre-charged, so that it exerts onto the plinth door **140** a flexural action, particularly a pushing action towards the front of the machine (when the assembly is mounted). This flexural, particularly pushing, action, exerted by the stiffening part **315** onto the plinth door **140,** ensures that the plinth door **140,** when closed, is flush with the first plinth portion **135,** even in its region far from the top of the plinth door where the locking action is exerted, i.e. at the bottom. This arrangement of stiffening part **315** is useful when the misalignment between the first and the second plinth parts **135** and **140** consists in a part of the plinth door **140** being closer to the rear of the machine than the first plinth part **135.**

[0036] In this way, the previously discussed drawbacks are overcome.

[0037] The exemplary invention embodiment described so far is susceptible of several modifications, readily apparent to those skilled in the art.

[0038] For example, the stiffening means may have a structure and/or shape different from the stiffening part **315** of the shown exemplary embodiment.

[0039] Also, the means for attaching the stiffening part **315** to the plinth door **140** may be different from screws, such as snap- fit means, clamps, rivets, glue.

[0040] The plinth door **140** may be located in other areas of the machine cabinet **105,** not necessarily at the front thereof, not necessarily at the bottom of the appliance. The invention may also be applied to any door provided in a cabinet of a household appliance for treating laundry to allow access to the inner region of the cabinet, irrespective of the kind of treatment the machine is designed to carry out on laundry.

Claims

1. A laundry machine **(100)** comprising an external cabinet **(105)** provided with a laundry loading opening **(115)** for accessing a laundry treatment chamber and a loading door **(125)** associated with the laundry loading opening for selectively closing or opening the same, the cabinet further comprising a swivable door **(140)** hinged at one side **(143)** thereof and openable to allow access to an inner region of the machine behind the cabinet, and a lock **(155)** operable to keep the swivable door in a closed position, **characterized in that**
a stiffening means **(315)** is coupled to an inner side of the swivable door, the stiffening means exerting on the swivable door a flexural action towards the rear or the front of the machine in order to ensure that, when closed, the swivable door is essentially flush with the cabinet surface.

2. The laundry machine of claim 1, wherein the stiffening means comprises a stiffening part **(315)** shaped so as to be adapted to substantially adhere to a surface of the inner side of the sviwable door.

3. The laundry machine of claim 2, wherein the stiffening part has a first portion **(323)** and a second portion **(325),** each one apt to be coupled to a corresponding, matching portion of the inner side surface of the swivable door, the second portion being farther from the swivable door hinge and from the lock than the first portion.

4. The laundry machine of claim 3, wherein the stiffening part second portion is, in a rest, non-assembled condition, not coplanar with the matching portion of the swivable door, thereby being adapted to exert said flexural action when the stiffening part second portion is fixed to the matching portion of the swivable door.

5. The laundry machine of any one of claims 2 to 4, wherein the stiffening part is coupled to the inner side of the swivable door by means of one or more among screws, snap-fit means, clamps, rivets, glue.

6. The laundry machine of any one of the preceding claims, wherein the swivable door is located at a plinth **(130)** of the cabinet.

7. The laundry machine of claim 6, wherein said cabinet plinth comprises said swivable door and a fixed plinth part **(135),** arranged one aside the other.

8. The laundry machine of claim 6, wherein the cabinet plinth is, at the bottom thereof, slanted towards the rear of the machine.

9. The laundry machine of claim 8 when depending on claim 3, wherein said stiffening part second portion is in correspondence of the portion of the swivable door that is slanted towards the rear of the machine.

10. The laundry machine of any one of claims 6 to 9, wherein said lock is located behind the cabinet and actuatable through a device accessible at a rim of the laundry loading opening, and adapted to be hidden by the loading door when the latter is closed.

11. The laundry machine of claim 6, wherein the swivable door is openable to enable access to a machine region where at least part of a laundry drying air moisture condensing system is arranged.

12. The laundry machine of claim 11, wherein the cabinet plinth is provided with perforations **(145,150)** for the intake/exhaust of the laundry drying air.

13. The laundry machine of any one of the preceding claims, wherein said stiffening means comprise a plastic part with stiffening ribs **(320)**.

