

US Patent & Trademark Office

Patent Public Search | Text View

United States Patent	12392075
Kind Code	B2
Date of Patent	August 19, 2025
Inventor(s)	Bhogulkar; Sushant Maruti et al.

Shipping spacer assembly for washing machines

Abstract

A shipping spacer assembly is configured to be removably attached to a wash tub of a washing machine for fixing a distance between a wash tub and a cabinet of a washing machine appliance in an installed position. The shipping spacer assembly includes a bolt, a cord retention mechanism, and a grommet. The bolt includes a shaft extending along an axial direction, a head located at one end of the shaft, and a threaded portion located opposite the head in the axial direction. The cord retention mechanism is configured for receipt of a power cord. The cord retention mechanism is positioned between the head of the bolt and the rear panel in the installed position. The grommet defines a grommet cavity. The shaft is removably positioned through the grommet cavity.

Inventors: Bhogulkar; Sushant Maruti (Karnataka, IN), Anburaj; Ravikumar (Tamilnadu, IN), Gopireddy; Srikanth (Telangana, IN), Madeti; Pavan Kumar (Andhra Pradesh, IN), Seerreddy; Veera Venkata Anil Bhaskar Prasad (Hyderabad, IN), Rangu; Venkata Chakradhar (Louisville, KY), Yadav; Neelapala Gopinath (Hyderabad, IN), Kommagalla; Ajay Kumar (Hyderabad, IN), Mallavarapu; Kalyana Swamy (Hyderabad, IN)

Applicant: Haier US Appliance Solutions, Inc. (Wilmington, DE)

Family ID: 1000008766156

Assignee: Haier US Appliance Solutions, Inc. (Wilmington, DE)

Appl. No.: 17/883133

Filed: August 08, 2022

Prior Publication Data

Document Identifier	Publication Date
US 20230416969 A1	Dec. 28, 2023

Foreign Application Priority Data

IN

202211036368

Jun. 24, 2022

Publication Classification

Int. Cl.: **D06F39/00** (20240101); **D06F23/04** (20060101); **D06F34/10** (20200101); **F16B43/00** (20060101)

U.S. Cl.:

CPC **D06F39/001** (20130101); **D06F23/04** (20130101); **D06F34/10** (20200201); **F16B43/00** (20130101);

Field of Classification Search

USPC: None

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
2386788	12/1944	Peter	248/603	D06F 37/24
7441420	12/2007	Kim et al.	N/A	N/A
9290881	12/2015	Jun et al.	N/A	N/A
10787763	12/2019	Zhang et al.	N/A	N/A
10837136	12/2019	Rineer et al.	N/A	N/A
11879496	12/2023	Xie	N/A	F16B 43/025
2004/0118167	12/2003	Kim	68/3R	D06F 39/001
2009/0074535	12/2008	Roberts	411/166	F16B 21/09
2012/0012716	12/2011	Lien	29/446	F16L 3/1207
2019/0112743	12/2018	Kim et al.	N/A	N/A
2019/0338456	12/2018	Pacho Millán	N/A	F16B 21/09
2020/0141039	12/2019	Cho et al.	N/A	N/A
2020/0199802	12/2019	Rineer	N/A	B65D 85/68
2021/0198830	12/2020	Chun	N/A	D06F 37/04

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
201045091	12/2007	CN	N/A
204099377	12/2014	CN	N/A
206000833	12/2016	CN	N/A
108589179	12/2017	CN	D06F 39/001
211420632	12/2019	CN	N/A

19852129	12/1999	DE	D06F 39/001
2132367	12/2010	EP	D06F 39/001
2175061	12/2010	EP	N/A
2313330	12/2016	EP	N/A
2342376	12/2016	EP	D06F 39/001
4015695	12/2021	EP	D06F 39/001
2216916	12/2003	ES	N/A
2281263	12/2006	ES	D06F 39/001
2043707	12/1979	GB	D06F 37/269
19990012987	12/1998	KR	N/A
20050113977	12/2004	KR	N/A
WO-2007039594	12/2006	WO	D06F 39/001

OTHER PUBLICATIONS

Bolt Science, “The Use of Two Nuts to Prevent Self Loosening”,
<https://www.boltscience.com/pages/twonuts.htm> (Year: 2019). cited by examiner

Primary Examiner: Chaudhri; Omair

Attorney, Agent or Firm: Dority & Manning, P.A.

Background/Summary

FIELD OF THE INVENTION

(1) The present subject matter relates generally to appliances, and more particularly to washing machine appliances.

BACKGROUND OF THE INVENTION

(2) Washing machine appliances generally include a wash tub housed within a cabinet. A wash basket is rotatably mounted within the wash tub and defines a wash chamber for receipt of articles for washing during a wash cycle. During the wash cycle, the wash basket rotates and agitates articles or wash fluid to wash the articles. The wash tub may move or vibrate within the cabinet during the wash cycle. One or more suspension devices of the washing machine appliance may suspend the wash tub within the cabinet and allow some movement relative to the cabinet during operation. The suspension devices generally allow the tub to move relative to the cabinet during operation of the washing machine appliance.

(3) Notably, vibrations that may be experienced during the transportation of the washing machine appliance may overwhelm the suspension devices, resulting in premature wear or damage to one or more components of the appliance. Accordingly, shipping bolts and spacers are commonly used to secure the tub to the cabinet to make the washer rigid and to ensure the safe handling of the washing machine appliance during shipping or other transport. After the washing machine appliance is installed, the shipping bolts and spacers should be removed prior to operating the machine. However, sometimes the shipping bolts and spacers are inadvertently left in the washer at the time of installation. If these bolts and spacers are not removed, the suspensions of the wash tub will not be activated and there will be a lot of noise and vibration. These issues result in customer dissatisfaction, damage to the appliance or surrounding property, or additional service visits or maintenance costs.

