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(54) MOTOR DISPOSED BELOW PRESSURE PUMP

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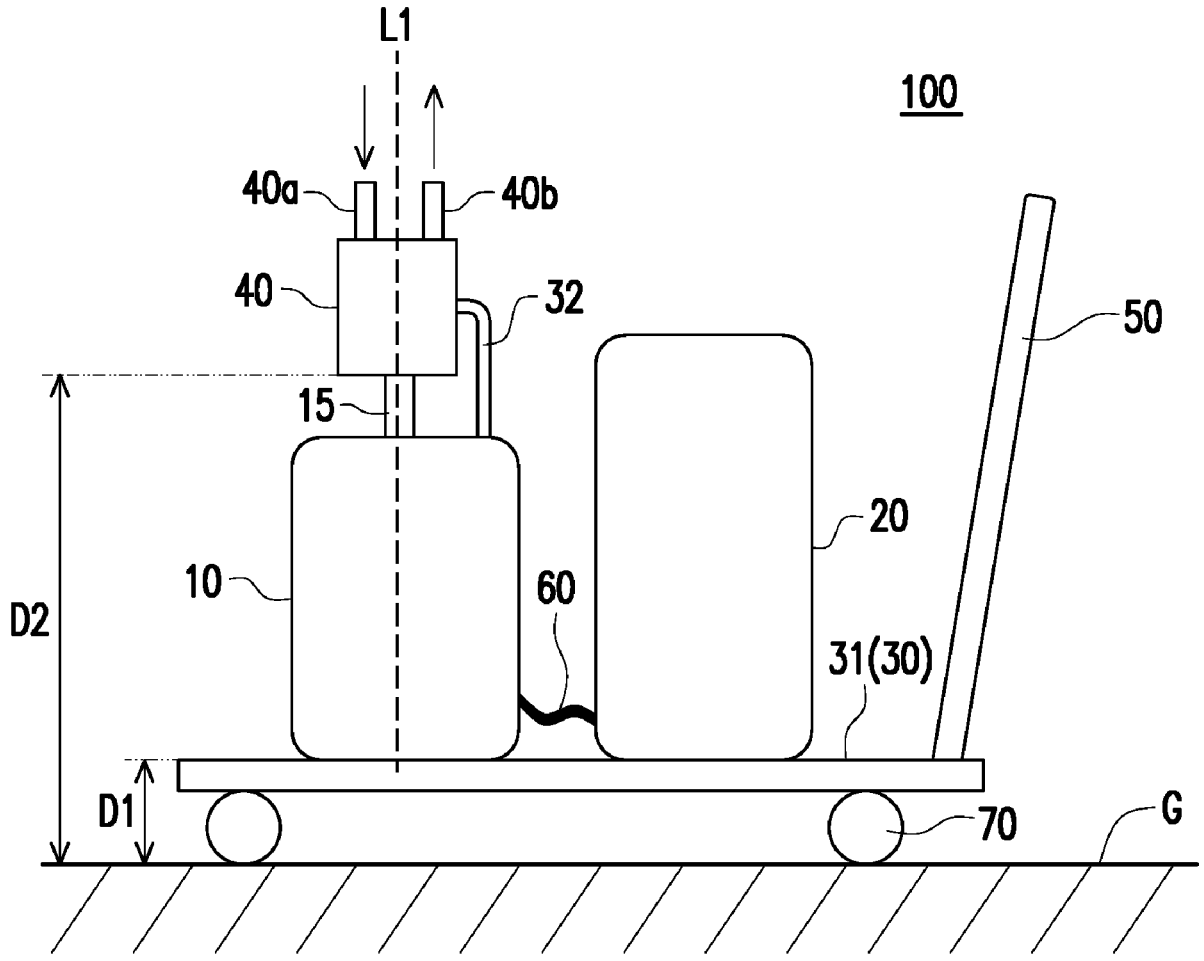
(57) **ABSTRACT**

A washing device includes a motor having a shaft, a battery electrically connected to the motor, and a pump driven by the motor. The pump is adapted to pressurize a liquid. The pump is disposed on the motor so that the motor is disposed between the pump and a ground.



