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(54) Top loading laundry washing machine

(57) A laundry washing machine (**100**) is disclosed. The laundry washing machine comprises an external casing (**110**), a washing tub (**115**) contained in the external casing (**110**) and a washing drum (**120**) contained in the washing tub (**115**). The washing drum (**120**) is provided on its lateral surface with a drum opening (**160**) for loading/unloading laundry into/from the washing drum (**120**), and with one or more drum doors (**145**) for closing said drum opening (**160**). The washing tub (**115**) is provided with a tub opening (**140**) for accessing the washing drum (**120**), and with one or more tub doors (**135**) for closing said tub opening (**140**). The external casing (**110**) is provided with a casing opening (**130**) for accessing the washing tub (**115**). The external casing (**110**) is free from a cover or a door or a lid for closing the casing opening (**130**).

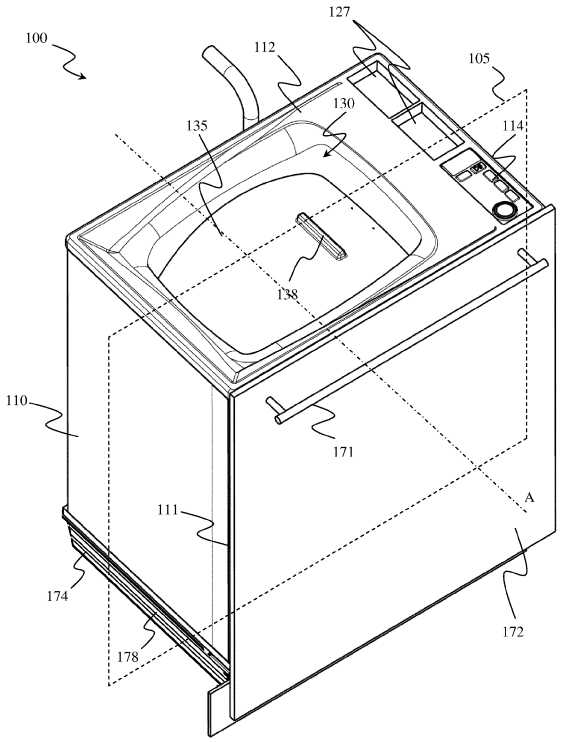

FIG.1

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Description

Field of the Invention

[0001] The present invention relates to laundry washing machines, both for domestic and professional use.

Description of the Related Art

[0002] A laundry washing machine - both of the type which can only wash and rinse laundry and of the type which can also dry laundry - comprises an external, substantially parallepiped-shaped, casing in which a washing tub is provided. The washing tub contains a perforated washing drum where the laundry to be washed can be loaded. Both the washing tub and the washing drum preferably have a substantially cylindrical shape. The washing drum is operated by an electric motor for being rotated, usually about a horizontal axis.

[0003] Modem laundry washing machines are available in two main configurations: front loading and top loading. While in a laundry washing machine of the front loading type the washing tub and the washing drum are accessible through a loading/unloading door located on a frontal side of the casing, in a laundry washing machine of the top loading type the washing tub and the washing drum are accessible from the top of the casing.

[0004] Making reference to the laundry washing machines of the top loading type, the washing drum is typically provided with a door located on the lateral surface thereof.

[0005] Known washing machines usually have the washing tub that is provided with a washing tub opening located on the top of the washing tub. A casing opening is provided on the top side of the casing. The borders of the casing opening and the borders of the washing tub opening are typically coupled to one another by means of an elastic bellows, or gasket. An access lid is usually provided on top of the casing for ermetically closing the casing opening. For example, the access lid may be hingeably connected to the top side of the casing, in such a way to watertight closing the casing opening when the access lid is in the closed position. Purpose of such access lid is to protect the inner components of the washing machine and avoid the occurrence of spurts of water/washing liquid and steam from the washing machine during the washing operations.

[0006] Built-in washing machines adapted to be integrated into a kitchen unit or below a stationary worktop have now become commonly widespread. However, the peculiar structure of a top loading washing machine is generally quite unsuitable for a built-in arrangement, since accessing the opening of the washing machine on the top side of its casing is made difficult by the presence of overlying furniture elements.

[0007] In order to solve these drawbacks, solutions have been tested and employed.

[0008] For example, patent application DE 10 2008 009 791 discloses a casing-loadable washing machine or top loader washing machine with a housing containing a lye container with a casing-side lye container opening and with a rotatable drum which is mounted with a substantially horizontal shaft. The washing machine is driven via a drive unit and has a closable withdrawal opening arranged in the casing. The lye container with the drum is arranged in a moving housing part which can be moved from the housing for opening the lye container opening and into the housing for the purposes of closing. The moving housing part is mounted together with the lye container and the drum so as to be displaceable in the axial direction.

Summary of the invention

[0009] In order to allow the installation within a cavity of a furniture, the known solution described in DE 10 2008 009 791 provides for a specifically designed top loading washing machine in which the washing machine itself mainly consists of two parts movable to one another along a horizontal direction substantially perpendicular to the frontal side of the furniture. Specifically, the washing machine is provided with a carrying part integral to the furniture. The carrying part supports the electric drive unit of the washing drum, and it is provided with rail elements extending along the horizontal direction. A lye container (*i.e.,* the washing tub), and the washing drum enclosed therein, are arranged instead in a moving part of the washing machine which is configured to move along the rail elements of the carrying part. The drum is provided with a closable withdrawal opening, while the lye container is provided with a lye container opening. The drive unit provided on the carrying part comprises a motor with a coupling by means of which the drum can be separated from the drive unit. In a closed, operational, configuration, the moving part is enclosed within the furniture. In this configuration, the drive unit is coupled to the drum, and the lye container opening is closed by a lye container lid arranged below the furniture. The moving part can be pulled outside the furniture by sliding on the rail elements; when pulled outside, the drive unit is decoupled from the drum. In an extended configuration, i.e., when the moving part is outside the furniture, the lye container opening is exposed, and laundry can be loaded in / unloaded from the drum trough the withdrawal opening.

[0010] The Applicant has observed that a solution of this type is not efficient, in terms of design requirements and cost. Indeed, the solution disclosed in DE 10 2008 009 791 requires the design of an *ad hoc* top loading washing machine, specifically provided with washing tub and drum that are movable (along the horizontal direction) with respect to the housing.

[0011] Moreover, the design of a top loading washing machine having this feature is more expensive and more complicated than the one of a standard top loading machine (*i.e.,* one that does not require to be installed within or below a furniture element). Indeed, the washing ma-

chine disclosed in DE 10 2008 009 791 requires to be carefully designed in such a way to implement a movable washing tub, as well as an effective coupling member for the detachable coupling between the drum and the drive unit.