(4) Accordingly, measures for simplifying the installation and transport of washing machine appliances would be desirable. Additionally or alternatively, a stabilization measure that entices its

removal from the wash tub prior to use of the washing machine appliance would be useful.

BRIEF DESCRIPTION OF THE INVENTION

(5) Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

(6) In one exemplary aspect of the present disclosure, a washing machine appliance is provided. The washing machine appliance may include a cabinet having a rear panel, a wash tub located within the cabinet, a power cord configured to connect the washing machine appliance to an external power source and a shipping spacer assembly. The shipping spacer assembly may be removably attached to the wash tub for fixing a distance between the wash tub and the cabinet in an installed position. The shipping spacer assembly may define an axial direction, a radial direction, and a circumferential direction. The shipping spacer assembly may include a bolt, a cord retention mechanism, and a grommet. The bolt may include a shaft extending along the axial direction, a head located at one end of the shaft, and a threaded portion located opposite the head in the axial direction. The cord retention mechanism may be configured for receipt of the power cord and may be located along the shaft of the bolt. The cord retention mechanism may be positioned between the head of the bolt and the rear panel when the shipping spacer assembly is in the installed position. The grommet may define a grommet cavity, the shaft removably positioned through the grommet cavity.

(7) In another exemplary aspect of the present disclosure, a shipping spacer assembly is provided. The shipping spacer assembly may be configured to be removably attached to a wash tub of a washing machine appliance for fixing a distance between the wash tub and a cabinet of the washing machine appliance in an installed position. The shipping spacer assembly may define an axial direction, a radial direction, and a circumferential direction. The shipping spacer assembly may include a bolt, a cord retention mechanism, and a grommet. The bolt may include a shaft extending along the axial direction, a head located at one end of the shaft, and a threaded portion located opposite the head in the axial direction. The cord retention mechanism may be configured for receipt of a power cord and may be located along the shaft of the bolt. The cord retention mechanism may be configured to be positioned between the head of the bolt and the cabinet when the shipping spacer assembly is in the installed position. The grommet may define a grommet cavity, the shaft removably positioned through the grommet cavity.

(8) These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures.

(2) FIG. 1 provides a perspective view of a washing machine appliance according to exemplary embodiments of the present disclosure.

(3) FIG. 2 provides a front section view of the exemplary washing machine appliance of FIG. 1.

(4) FIG. 3 provides a side cross section view of the exemplary washing machine appliance of FIG. 1.

(5) FIG. 4 provides a cross section view of an exemplary shipping spacer assembly according to exemplary embodiments of the present disclosure.

(6) FIG. 5 provides a cross section, exploded view of the exemplary shipping spacer assembly of FIG. 4.

(7) FIG. 6 provides a perspective, exploded view of an exemplary shipping spacer assembly according to exemplary embodiments of the present disclosure.

(8) FIG. 7 provides a cross section view of an exemplary shipping spacer assembly installed in an exemplary washing machine appliance according to exemplary embodiments of the present disclosure.

(9) FIG. 8 provides a perspective, rear view of an exemplary washing machine appliance according to exemplary embodiments of the present disclosure.

(10) Use of the same or similar reference numerals in the figures denotes the same or similar features unless the context indicates otherwise.

DETAILED DESCRIPTION

(11) Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

(12) As used herein, the term “or” is generally intended to be inclusive (i.e., “A or B” is intended to mean “A or B or both”). The terms “first,” “second,” and “third” may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components. Terms such as “inner” and “outer” refer to relative directions with respect to the interior and exterior of the appliance, and in particular the chamber(s) defined therein. For example, “inner” or “inward” refers to the direction towards the interior of the appliance. Terms such as “left,” “right,” “front,” “back,” “top,” “rear,” or “bottom” are used with reference to the perspective of a user accessing the appliance (e.g., when the door is in the open position). For example, a user stands in front of the appliance to open a door and reaches into the internal chamber(s) to access items therein.

(13) Approximating language, as used herein throughout the specification and claims, may be applied to modify any quantitative representation that could permissibly vary without resulting in a change in the basic function to which it is related. Accordingly, a value modified by a term or terms, such as “generally,” “about,” “approximately,” and “substantially,” are not to be limited to the precise value specified. In at least some instances, the approximating language may correspond to the precision of an instrument for measuring the value, or the precision of the methods or machines for constructing or manufacturing the components or systems. For example, the approximating language may refer to being within a 10 percent margin (i.e., including values within ten percent greater or less than the stated value). In this regard, for example, when used in the context of an angle or direction, such terms include within ten degrees greater or less than the stated angle or direction (e.g., “generally vertical” includes forming an angle of up to ten degrees in any direction, such as, clockwise or counterclockwise, with the vertical direction V).

(14) Aspects of the present subject matter advantageously provide a washing machine appliance that may provide a stable shipping situation, with a wash tub internal to the washing machine appliance secured during shipment. Further, the present subject matter may provide a way to remove a shipping spacer assembly, which includes a bolt, a cord retention mechanism and a mechanism configured to fix the distance between the wash tub and the cabinet of the washing machine appliance. By attaching the shipping spacer assembly to a power cord of the washing machine appliance and making the power cord inaccessible without removal of the shipping spacer assembly from the washing machine, the chance of the shipping spacer assembly remaining in the

washing machine after installation may be greatly reduced.

(15) By orienting a cord retention mechanism to be irremovable from the bolt of the shipping spacer assembly until removal of the bolt from the appliance, removal of the shipping spacer assembly and accessing the power cord are performed in one step instead of two separate steps of installation, the shipping spacer assembly may be removed with the step of accessing the power cord instead of as a separate step when installing the appliance. Further, the step of accessing the power cord may be a more generally well-known step than the step of removing the shipping bolts, so combining these steps may advantageously result in fewer service calls associated with spacers left in washing machines after installation. Bolts left in washing machines after installation may lead to improper functioning of suspension systems within the washing machine and may lead to walking or movement of the washing machine appliance during use following installation. Removal of bolts as a part of attaching the washing machine to a power source may increase correct installation practices and decrease service calls or returns due to improper installation of the appliance.