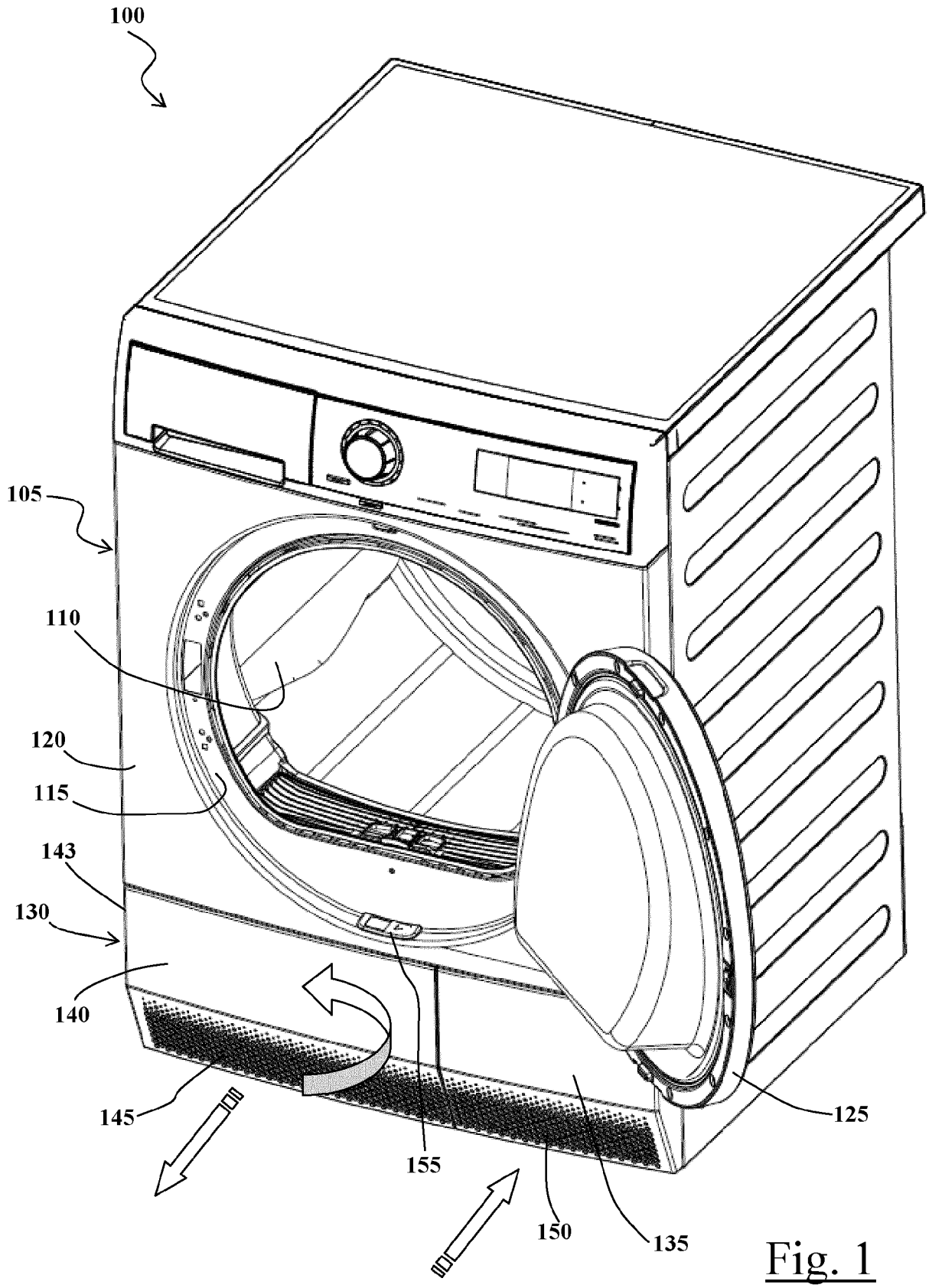

Fig. 1

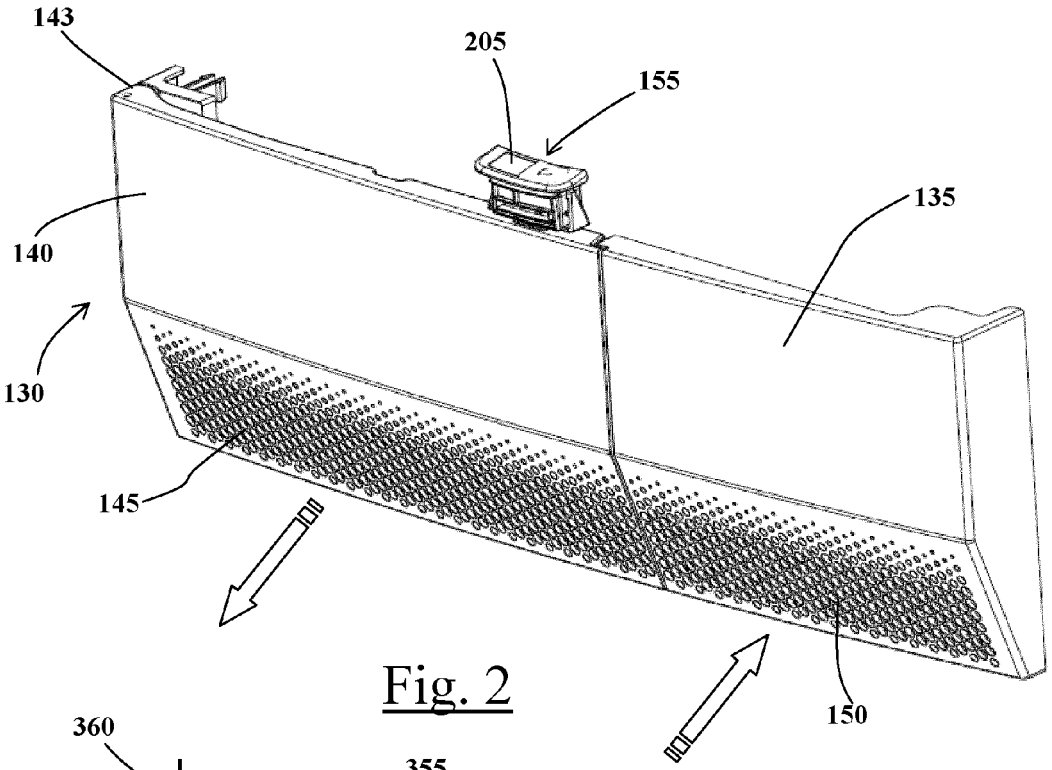
143
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