[0012] A further drawback of this solution is that when the washing machine is in the closed configuration, the lye container opening requires to be closed by a lye container lid which is arranged below the furniture. Thus, the furniture needs to be suitably modified in such a way to support such a lid.

[0013] The Applicant has found that the abovementioned drawbacks can be solved by providing a washing machine in which the external casing is free from any cover/door/lid, so that (a portion of) the tub is exposed also during the operation of the washing machine.

[0014] The tub is equipped with one or more tub doors avoiding that water/washing liquid and/or steam spurts outside the washing machine passing through the casing opening when the washing machine is in operation.

[0015] For this purpose, a laundry washing machine is proposed. The laundry washing machine comprise an external casing, a washing tub contained in the external casing, and a washing drum contained in the washing tub. The washing drum is provided on its lateral surface with a drum opening for loading/unloading laundry into/from the washing drum, and with one or more drum doors for closing said drum opening. The washing tub is provided with a tub opening for accessing the washing drum, and with one or more tub doors for closing said tub opening. The external casing is provided with a casing opening for accessing the washing tub. The external casing is free from a cover or a door or a lid for closing the casing opening.

[0016] Thus, the proposed laundry washing machine has a very compact structure, being free from any lid located on the top of the casing which has to be swung for accessing the tub.

[0017] The absence of lid reduces the external size of the laundry washing machine, making it optimal for the built-in arrangements. This feature is particularly advantageous since the furniture elements where the washing machine has to be installed typically have standard, predefined, size.

[0018] According to an embodiment of the present invention, the casing opening is provided on a top side of the external casing.

[0019] The casing opening is delimited by a top frame located on the top side of the external casing. Preferably, said top frame is provided with at least one between at least one compartment fluidly connected to the internal of the washing tub for supplying water and washing/rinsing products, and an interface panel of the laundry washing machine.

[0020] According to an embodiment of the present invention, the one or more tub doors comprise a door of the sliding type, adapted to slide with respect to the washing tub.

[0021] According to another embodiment of the present invention, the one or more tub doors comprise a door of the hinged type, adapted to swing with respect to the washing tub about hinge elements connected to the washing tub.

[0022] Advantageously, the laundry washing machine is adapted to operate with a portion of the washing tub exposed through the casing opening, and, when closed, the one or more tub doors is/are adapted to avoid that water/washing liquid and/or steam spurts outside the laundry washing machine passing through the casing opening when the laundry washing machine is in operation.

[0023] According to an embodiment of the present invention, the laundry washing machine is adapted to be slidingly inserted/extracted into/from a cavity of a hollow furniture element. Advantageously the external casing may be substantially parallepiped-shaped, with lateral sides extending from the top side of the external casing toward a bottom side of the external casing; in this case the first guide elements and the second guide elements are preferably slanted with respect to the lateral sides of the external casing so as to converge one another toward the bottom side of the external casing.

[0024] According to an embodiment of the present invention, wheel elements are provided on a bottom side of the casing to allow the laundry washing machine to be pulled/pushed across a flat element.

[0025] Another aspect of the present invention provides for a furniture assembly comprising a hollow furniture element and a laundry washing machine. The washing machine is adapted to be displaced, with respect to said hollow furniture element, from a closed configuration, in which the laundry washing machine is at least substantially housed within a cavity of the hollow furniture element, to an open configuration, wherein the laundry washing machine is extracted from the cavity so that the washing drum can be accessed through the casing opening by opening the tub door and the drum door.

Brief description of the drawings

[0026] These and other features and advantages of the present invention will be made apparent by the following description of some exemplary and non limitative embodiments thereof; for its better intelligibility, the following description should be read making reference to the attached drawings, wherein:

Figure 1 is a isometric view of a laundry washing machine according to an embodiment of the present invention;

Figure 2 is a sectional view of the laundry washing machine of **Figure 1;**

Figure 3 is an isometric view of the laundry washing machine of **Figure 1** with the tub door in an opened configuration and the drum with the drum door exposed through the tub opening according to an em-

bodiment of the present invention;

Figure 4 is an isometric view of the laundry washing machine of **Figure 1** with the tub door in an opened configuration and the drum with the drum door exposed through the tub opening according to another embodiment of the present invention;

Figure 5 is an isometric view of the laundry washing machine of **Figure 1** with the drum door that is open;

Figure 6 is a sectional view of the laundry washing machine of **Figure 5** without the casing, and

Figure 7 is an isometric view of the washing machine of **Figure 1** in a built-in arrangement.

Detailed description of the invention

[0027] With reference to the figures, **Figures 1-2** illustrate a laundry washing machine **100** of the top loading type - hereinafter referred to as "top loading washing machine" or simply "washing machine"- according to an embodiment of the present invention. **Figure 1** is an isometric view of the washing machine **100,** while **Figure 2** is a sectional view of the washing machine **100** taken along the section plane of **Figure 1** identified with the reference **105.** In the exemplary embodiment herein considered, the washing machine **100** is a washing machine adapted to only wash and rinse laundry; however the invention may be applied as well to a washing/drying machine which can also dry laundry.

[0028] The washing machine **100** comprises an external casing or housing **110,** for example substantially parallepiped-shaped. The casing **110** is provided on its frontal side with a frontal frame **111,** and on its top side with a top frame **112.** The washing machine **100** comprises a control unit (not shown in the figures) connected to the various parts of the laundry machines **100** in order to ensure its operations. Preferably, but not necessarily, an interface panel **114** coupled to the control unit of the washing machine **100** is provided on the top frame **112,** for example on a side portion thereof, by means of which the user may select and set the washing parameters, such as, for example, a desired washing program. Preferably, other parameters can optionally be inserted by the user, for example the washing temperature, the spinning speed, the load in terms of weight of the laundry to be washed and so on.

[0029] The casing **110** houses a washing tub **115** containing a rotatable perforated drum **120** where the laundry to be washed can be loaded. In operation, the drum **120** is adapted to rotate about a horizontal axis **A,** which is substantially perpendicular to the frontal frame **111.**

[0030] The tub **115** and the drum **120** have preferably a substantially cylindrical shape. A hollow space **122** is defined between the tub **115** and the drum **120.** Preferably, although not necessarily, baffles or lifters **124** (only one shown in figure) are mounted within an internal wall of the drum **120** and parallel to the drum rotation axis **A** for performing turning over and tumbling of the laundry when the drum **120** is in rotation. The tub **115** is preferably suspended in a floating manner inside the casing **110,** advantageously by means of a number of coil springs and shock absorbers **126.** Preferably, but not necessarily, one or more (two in the figures) compartments **127** fluidly connected to the internal of the tub **115** and adapted to the loading of washing/rinsing products (*i.e.,* detergent, softener, and so on) are provided in the top frame **112.** The compartments **127** have been depicted in the figures without any lid; however, each compartment **127** may be provided as well with a corresponding lid for avoiding spurts of the washing/rinsing products.