(16) Turning now to the figures, FIGS. **1**, **2**, and **3** illustrate an exemplary embodiment of a washing appliance. Specifically, the washing appliance is illustrated as a vertical axis washing machine appliance **100**. In FIG. **1**, a lid or door **130** is shown in a closed position. FIG. **2** provides a front cross sectional view and FIG. **3** provides a side cross sectional view of certain components of washing machine appliance **100**.

(17) Washing machine appliance **100** generally defines a vertical direction V, a lateral direction L, and a transverse direction T, each of which is mutually perpendicular, such that an orthogonal coordinate system is defined. While described in the context of a specific embodiment of vertical axis washing machine appliance **100**, using the teachings disclosed herein it will be understood that vertical axis washing machine appliance **100** is provided by way of example only. Other washing appliances having different configurations, different appearances, or different features may also be utilized with the present subject matter as well (e.g., horizontal axis washing machine appliances or front load washing machine appliances).

(18) Washing machine appliance **100** has a cabinet **102** that extends between a top portion **103** and a bottom portion **104** along the vertical direction V. Cabinet **102** may further include a rear panel **118**, a front panel **116** located forward of the rear panel **118** in transverse direction T, and a left panel **122** opposing a right panel **124** in the lateral direction L. The cabinet may further include a top panel **140** located perpendicular to the front panel **116**, rear panel **118**, left panel **122** and right panel **124**, the top panel extending in a plane roughly having the lateral direction L and the transverse direction T. The rear panel **118** may extend in a plane roughly having the lateral direction L and the vertical direction V. A wash basket **120** is located within cabinet **102**. As shown, wash basket **120** is movably disposed and rotatably mounted in a wash tub **121** in a spaced apart relationship from a tub sidewall **148** and a tub bottom **146**. Wash basket **120** is further rotatably mounted within cabinet **102**. Basket **120** includes a plurality of perforations **106** therein to facilitate fluid communication between an interior of basket **120** and wash tub **121**. A motor **142** may be in mechanical communication with wash basket **120** to selectively rotate wash basket **120** (e.g., about a rotation axis W during an agitation or a rinse cycle of washing machine appliance **100**). Wash basket **120** is received within wash tub **121** and is configured for receipt of articles for washing. The wash tub **121** holds wash and rinse fluids for agitation in wash basket **120** within wash tub **121**. In optional embodiments, an agitator or impeller **128** extends into wash basket **120** and is also in mechanical communication with motor **142**. Impeller **128** may assist agitation of articles disposed within wash basket **120** during operation of washing machine appliance **100**.

(19) In some embodiments, cabinet **102** of washing machine appliance **100** has a top panel **140**. Top panel **140** defines an opening **105** that permits user access to wash basket **120** of wash tub **121**. Door **130**, which may be rotatably mounted to top panel **140**, permits selective access to opening **105**. In particular, door **130** selectively rotates between the closed position shown in FIG. **1** and an

open position, not shown. In the closed position, door **130** inhibits access to wash basket **120**. Conversely, in the open position, a user can access wash basket **120**. In optional embodiments, a window **136** in door **130** permits viewing of wash basket **120** when door **130** is in the closed position (e.g., during operation of washing machine appliance **100**). Door **130** also includes a handle **132** that, for example, a user may pull or lift when opening and closing door **130**. Further, although door **130** is illustrated as mounted to top panel **140**, alternatively, door **130** may be mounted to another portion of cabinet **102** (e.g., to front panel **116**) or any other suitable support. (20) In some embodiments, basket **120** and agitation element **128** are driven by a motor **142** (i.e., rotated about the vertical axis W) through a transmission assembly **144**, e.g., such as a clutch assembly. The motor **142** attaches to and rotates basket **120** within wash tub **121**. Transmission assembly **144** facilitates driving engagement of basket **120** and agitation element **128** for rotatable movement within wash tub **121**, and transmission assembly **144** facilitates relative rotation of basket **120** and agitation element **128** for selected phases of a wash cycle. Motor **142** and transmission and transmission assembly **144** collectively are referenced herein as a motor assembly **156**.

(21) A liquid supply connection **152** may include various valves and conduits to deliver fluid to basket **120** and wash tub **121**, as would be understood. Liquid supply connection **152** provides a fresh water supply for use in washing machine appliance **100** when connected to a building plumbing system (e.g., at water supply source **162**). A dispenser **154** may also be provided to produce a solution (e.g., wash fluid) by mixing fresh water with a known detergent or other composition for cleansing of articles in basket **120**. Tub **121** includes a bottom **104** and a tub side **148**, and basket **120** is rotatably mounted within wash tub **121**. A pump assembly **150** is located beneath tub **121** and basket **120** for gravity assisted flow when draining tub **121**. A power cord **170** (e.g., as shown in FIG. 4) may attach at rear panel **118**. Power cord **170** may be configured to connect appliance **100**, including a controller **108** or a control panel **110**, to an external power source such as an electrical outlet. Power cord **170** may include a cord head **172** and prongs **174** extending from cord head **172**. Prongs **174** may be configured to be inserted into the external power source, such as a household power outlet to connect appliance **100** to the external power source, to power the appliance, as would be understood.

(22) As illustrated, basket **120**, tub **121**, and motor assembly **156** may be supported by a vibration damping suspension system **126**. The damping suspension system **126** can include a plurality of damping elements, such as piston-casing damping elements, coupled to the wash tub **121**. The damping suspension system **126** can include other elements, such as a balance ring **138** disposed around the upper circumferential surface of the wash basket **120**. The balance ring **138** can be used to counterbalance an out of balance condition for the wash machine as the basket **120** rotates within the wash tub **121**. The wash basket **120** could also include a balance ring **139** located at a lower circumferential surface of the wash basket **120**. During washing operations, damping suspension system **126** generally function to dampen dynamic motion as the wash basket **120** rotates within the wash tub **121**, and may be performed as shown or in an equivalent manner, as would be understood.