Fig. 2

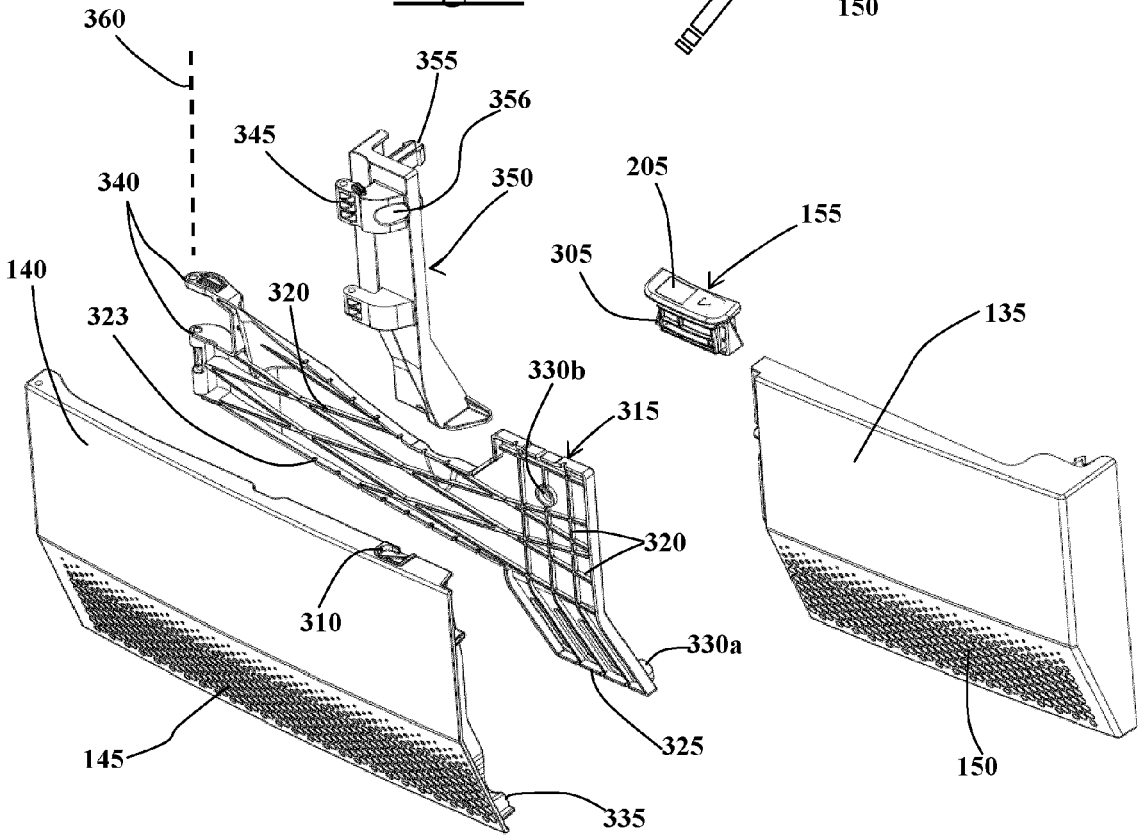
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Fig. 3