[0031] In order to allow reaching the tub **115** from the outside, a casing opening **130** is provided on the top side of the casing **100,** delimited by the top frame **112.** A corresponding tub opening (not visible in **Figures 1** and **2,** but identified in the following figures with the reference **140**) is located on the top of the tub **115** for allowing access to the inside of the tub **115.** The tub **115** is provided with a tub door **135** (but in another **embodiment** there could be more than one doors) for closing said tub opening **140.** In the embodiment illustrated in the figures, the tub door **135** is provided with a handle **138** for facilitating the opening and the closing of the tub door **135.** When the tub door **135** is in a closed configuration (as depicted in both **Figure 1** and **2**), the drum **120** housed within the tub **115** cannot be accessed. In this configuration, it is avoided that water/washing liquid and/or steam spurts outside the washing machine **100** passing through the casing opening **130** when the washing machine **100** is in operation (*e.g.*, when the drum **120** is rotating). In the exemplary embodiment considered, the tub door **135** is of the single-leaf type, however similar considerations apply in case the tub door **135** is of the double-leaf type (i.e. two doors hinged to the tub).

[0032] According to an embodiment of the present invention, the tub door **135** is of the hinged type, adapted to swing with respect to the tub **115** about hinge elements connected to the tub **115** itself. According to another embodiment of the present invention, the tub door **135** is of the sliding type, adapted to slide with respect to the tub opening **140,** for example inside a corresponding housing located in proximity to the tub **115** or in the casing **110.** Naturally, the concepts of the present invention apply as well to different tub door **135** arrangements.

[0033] When the washing machine **100** is not in operation, a user may open the tub door *135, e.g.,* exploiting the handle **138,** in such a way to expose (a portion of) the drum **120.** The drum **120** is provided on its lateral surface with a drum opening (not visible in **Figures 1** and **2,** but identified in the following figures with the reference **160**) for loading/unloading the laundry, and with one (or more) drum door for closing said drum opening **160.** Advantageously, once the tub door **135** is opened, the user may manually rotate the drum **120** until the drum door is exposed at the tub opening.

[0034] **Figures 3** and **4** are isometric views of the washing machine **100** with the tub door **135** in an opened configuration and the drum **120** with the drum door ex-

posed through the tub opening. **Figure 3** corresponds to the embodiment in which the tub door **135** is of the sliding type, while **Figure 4** corresponds to the embodiment in which the tub door **135** is of the hinged type. The drum door is identified with the reference **145.** In the considered embodiment, the drum door **145** is of the double-leaf type, with a first leaf **148** hingeably connected to the drum **120** by means of a first hinge **150** and a second leaf **152** hingeably connected to the drum **120** by means of a second hinge **154.** The concepts of the present invention can be also applied to a drum **120** provided with a drum door **145** of the single-leaf type. A lock element **156** is provided to firmly secure the drum door **145** in a closed configuration when the washing machine **100** is in operation (and the drum **120** is rotating).

[0035] An user may unlock the lock element **156** and open the drum door **145,** in such a way to gain access inside of the drum **120** for loading/unloading laundry. **Figure 5** is an isometric view of the washing machine **100** (the embodiment thereof with the tub door **135** of the sliding type) with the drum door **145** that is open.

[0036] **Figure 6** is a sectional view of the washing machine **100** of **Figure 5** taken along the section plane **105** with the casing **110** that has been removed. According to an embodiment of the invention, the tub **115** is advantageously provided with a tub opening frame **165** surrounding the tub opening **140** and adapted to fit corresponding borders of the casing opening **130** on the top frame **112.** Preferably, although not necessarily, the tub opening frame **165** is made of a rigid material, such as the same material of the tub **115** (*e.g.*, plastic). According to another embodiment of the present invention, the tub **115** is not connected with the casing **110,** but instead the former is floating with respect to the latter

[0037] According to an embodiment of the invention, the casing **110** is free from any cover/door/lid provided on the top frame **112** for closing the casing opening **130** (and thus the tub opening **140** as well), so that (a portion of) the tub **115** is exposed also during the operation of the washing machine **100.** The presence of the tub door **135** avoids that water/washing liquid and/or steam spurts outside the washing machine **100** passing through the casing opening **130** when the washing machine **100** is in operation (situation in which the tub door **135** is closed).

[0038] Compared to the known washing machines of the top-loading type, the washing machine **100** according to the present invention has a more compact structure, being free from any cumbersome lid located on the top frame **112** of the casing **110** which has to be swung (thus requiring a considerable amount of free space above the casing **110**) for accessing the tub **115.**

[0039] Moreover, although the washing machine **100** may be employed as a "stand-alone" laundry machine, *i.e.*, adapted to be directly set up -alone, without any additional furniture, according to an embodiment of the present invention, the compact structure thereof may be advantageously exploited for a built-in arrangement, in which the washing machine **100** may be integrated into a kitchen unit or into any other hollow furniture element provided with a suitably cavity, as well as below a stationary worktop. The absence of lid reduces the external size of the washing machine **100,** making it optimal for the built-in arrangements, especially since the furniture elements typically have standard, predefined, size.

[0040] For this purpose, according to an advantageous embodiment of the present invention, the washing machine **100** is supported by wheel elements **170** (*e.g.*, one or two pairs of wheels) located on the bottom side of the casing **110** and a handle **171** is coupled with the frontal frame **111,** in such a way to easily allow the washing machine **100** to be pulled/pushed across a flat element, such as the floor on which the washing machine **100** is located. In this way, the washing machine **100** may be installed within a hollow furniture element. According to an embodiment of the present invention (illustrated in the figures), a covering panel **172,** preferably made in the same material of that of the hollow furniture element in which the washing machine **100** is installed, may be attached to the frontal frame **111,** for example by means of screws, rivets and/or glue. In this case, the handle **171** may be fixed to the covering panel **172** (*e.g.,* by means of screws, rivets and/or glue). According to another embodiment of the present invention (not illustrated in the figures), instead of providing a covering panel, the handle **171** is directly fixed to the frontal frame **111.**

[0041] In a closed configuration, the washing machine is (at least substantially) housed within a cavity of the hollow furniture element; in this configuration, the washing machine **100** may be active, and carry out the selected washing program. When the user has to load/unload laundry within/from the washing machine **100,** she/he (at least partially) pulls out the washing machine **100** from the cavity by acting on the handle **171.** When the washing machine **100** has been extracted from the cavity of the furniture element by a sufficient amount, the drum **120** may be easily accessed through the casing opening **130** by opening the tub door **135** and the drum door **145.** According to another embodiment of the present invention, instead of directly providing the washing machine **100** with wheel elements **170,** the washing machine **100** may be installed on a movable floor element (*e.g.*, integral with the furniture element) provided with wheels.