(23) In certain embodiments, control panel **110**, with at least one input selector **112**, extends from top panel **140**. Control panel **110** and input selector **112** collectively form a user interface input for operator selection of machine cycles and features. A display **114** of control panel **110** indicates selected features, operation mode, a countdown timer, or other items of interest to appliance users regarding operation. Operation of washing machine appliance **100** may be controlled by a controller **108** connected (e.g., electrically coupled) to control panel **110** for user manipulation to select washing machine cycles and features. In response to user manipulation of control panel **110**, controller **108** operates the various components of washing machine appliance **100** to execute selected machine cycles and features.

(24) Controller **108** may include a memory (e.g., non-transitive media) and microprocessor, such as

a general or special purpose microprocessor operable to execute programming instructions or micro-control code associated with a selected machine cycles and features (e.g., as part of a washing operation). The memory may represent random access memory such as DRAM or read only memory such as ROM or FLASH. In certain embodiments, the processor executes programming instructions stored in memory. The memory may be a separate component from the processor or may be included onboard within the processor. Alternatively, controller **108** may be constructed without using a microprocessor (e.g., using a combination of discrete analog or digital logic circuitry, such as switches, amplifiers, integrators, comparators, flip-flops, AND gates, and the like) to perform control functionality instead of relying upon software. Control panel **110** and other components of washing machine appliance **100** (e.g., one or more sensors, such as a pressure sensor mounted to tub **121**) may be in communication with controller **108** via one or more signal lines or shared communication busses.

(25) In some embodiments, during operation of washing machine appliance **100**, laundry articles are loaded into wash basket **120** through opening **105**, and a washing operation is initiated through operator manipulation of input selectors **112**. Wash basket **120** or wash tub **121** may be filled with water and detergent or other fluid additives via an additive dispenser **154**. One or more valves can be controlled by washing machine appliance **100** to provide for filling wash basket **120** to the appropriate level for the volume or number of articles being washed or rinsed. By way of example for a wash cycle, once wash tub **121** is properly filled with fluid, the contents of wash tub **121** can be agitated (e.g., with an impeller as discussed previously) for washing of laundry items in wash basket **120**.

(26) After the agitation phase of the wash cycle is completed, wash tub **121** can be drained. Laundry articles can then be rinsed (e.g., for a rinse cycle) by again adding fluid to wash basket **120** depending on the specifics of the washing operation selected by a user. Agitation element **128** may again provide agitation within wash basket **120**. One or more spin cycles also may be used. In particular, a spin cycle may be applied after the wash cycle or after the rinse cycle to wring wash fluid from the articles being washed. During a spin cycle, wash basket **120** is rotated at relatively high speeds. After articles disposed in wash basket **120** are cleaned or washed, the user can remove the articles from wash basket **120** (e.g., by reaching into wash basket **120** through opening **105**).

(27) Turning especially to FIG. 3, a shipping spacer assembly **200** may be attached to wash tub **121**. Rear panel **118** defines a spacer hole **202** extending therethrough in transverse direction T. Wash tub **121** further defines a bolt boss **204** extending into wash tub **121**. Generally, shipping spacer assembly **200** is removably attached to wash tub **121** for fixing a distance WP between wash tub **121** and cabinet **102** in an installed position. In some embodiments, shipping spacer assembly **200** attaches to wash tub **121** by entering bolt boss **204**, a portion of shipping spacer assembly **200** extending between rear panel **118** and wash tub **121**. In other words, a portion of shipping spacer assembly **200** extends through spacer hole **202** and into bolt boss **204**. Shipping spacer assembly **200** is configured to attach to wash tub **121** by removable receipt through spacer hole **202**.

Advantageously, fixing distance WP between wash tub **121** and cabinet **102** may allow the wash tub **121** to be rigidly fixed during transportation, preventing wear on suspension system **126** due to movement during transportation.

(28) Turning to FIGS. 4 through 8, embodiments of shipping spacer assembly **200** are depicted, including an installed view in FIGS. 4, 7 and 8, and exploded views in FIGS. 5 and 6. Further, FIG. 8 depicts shipping spacer assemblies **200** installed in rear panel **118** and securing power cord **170** for shipping. Washing machine appliance **100** is shown herein as a top loading washing machine, as an example. Other embodiments of a washing machine appliance may also be used in embodiments, such as a front loading washing machine, a dryer appliance, or another household appliance where stabilization during shipping may be beneficial. Generally, features of washing machine appliance **100** will be described below, with the understanding that other embodiments may include or be provided as another suitable household appliance (e.g., defining an internal

chamber).

(29) Washing machine appliance **100** may further include a retention bar **206**, as shown in FIGS. **4**, **5**, and **8**. Retention bar **206** may be located on rear panel **118**. Generally, retention bar **206** is located transversely behind rear panel **118**. Retention bar **206** extends along a width of rear panel **118**. In some embodiments, and as shown in FIG. **8**, retention bar **206** extends laterally along a portion of rear panel **118**. Retention bar **206** may aid in stabilizing washing machine appliance **100** during transportation or during use. Retention bar **206** defines a retention aperture **208**. Retention aperture **208** extends through retention bar **206**. Retention aperture **208** is configured to removably receive shipping spacer assembly **200**. For example, retention aperture **208** receives shipping spacer assembly **200** in installed position (which is shown in FIGS. **4** and **8**). Retention aperture **208** may align with spacer hole **202** or with bolt boss **204**. For example, retention aperture **208**, spacer hole **202** and bolt boss **204** may be aligned with one another along the transverse direction **T**.