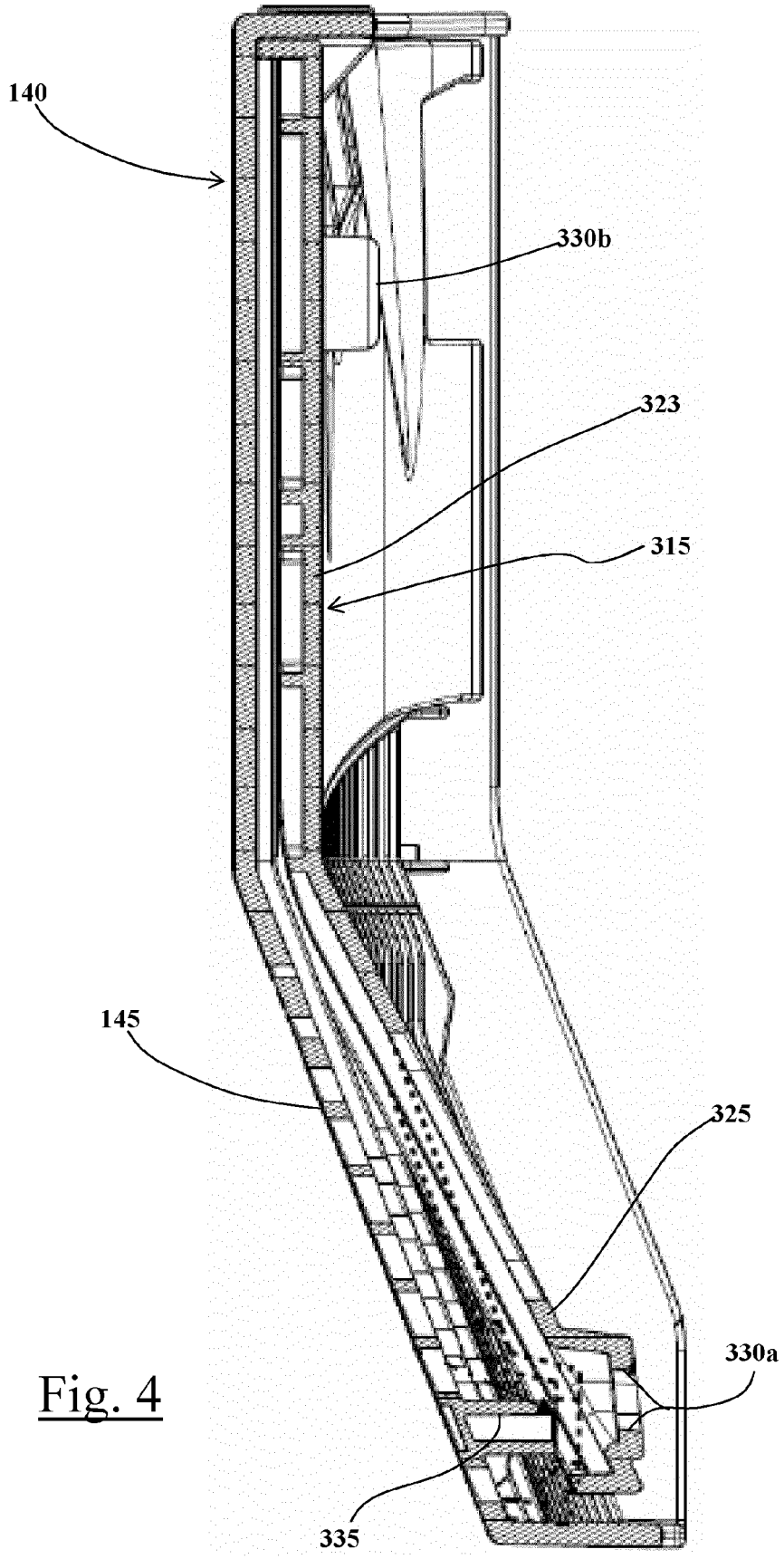

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 3284

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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	30 August 2012	Weinberg, Ekkehard

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 3284

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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