[0042] In a preferred embodiment of the invention, the washing machine **100** is provided with both wheel elements **170** and handle **171** at the same time.

[0043] In an embodiment of the invention, the washing machine **100** and the cavity of the hollow furniture are slidingly coupled one another by means of lateral slide elements, which allow the washing machine **100** to be extracted/inserted from the cavity with ease.

[0044] The lateral slide element advantageously comprises rail elements **174** located on both the lateral sides of the casing **110** and extending substantially parallel to the direction of the horizontal axis **A,** and corresponding guide elements **175** located on sides of the cavity of the hollow furniture. As illustrated in **Figures 3-6,** the rail el-

ements **174** are configured to be slidingly engaged into the guide elements **175.** For example, the guide elements **175** comprise suitably shaped protruding members for defining corresponding lanes adapted to engage the rail elements **174.** In order to improve the sliding between the rail elements **174** and the guide elements **175,** the guide elements **175** may be additionally provided with rollers. Similar considerations apply if the rail elements **174** are located on the sides of the cavity of the hollow furniture and the corresponding guide elements **175** are located on the lateral sides of the casing **110.**

[0045] Although adapted to be fixed on sides of the cavity of the hollow furniture, for the sake of clarity the guide elements **175** have been illustrated in **Figures 3-6** detached from any furniture.

[0046] According to an embodiment of the present invention, the rail elements **174** are advantageously located on two support frames **178,** each one coupled to (a bottom portion of) a corresponding lateral side of the casing **110** and slanted with respect to said lateral side. The support frames **178** are arranged in such a way to define, on the section plane identified with the reference **105,** substantially a "V", so that the rail elements **174** results to be at least partially faced one to another, converging toward the bottom of the washing machine **110** (as depicted in **Figure 2**)**.** In order to allow a correct sliding of the rail elements **174** along the lanes defined by the guide elements **175,** the guide elements **175** are shaped so as to follow the slanted profile of the support frames **178.** Thanks to this peculiar arrangement, once installed, the washing machine **100** self-centers on the above **described** slide elements, so that any unwanted clearance between the washing machine **100** and the hollow furniture is advantageously kept as low as possible.

[0047] In **Figure 7** there is illustrated the washing machine **100** (with the tub door **135** of the sliding type) in an exemplary built-in arrangement (the hollow furniture element is identified with the reference **180**)**,** with the washing machine **100** that is pulled out from the cavity, and the tub door **135** that is opened.

[0048] Naturally, different types of slide elements may be also contemplated.

[0049] According to another embodiment of the present invention, instead of being supported by wheel elements **170,** the washing machine **100** may be arranged to be installed within the furniture element in a lifted manner, with the washing machine **100** itself that is supported by the slide elements only.

Claims

1. A laundry washing machine (**100**), comprising:

- an external casing (**110**);
- a washing tub (**115**) contained in the external casing (**110**);
- a washing drum (**120**) contained in the washing tub (**115**), wherein:
- the washing drum (**120**) is provided on its lateral surface with a drum opening (**160**) for loading/unloading laundry into/from the washing drum (**120**), and with one or more drum doors (**145**) for closing said drum opening (**160**);
- the washing tub (**115**) is provided with a tub opening (**140**) for accessing the washing drum (**120**), and with one or more tub doors (**135**) for closing said tub opening (**140**), and
- the external casing (**110**) is provided with a casing opening (**130**) for accessing the washing tub (**115**),

characterized in that

the external casing (**110**) is free from a cover or a door or a lid for closing the casing opening (**130**).

2. The laundry washing machine (**100**) of claim 1, wherein the casing opening (**130**) is provided on a top side of the external casing (**100**).

3. The laundry washing machine (**100**) of claim 2, wherein the casing opening (**130**) is delimited by a top frame (**112**) located on the top side of the external casing (**100**), said top frame (**112**) being provided with at least one between:

- at least one compartment (**127**) fluidly connected to the internal of the washing tub (**115**) for supplying water and washing/rinsing products, and
- an interface panel (**114**) of the laundry washing machine (**100**).

4. The laundry washing machine (**100**) of any one among the preceding claims, wherein said one or more tub doors (**135**) comprise a door of the sliding type, adapted to slide with respect to the washing tub (**120**).

5. The laundry washing machine (**100**) of any one among claims 1 to 3, wherein said one or more tub doors (**135**) comprise a door of the hinged type, adapted to swing with respect to the washing tub (**120**) about hinge elements connected to the washing tub (**120**).

6. The laundry washing machine (**100**) of any one among the preceding claims, wherein:

- the laundry washing machine (**100**) is adapted to operate with a portion of the washing tub (**115**) exposed through the casing opening (**130**), and
- when closed, the one or more tub doors (**135**) is/are adapted to avoid that water/washing liquid and/or steam spurts outside the laundry washing machine (**100**) passing through the casing

opening (**130**) when the laundry washing machine (**100**) is in operation.

7. The laundry washing machine (**100**) of any one among the preceding claims, wherein the laundry washing machine (**100**) is adapted to be slidingly inserted/extracted into/from a cavity of a hollow furniture element (**180**).

8. The laundry washing machine (**100**) of claim 7, wherein first guide elements (**174**) are laterally provided on the external casing (**110**) for being slidingly engaged into corresponding second guide elements (**175**) located on sides of the cavity of the hollow furniture element (**180**).

9. The laundry washing machine (**100**) of claim 8, wherein:

- the external casing (**100**) is substantially parallepiped-shaped, with lateral sides extending from the top side of the external casing (**110**) toward a bottom side of the external casing (**110**);
- the first guide elements (**174**) and the second guide elements (**175**) are slanted with respect to the lateral sides of the external casing (**110**) so as to converge one another toward the bottom side of the external casing (**110**).

10. The laundry washing machine (**100**) of any one among the preceding claims, further comprising wheel elements (**170**) located on a bottom side of the casing (**110**) to allow the laundry washing machine (**100**) to be pulled/pushed across a flat element.

11. A furniture assembly (**100**, **180**) comprising a hollow furniture element (**180**) and a laundry washing machine (**180**) according to any one among the preceding claims, wherein the washing machine (**100**) is adapted to be displaced, with respect to said hollow furniture element (**180**), from a closed configuration, in which the laundry washing machine (**100**) is at least substantially housed within a cavity of the hollow furniture element (**180**), to an open configuration, wherein the laundry washing machine (**100**) is extracted from the cavity so that the washing drum (**120**) can be accessed through the casing opening (**130**) by opening the tub door (**135**) and the drum door (**145**).