(30) Shipping spacer assembly **200** is configured to attach to wash tub **121** by removable receipt through retention aperture **208**. Alternatively, retention bar **206** may not be used, with shipping spacer assembly **200** configured to be seated directly against cabinet **102**. For example, shipping spacer assembly **200** may be removably received directly at spacer hole **202** defined on rear panel **118**. In some embodiments, a portion of shipping spacer assembly **200** may rest on an exterior side **117** of rear panel **118** adjacent to spacer hole **202** when a portion of shipping spacer assembly **200** is received in bolt boss **204** defined by wash tub **121**.

(31) As shown in FIGS. **4** through **7**, shipping spacer assembly **200** defines an axial direction **A**, a radial direction **R**, and a circumferential direction **C**. Shipping spacer assembly **200** generally includes a bolt **210**, and a spacing feature for fixing distance **WP** between the wash tub **121** and cabinet **102** (e.g., a spacer **218** or an axial stop **216**), a grommet **232**, and a cord retention mechanism **224**. Generally, elements other than bolt **210** of shipping spacer assembly **200** are removably received onto bolt **210** of shipping spacer assembly **200**. Each of the elements of various embodiments of shipping spacer assembly **200** will be described in more detail below.

(32) Bolt **210** of shipping assembly **200** generally includes a shaft **214** extending along the axial direction **A**, a head **212** located at one end of shaft **214**, and a threaded portion **244** located at an opposing end of shaft **214**. For example, threaded portion **244** is located opposite head **212** of bolt **210** in the axial direction **A**.

(33) Generally, bolt **210** is configured to be removably attached to wash tub **121**. In some embodiments, bolt **210** is configured to be inserted into spacer hole **202** and attach to bolt boss **204**. More specifically, threaded portion **244** may be configured to be removably attached into bolt boss **204** of wash tub **121**. Further, threaded portion **244** may be inserted through spacer hole **202** or retention aperture to attach shipping spacer assembly **200** to bolt boss **204**. In some embodiments, when threaded portion **244** is received into bolt boss **204**, a portion of threaded portion **244** may remain out of bolt boss **204**. Alternatively, threaded portion **244** may be sized to fit inside or fit flush with bolt boss **204** when received by bolt boss **204**. Receipt of threaded portion **244** within bolt boss **204** may fix distance **WP** between wash tub **121** and cabinet **102** of washing machine appliance **100**, as shown in FIG. **3**.

(34) According to exemplary embodiments, head **212** is configured to hold elements of shipping spacer assembly **200** along shaft **214** when shipping spacer assembly **200** is attached to washing machine appliance **100**. In this regard, for example, shaft **214** may have a shaft diameter **SD** and head **212** of bolt **210** may have a head diameter **HD** greater than shaft diameter **SD**. In some embodiments, head **212** includes a head flange **246**, which attaches to or is defined by shaft **214**. Accordingly, head diameter **HD** of bolt **210** may be largest at head flange **246**. Head flange **246** may extend beyond spacer **218** in radial direction **R**. Head **212** may retain other elements along shaft **214** such as grommet **232** and cord retention mechanism **224**, preventing movement of the elements from being removed when shipping spacer assembly **200** is in the installed position, or

when threaded portion **244** is attached to bolt boss **204**. In other words, head flange **246** and threaded portion **244** received into bolt boss **204** may secure grommet **232** and cord retention mechanism **224** along shaft **214**.

(35) Generally, cord retention mechanism **224** is located along shaft **214** of bolt **210**, between head **212** and threaded portion **244**. As shown in FIGS. **4** and **7**, cord retention mechanism **224** may be positioned between head **212** of bolt **210** and rear panel **118** when shipping spacer assembly **200** is in the installed position. Cord retention mechanism **224** includes a connecting tab **236** defining a shaft aperture **228** and a cord retention clip **238**. As shown in FIGS. **4** and **5**, connecting tab **236** may form an incomplete circle, clasp power cord **170** next to grommet **232**. In some embodiments, connecting tab **236** may form a full circle, or hoop (not shown) that surrounds a portion of the power cord. In the examples of FIGS. **4** and **5**, cord retention mechanism **224** is further located between grommet **232** and rear panel **118** of cabinet **102**. As shown in FIG. **4**, power cord **170** may be secured between cord retention clip **238** and grommet **232**, with cord retention clip **238** extending beyond grommet **232** in radial direction **R**.

(36) Additionally or alternatively, and as shown in the embodiments of FIGS. **6** and **7**, connecting tab **236** of cord retention mechanism **224** may be a two piece tab, with cord retention clip **238** connecting to a first tab **236A** and connecting to a second tab **236B**. In some embodiments, each tab **236A**, **236B** may define a corresponding shaft aperture **228A**, **228B**, as shown in FIG. **7**. Optionally, and as shown in FIG. **6**, first tab **236A** may form a “U” shape and may define a shaft cavity **228A**, with second tab **236B** forming an “O” shape and defining a shaft aperture **228B**. The power cord **170** may be in clip **238**, sandwiched between first tab **236A** and second tab **236B**, encasing a portion of power cord **170**.

(37) According to exemplary embodiments, shaft **214** may be removably received through shaft aperture **228** of cord retention mechanism **224**. As shown in FIGS. **4** through **7**, cord retention clip **238** extends from connecting tab **236**. In this regard, cord retention clip **238** extends adjacent to shaft **214**. A portion of power cord **170** may be received through cord retention clip **238**. Cord retention clip **238** may further hold power cord **170** against rear panel **118**.

(38) During use, power cord **170** may be removable from cord retention mechanism **224** only upon removal of cord retention mechanism **224** from bolt **210**. Additionally or alternatively, cord retention mechanism **224** may be only removable from bolt **210** following removal of grommet **232** from bolt **210** and following bolt **210** being removed from rear panel **118**. Thus, access to the power cord **170** may be predicated on removal of shipping spacer assembly **200**, including bolt **210**, grommet **232**, and cord retention mechanism **224** from cabinet **102** of washing machine appliance **100**. Advantageously, removal of the power cord **170** by removal of the shipping spacer assembly **200** may avoid or decrease the probability of bolts or spacers being left in the washing machine appliance **100** during use. In some embodiments, cord retention mechanism **224** is made of metal (e.g., sheet metal) or another material difficult to cut, but pliable enough to not damage power cord **170** when power cord **170** is received in cord retention clip **238**. In this manner, a user attempting to remove the power cord **170** would be encouraged to remove the shipping spacer assembly **200** instead of attempting to cut the cord retention clip **238**.

(39) Generally, grommet **232** is located along shaft **214** between head **212** and threaded portion **244**. Grommet **232** of shipping spacer assembly **200** may define a grommet cavity **234**. Shaft **214** is removably positioned through grommet cavity **234**. Further, grommet **232** may define a grommet shoulder **240**. Grommet shoulder **240** may extend in radial direction **R** from a central shaft **242** of grommet **232**. As shown in the embodiments of FIGS. **4** and **5**, cord retention mechanism **224** may abut grommet shoulder **240**, grommet shoulder **240** located between cord retention mechanism **224** and head **212** of bolt **210**. In other words, cord retention mechanism **224** is located between grommet shoulder **240** and threaded portion **244**. When in the installed position, as shown in FIG. **4**, cord retention mechanism **224** may be sandwiched between grommet shoulder **240** and retention bar **206** or cabinet **102**.

(40) In some embodiments, grommet 232 touches head 212. Grommet 232 may be attached to spacer 218. Such may include or be provided as a unitary feature. In some embodiments, and as shown in FIG. 6, grommet cavity 234 may receive a portion of spacer 218 as well as shaft 214. Spacer 218 may extend from grommet 232 behind retention bar 206 or rear panel 118 at spacer hole 202 or retention aperture 208. As shown installed in FIG. 6, at least a portion of grommet 232 may be external to rear panel 118 when shipping spacer assembly 200 is attached to wash tub 121. Additionally or alternatively, grommet 232 may be external to retention bar 206. In some embodiments, grommet 232 is affixed to spacer 218. Advantageously, grommet 232 being affixed to spacer 218 may promote removal of shipping spacer assembly 200 as grommet 232 visibly needs to be removed in order to access cord retention mechanism 224 or power cord 170, indicating to the user installing appliance 100 that bolt 210 needs to be removed, and spacer 218 is attached to grommet 232, so it will be removed with grommet 232.

(41) For the illustrated embodiments of FIGS. 4 and 5, shipping spacer assembly 200 may further include a spacer 218. Spacer 218 is sized to fix a distance WP between wash tub 121 and rear panel 118, as shown in FIG. 3. As shown in FIG. 3, spacer 218 extends between and may connect wash tub 121 and rear panel 118. In other words, spacer 218 may be physically touching wash tub 121 and rear panel 118 during attachment of shipping spacer assembly 200 to wash tub 121.

(42) In embodiments with spacer 218, spacer 218 may define a spacer cavity 220. Spacer cavity 220 extends along axial direction A. Spacer cavity 220 removably receives shaft 214 of bolt 210. Generally, spacer cavity 220 is sized to fit shaft 214 of bolt 210, spacer cavity 220 defined as a space with a diameter CD smaller than diameter HD of head 212. Thus, during use or when shipping spacer assembly 200 is attached to washing machine appliance 100, spacer 218 is irremovable from shaft 214. In other words, bolt 210 is removable from spacer 218 and spacer cavity 220 by moving spacer 218 towards threaded portion 244 and restrained on shaft 214 by moving spacer 218 towards head 212.

(43) Spacer 218 is generally located between head 212 and threaded portion 244. As shown in FIGS. 4 and 5, spacer 218 may be affixed or attached to grommet 232. During assembly, cord retention mechanism 224 may removably receive spacer 218 and/or grommet 232 at shaft aperture 228, with cord retention mechanism 224 abutting grommet shoulder 240. Further, spacer 218 and grommet 232 may removably receive shaft 214 at spacer cavity 220 and grommet cavity 234, respectively. The use of “and/or” in this paragraph is used as grommet 232 and spacer 218 are a unitary feature in some embodiments and are two separate elements of shipping spacer assembly 200 in some embodiments, and that both are needed to be removed together when they are a unitary feature, but that only one of the two elements (e.g., spacer 218) may need to be removed if the elements are separate. In this manner, cord retention mechanism 224 may be removed from bolt 210 only upon removal of spacer 218 and/or grommet 232 from shaft 214 of bolt 210. Further, bolt 210 needs to be removed from bolt boss 204 and rear panel 118 of washing machine appliance 100 before spacer 218 and/or grommet 232 can be removed from bolt 210. Advantageously, in order to get power cord 170 out of cord retention clip 238, bolt 210 must first be removed with spacer 218 and/or grommet 232, so the appliance installation procedure of gaining access to power cord 170 includes the removal of spacers 218 and bolts 210 from washing machine appliance 100. This may reduce or eliminate shipping spacer assemblies 200 being left in washing machine appliance 100 during use of washing machine appliance 100.

(44) As shown in FIGS. 4 and 5, some embodiments of shipping spacer assembly 200 may include a washer 230. Washer 230 may define a washer hole 248. Shaft 214 may be removably received through washer hole 248. Washer 230 may be located between head 212 and grommet 232. Advantageously, washer 230 may aid in seating shipping spacer assembly 200 in bolt boss 204, as would be understood. In certain embodiments, washer 230 may be necessary to prevent head 212 (e.g., head flange 246) from digging into grommet 232 when shipping spacer assembly 200 is in the installed position.