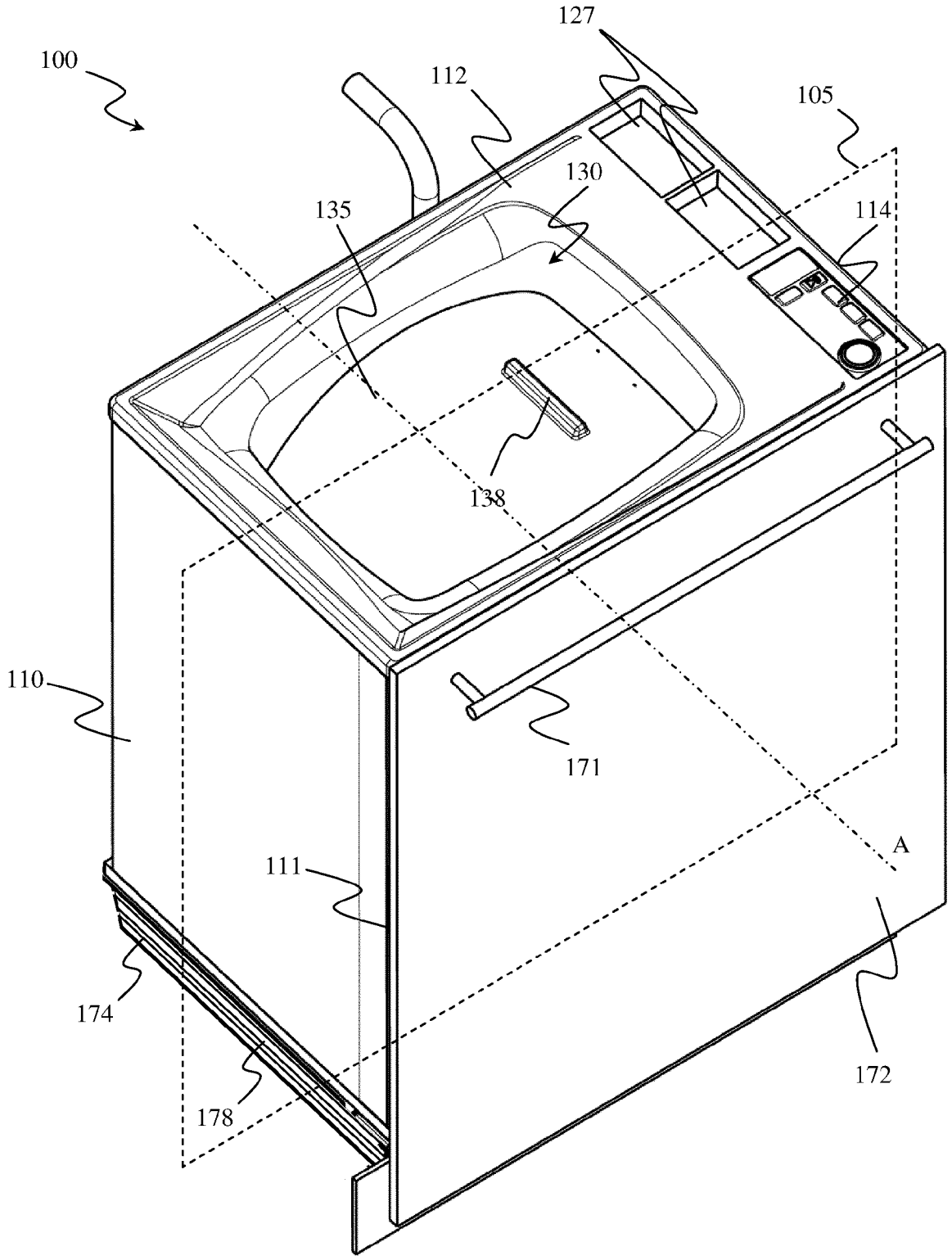

FIG.1

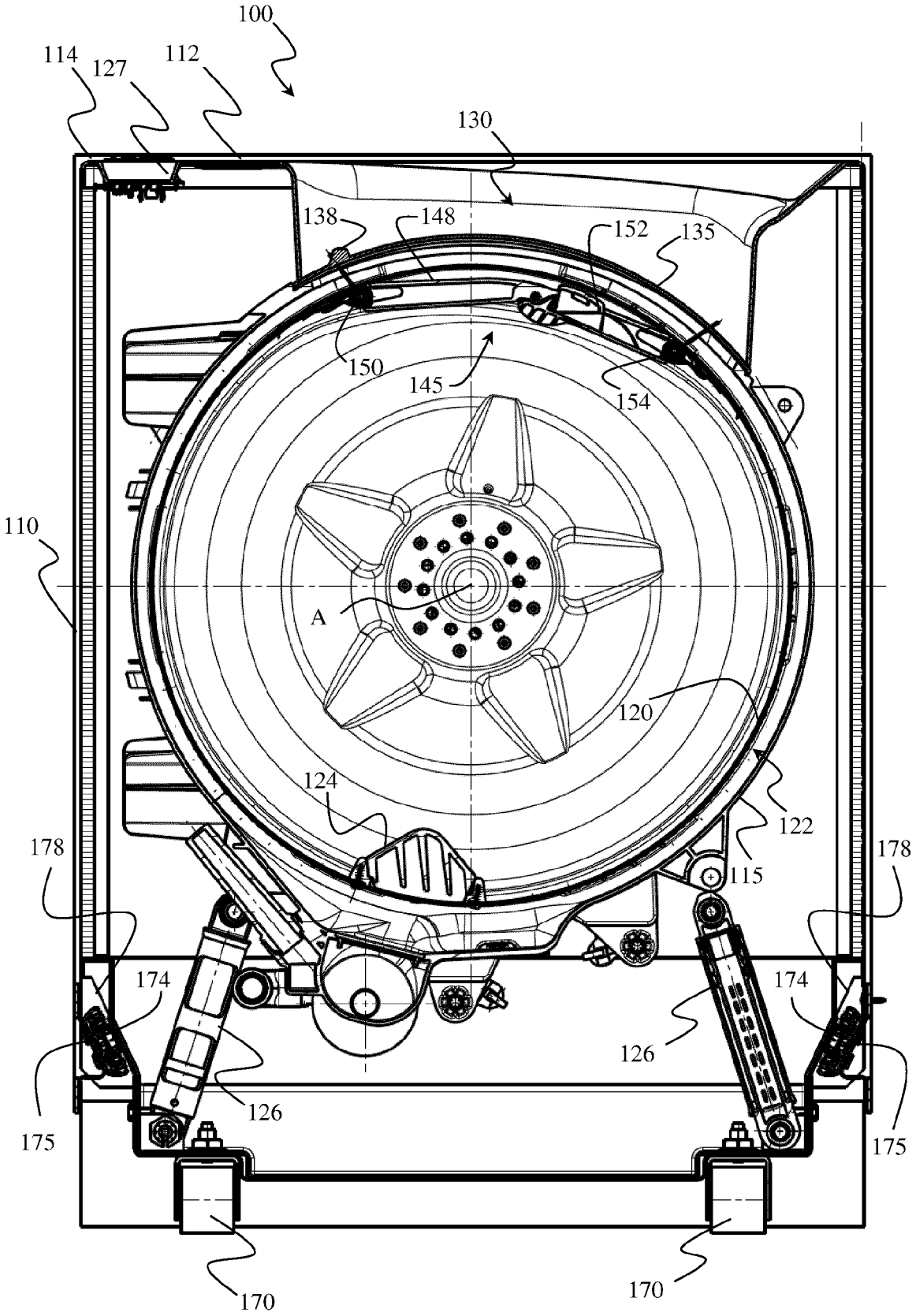
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FIG.2

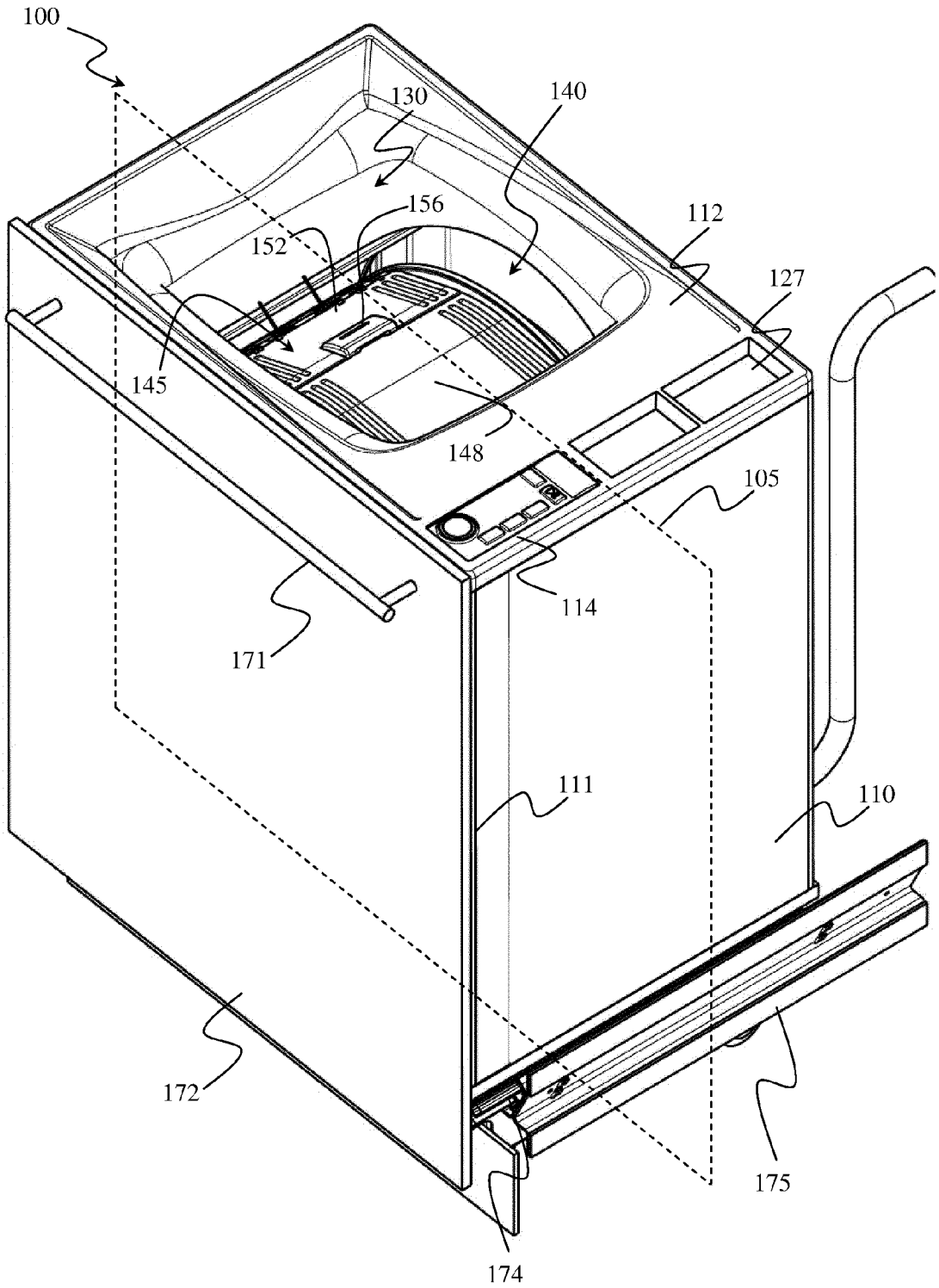
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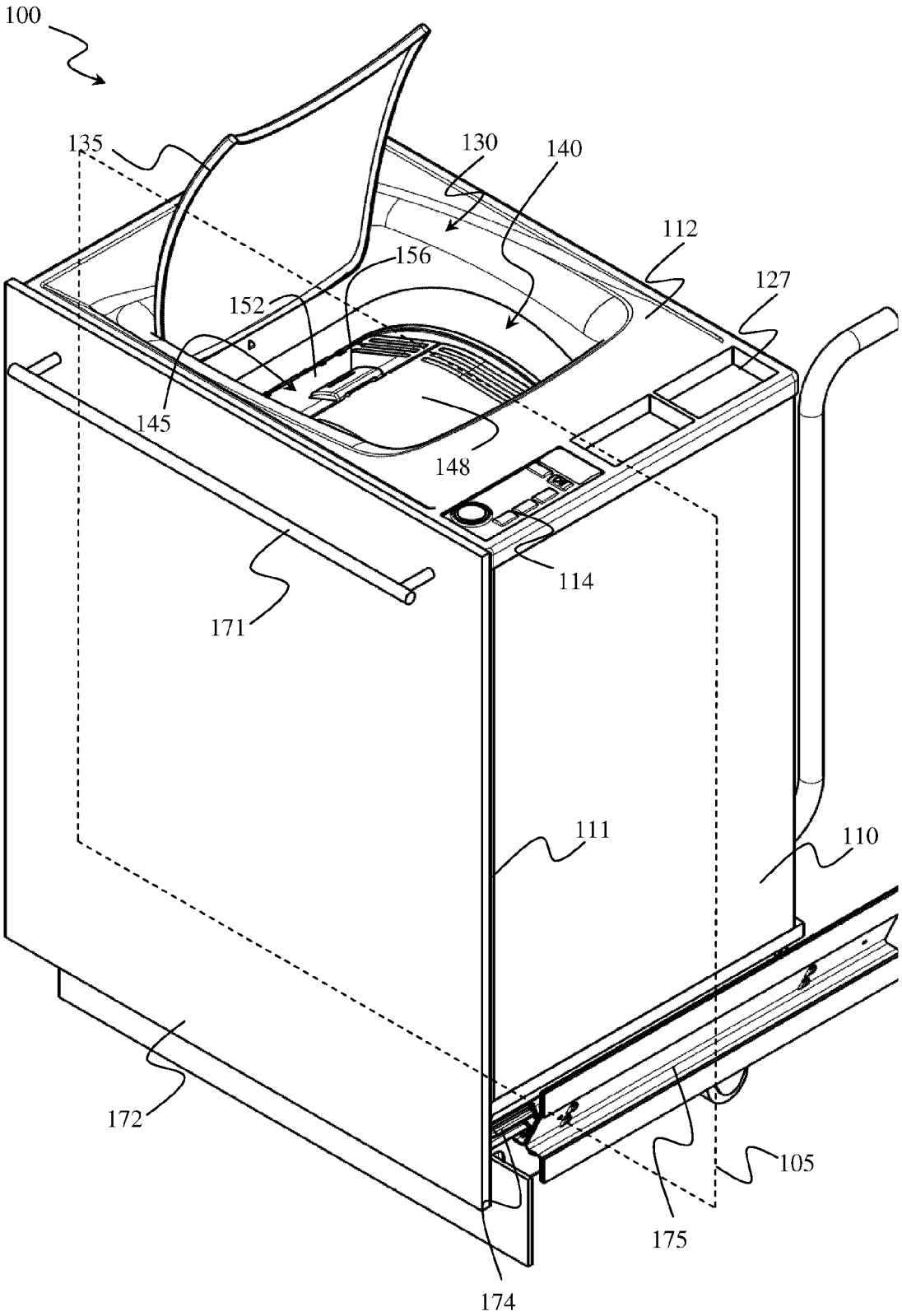
FIG.3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174