(45) As shown in FIGS. 6 and 7, shipping spacer assembly **200** may include an axial stop **216**. Axial stop **216** may aid bolt **210** in fixing the distance between wash tub **121** and cabinet **102** and may be used instead of spacer **218** in that capacity. Axial stop **216** may be fixed in axial direction A along shaft **214**. In the installed position of shipping spacer assembly **200**, axial stop **216** may be seated against wash tub **121**, as shown in FIG. 7 to fix the distance between wash tub **121** and rear panel **118** of cabinet **102**. In some embodiments, and as shown, axial stop **216** may be a threaded nut that is locked onto threaded portion **244** of bolt **210**.

(46) In some embodiments, axial stop **216** may be an equivalent structure locked onto threaded portion **244** of bolt **210** including a peg inserted into a hole defined in bolt **210**, a rivet extending out from bolt **210** at the threaded portion **244**, or equivalent rigid structures. For example, axial stop **216** may be threaded fully onto threaded portion **244** of bolt **210**, proximate to head **212**. In examples with threaded portion **244** received into bolt boss **204** and axial stop **216** seated against wash tub **121**, bolt **210** with axial stop **216** fixes the distance between rear panel **118** and wash tub **121**. Thus, axial stop **216** may replace spacer **218** in such embodiments. Advantageously, embodiments with axial stop **216** may have no spacer, and thus no spacer may be accidentally left in washing machine appliance **100** during use of appliance **100**. Additionally, suspension system **126** may not be worn out during transportation as shipping spacer assembly **200** still fixes the distance between wash tub **121** and cabinet **102** during transportation.

(47) Additionally or alternatively, as shown in the embodiments of FIGS. 6 and 7, cord retention mechanism **224** may be located between head **212** and grommet **232**. Embodiments with an axial stop **216** may further have no need for washer **230**, with cord retention mechanism **224** being made of a similarly rigid material to washer **230** and may aid in seating shipping spacer assembly **200** in bolt boss **204**. Thus, washer **230** may be unused in embodiments like that shown in FIGS. 6 and 7, without losing integrity of the fixed placement of wash tub **121** and cabinet **102** made by shipping spacer assembly **200**.

(48) As shown in FIG. 6, head **212**, grommet **232** and cord retention mechanism **224** of bolt **210** are located external to rear panel **118**. Additionally or alternatively, head **212**, grommet **232** and cord retention mechanism **224** of bolt **210** are located external to retention bar **206**. As shown in FIGS. 6 and 8, spacer **218** and thread portion of bolt **210** are located internal to washing machine appliance **100**, spacer **218** fixing distance WP between rear panel **118** and wash tub **121**.

(49) In some embodiments, and as shown in FIG. 8, washing machine appliance **100** may comprise at least two shipping spacer assemblies **200**. Each shipping spacer assembly **200** may be removably attached to rear panel **118**. Rear panel **118** may define at least two spacer holes **202**. In certain embodiments, washing machine appliance **100** may comprise four shipping spacer **218** assemblies with rear panel **118** defining four spacer holes **202**. There may be a corresponding number of spacer holes **202** to shipping spacer assemblies **200**. Each shipping spacer assembly **200** of washing machine appliance **100** may be removably attach to rear panel **118** at each respective spacer hole **202**. A portion of each shipping spacer assembly **200** may be located between rear panel **118** and wash tub **121**, as shown in FIG. 3.

(50) As shown in FIG. 8, embodiments may include a tag **300** attached to power cord **170**. In some examples, tag **300** may be attached to power cord head **172** between prongs **174**. Tag **300** may include a message **302** to remove shipping spacer assemblies **200** from cabinet **102**. Placement of tag **300** between prongs **174** may increase the likelihood of message **302** of tag **300** being viewed by a user installing washing machine appliance **100**, and thus may increase the likelihood of shipping spacer assemblies **200** being removed from washing machine appliance **100** prior to use of appliance **100**.

(51) Embodiments described herein may further relate to safety improvements in a front load washing machine appliance by ensuring the removal of shipping bolts or spacers using a sheet metal extruded hole power cord retaining clip. Generally, a shipping spacer assembly may be used to arrest the free motion of a suspended sub washer system (e.g., wash tub **121** and wash basket

120) during shipment to prevent damage and may ensure the safe handling of the appliance during shipping. At the same time, during operation or in running condition, the sub washer (e.g., wash tub **121** and wash basket **120**) must swing freely. Therefore, the shipping bolts and shipping spacers should be removed before the user uses the washing machine. Hence, an advantage or objective of the present subject matter is to ensure that the shipping bolts and shipping spacers are removed immediately after installation.

(52) Embodiments described herein may include shipping spacer assemblies made of shipping bolts, shipping spacers, and extruded sheet metal power cord retaining clips. The shipping spacer assembly may be removed as a single piece to avoid the shipping spacer being left in the appliance after installation. The shipping bolt with washer may be inserted through the hole in the shipping spacer and then through the power cord retaining clip which may hold the power cord. Before shipping the washing machine appliance, all the shipping bolt assemblies may be assembled to fix the sub washer to the structure to prevent damage while shipping. Before installing the washing machine appliance, the user may need to disassemble all the shipping bolt assemblies from the washing machine to get full access to the power cord. Users may retain all shipping bolt assemblies in a safe place as the shipping bolt assemblies may be desired for assembling in future shipping of the washing machine appliance. Embodiments described herein may provide ease for users to assemble and disassemble the shipping spacer assembly to the washing machine appliance and may secure the power cord without any damage as the power cord retaining clip may be made of sheet metal or an equivalent material.

(53) Embodiments described herein may further describe an arrangement to provide shipping bolt with power cord retaining clip configured to hold the power cord. A user may not be able to remove the power cord before removing the shipping spacer assembly as a single piece. The shipping spacer assembly may be made of four parts: a shipping bolt, a bushing or grommet, a power cord retaining clip, and a nut. The assembly process may begin by placing the power cord in power cord retainer clip, pushing the power cord retainer clip into position, fastening the shipping bolt with inserted grommet or bushing, and placing the over tightened nut on the bolt in place of a spacer. This shipping spacer assembly may be used to fix the sub washer (e.g., drum, or wash tub) to the structure (e.g., cabinet) to prevent damage while shipping.

(54) This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

Claims

1. A washing machine appliance comprising: a cabinet having a rear panel; a wash tub located within the cabinet; a power cord configured to connect the washing machine appliance to an external power source; and a shipping spacer assembly removably attached to the wash tub for fixing a distance between the wash tub and the cabinet in an installed position, the shipping spacer assembly defining an axial direction, a radial direction, and a circumferential direction, the shipping spacer assembly comprising: a bolt comprising a shaft extending along the axial direction, a head located at one end of the shaft, and a threaded portion located opposite the head in the axial direction; a cord retention mechanism configured for receipt of the power cord, and located along the shaft of the bolt, the cord retention mechanism being positioned between the head of the bolt and the rear panel when the shipping spacer assembly is in the installed position; and a grommet

- defining a grommet cavity, the shaft removably positioned through the grommet cavity, wherein the cord retention mechanism is located between the grommet and the rear panel of the cabinet.
2. The washing machine appliance of claim 1, wherein the shipping spacer assembly further comprises a spacer defining a spacer cavity, the shaft removably received through the spacer cavity in the installed position, and the spacer attached to the grommet.
 3. The washing machine appliance of claim 2, wherein the grommet defines a grommet shoulder, and wherein the cord retention mechanism abuts the grommet shoulder, the grommet shoulder located between the cord retention mechanism and the head of the bolt.
 4. The washing machine appliance of claim 1, wherein the wash tub defines a bolt boss removably receiving the threaded portion of the bolt, wherein the head comprises a head flange that extends circumferentially beyond the shaft in the radial direction, and wherein the head flange and threaded portion secure the grommet and the cord retention mechanism along the shaft in the installed position.
 5. The washing machine appliance of claim 1, the shipping spacer assembly further comprising a washer defining a washer hole, the shaft removably received through the washer hole, the washer located between the head of the bolt and the grommet.
 6. The washing machine appliance of claim 1, wherein the cord retention mechanism comprises a connecting tab defining a shaft aperture and a cord retention clip extending from the connecting tab, wherein the shaft is removably received through the shaft aperture of the cord retention mechanism, and wherein a portion of the power cord is received through the cord retention clip.
 7. The washing machine appliance of claim 6, wherein the power cord is secured between the cord retention clip and the grommet, the cord retention clip extending beyond the grommet in the radial direction.
 8. The washing machine appliance of claim 1, wherein the power cord is retained in the cord retention mechanism, the power cord removable from the cord retention mechanism only upon removal of the cord retention mechanism from the bolt.
 9. The washing machine appliance of claim 1, wherein the cord retention mechanism is only removable from the bolt following removal of the grommet from the bolt and the bolt from the rear panel.
 10. The washing machine appliance of claim 1, wherein the wash tub defines a bolt boss removably receiving the threaded portion of the bolt, the shipping spacer assembly further comprising: an axial stop, the axial stop fixed along the shaft in the axial direction and being seated against the wash tub when the shipping spacer assembly is in the installed position to fix the distance between the wash tub and the rear panel of the cabinet.
 11. The washing machine appliance of claim 10, wherein the axial stop comprises a threaded nut that is locked onto the threaded portion of the bolt.
 12. The washing machine appliance of claim 1, wherein the cord retention mechanism is located between the grommet and the head of the bolt.
 13. The washing machine appliance of claim 1, wherein the shipping spacer assembly is a first shipping spacer assembly and the rear panel defines a first spacer hole and a second spacer hole, the first shipping spacer being removably received within the first spacer assembly, the washing machine appliance further comprising: a second shipping spacer assembly removably attached to the rear panel at the second spacer hole.
 14. A shipping spacer assembly configured to be removably attached to a wash tub of a washing machine appliance for fixing a distance between the wash tub and a cabinet of the washing machine appliance in an installed position, the shipping spacer assembly defining an axial direction, a radial direction and a circumferential direction, the shipping spacer assembly comprising: a bolt comprising a shaft extending along the axial direction, a head located at one end of the shaft, and a threaded portion located opposite the head in the axial direction; a cord retention mechanism configured for receipt of a power cord, and located along the shaft of the bolt, the cord retention

mechanism configured to be positioned between the head of the bolt and the cabinet when the shipping spacer assembly is in the installed position; and a grommet defining a grommet cavity, the shaft removably positioned through the grommet cavity, wherein the cord retention mechanism is located between the grommet and the rear panel of the cabinet.

15. The shipping spacer assembly of claim 14, wherein the grommet defines a grommet shoulder, and wherein the cord retention mechanism abuts the grommet shoulder, the grommet shoulder located between the cord retention mechanism and the head of the bolt.

16. The shipping spacer assembly of claim 14, wherein the cord retention mechanism comprises a connecting tab defining a shaft aperture and a cord retention clip extending from the connecting tab, wherein the shaft is removably received through the shaft aperture of the cord retention mechanism, and wherein the cord retention clip is configured for receiving a portion of the power cord.

17. The shipping spacer assembly of claim 14, wherein the cord retention mechanism is only removable from the bolt following removal of the grommet from the bolt and the bolt from the cabinet.

18. The shipping spacer assembly of claim 14, the shipping spacer assembly further comprising an axial stop, the axial stop fixed axially along the shaft and configured to be seated against the wash tub when the shipping spacer assembly is in the installed position to fix the distance between the wash tub and the cabinet.

19. The shipping spacer assembly of claim 18, wherein the axial stop comprises a threaded nut that is locked onto the threaded portion of the bolt.

20. The washing machine appliance of claim 1, wherein the cord retention mechanism comprises: a first tab forming a U-shape; and a second tab forming an O-shape.