FIG.4

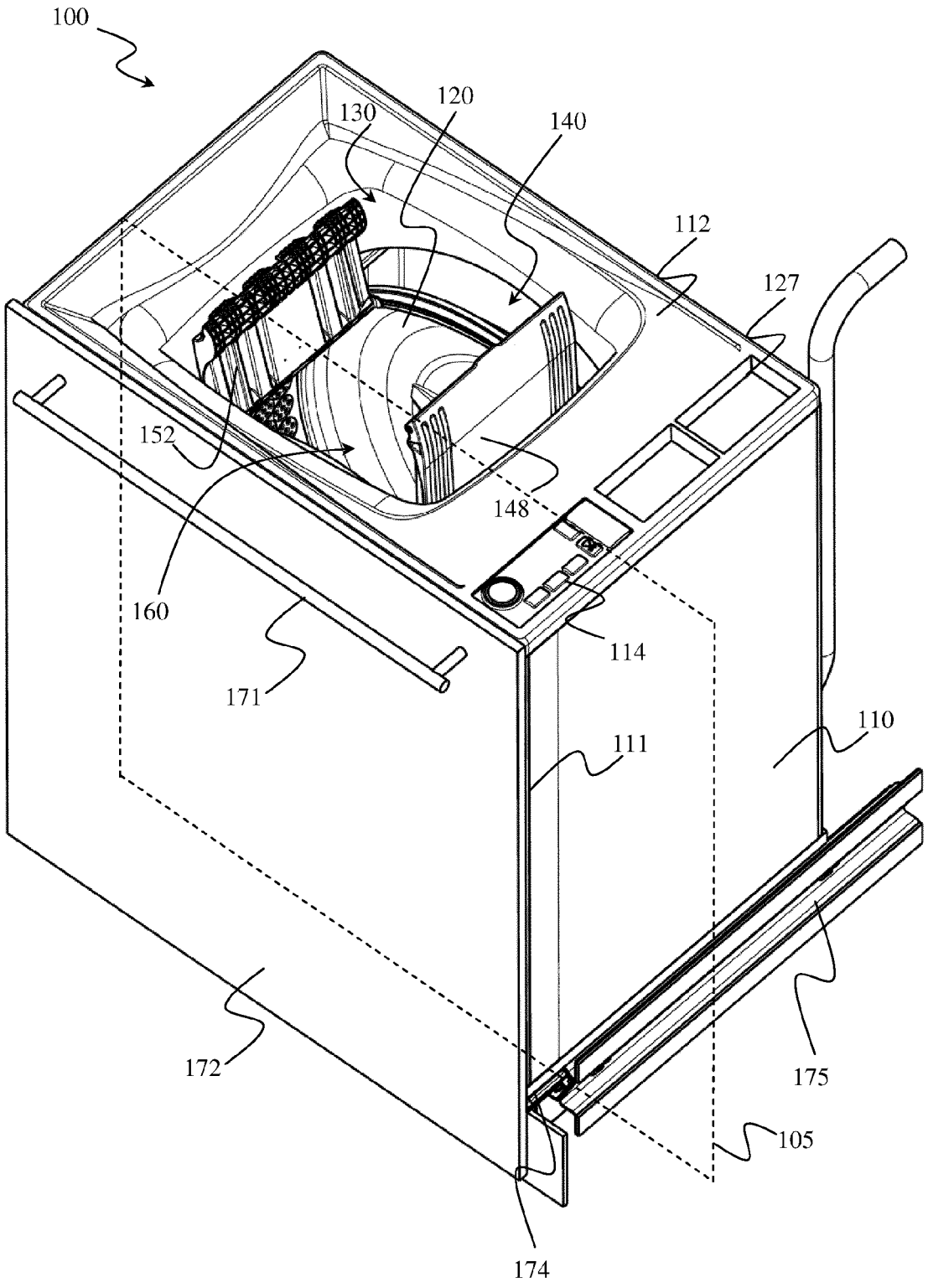
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FIG.5

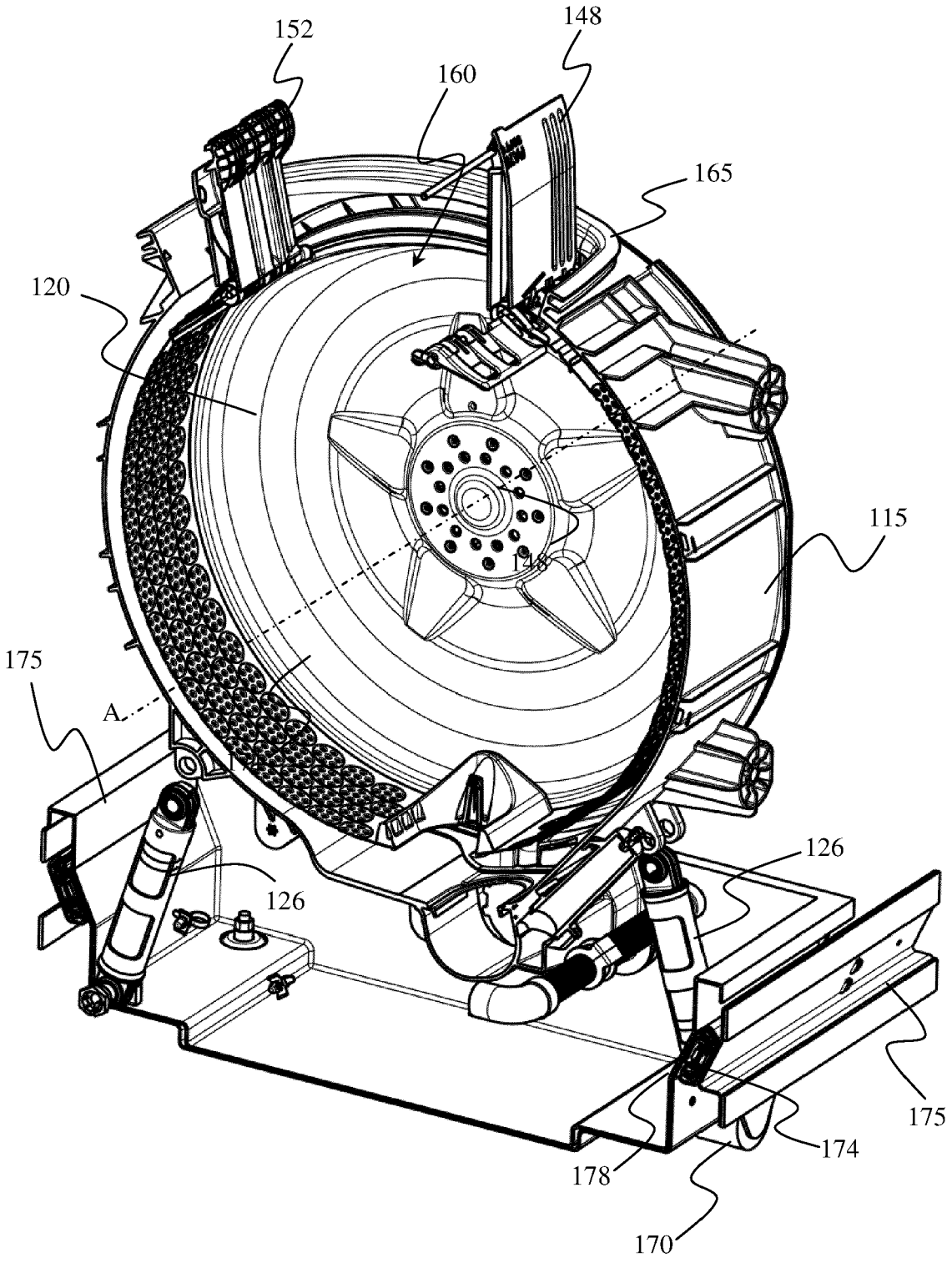
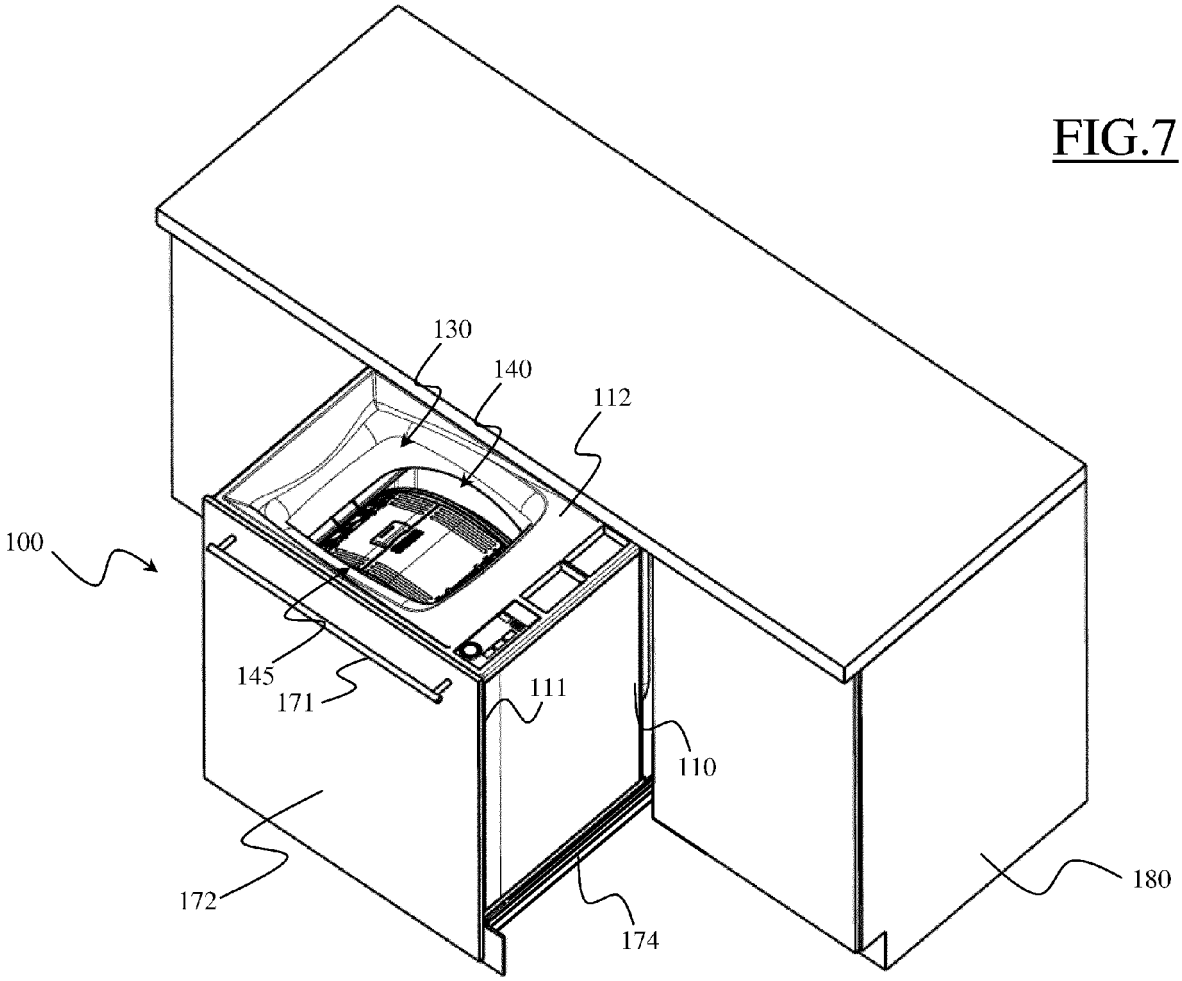


FIG.6

FIG.7



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Application Number
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Place of search	Date of completion of the search	Examiner
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