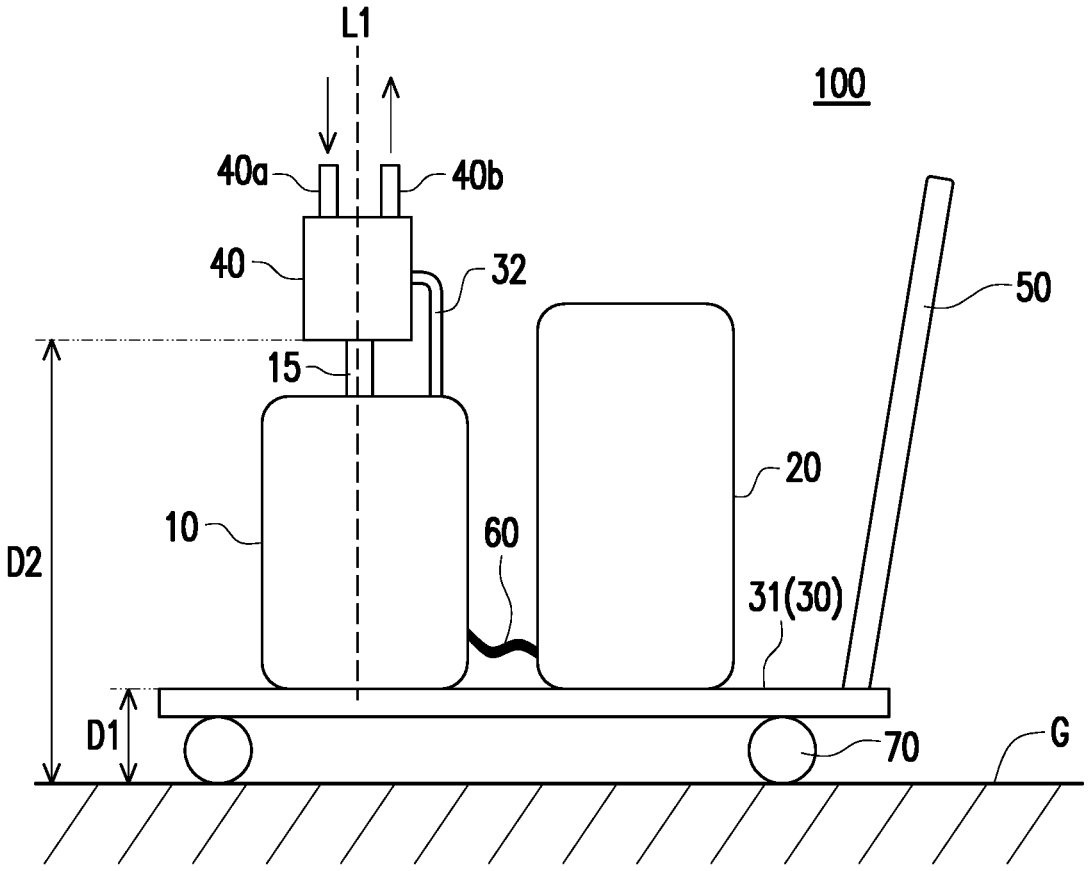


FIG. 1

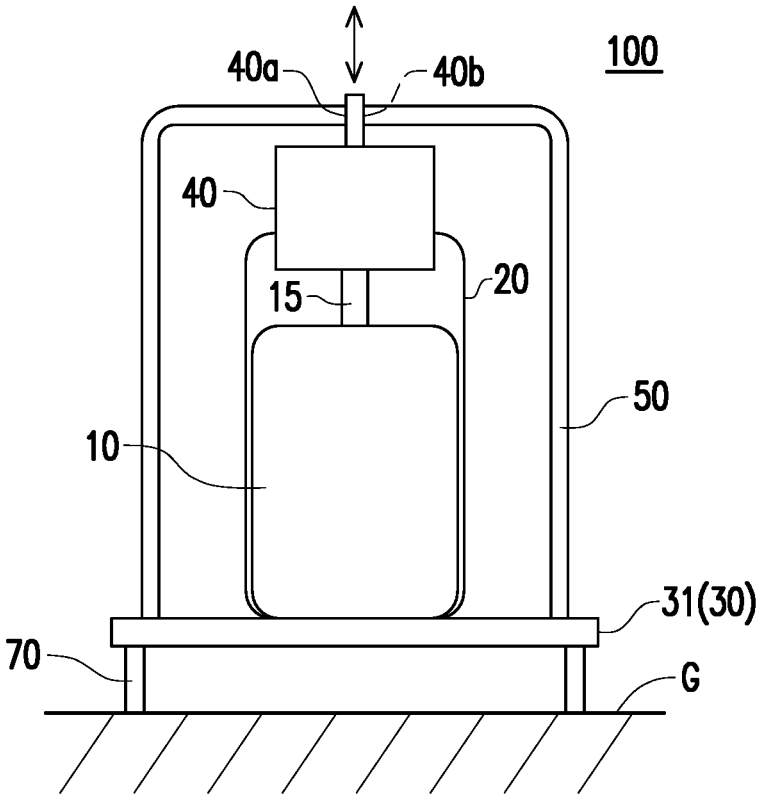


FIG. 2

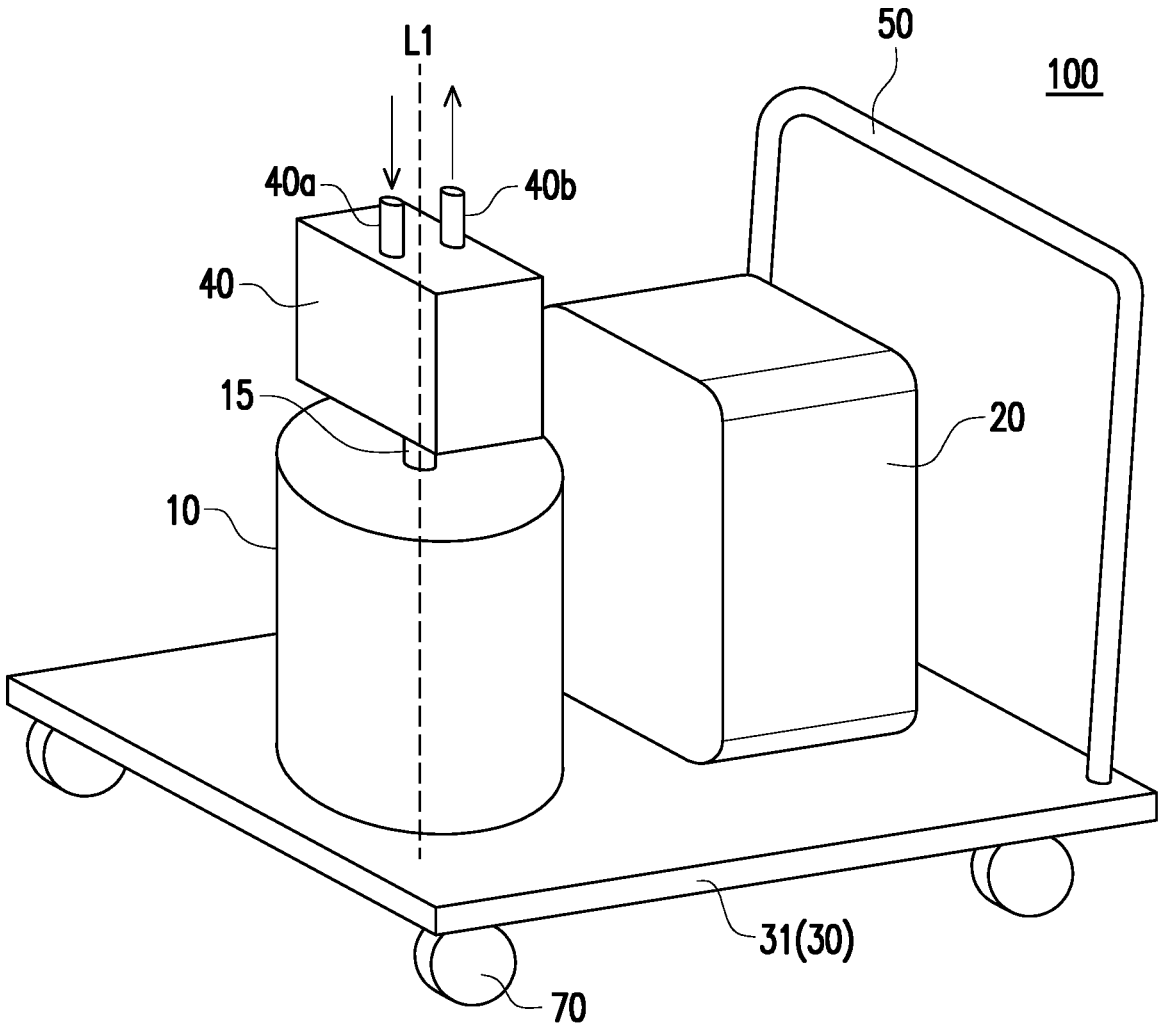


FIG. 3

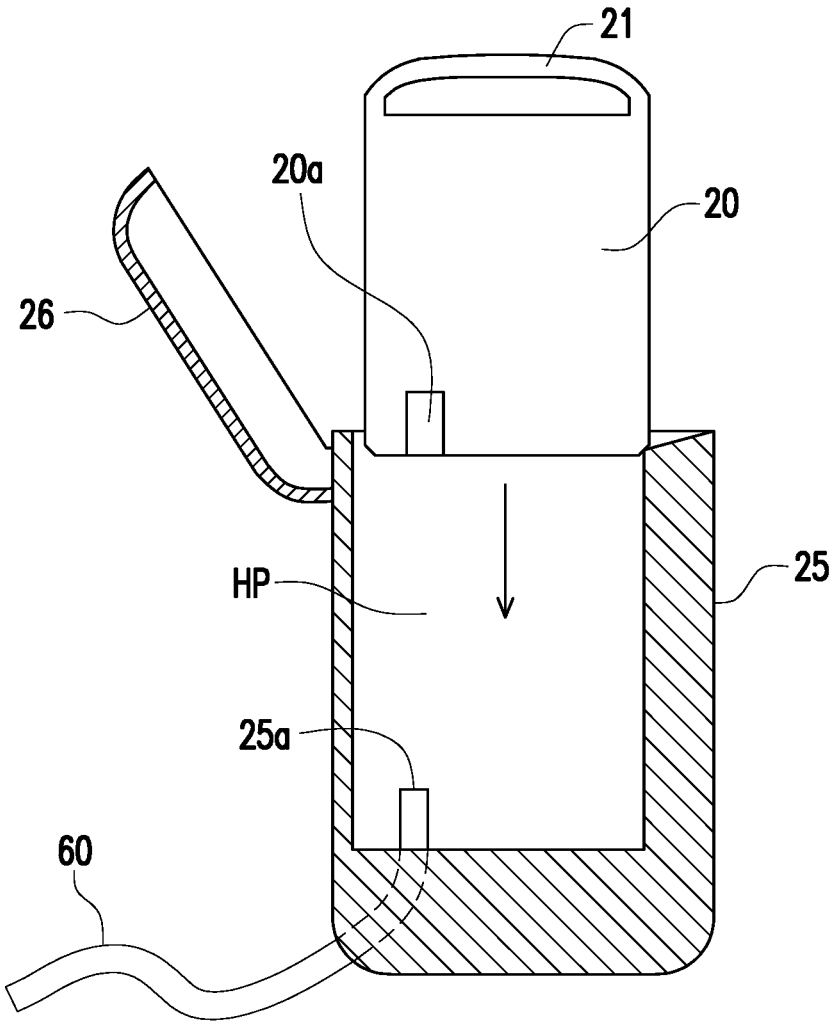


FIG. 4

MOTOR DISPOSED BELOW PRESSURE PUMP

BACKGROUND

Technical Field

[0001] The disclosure relates to a washing device and more specifically relates to a mounting configuration of a motor of the washing device.

Description of Related Art

[0002] In Patent Literature 1, a high pressure washing device includes a water pump mounted to a side of a motor. The present disclosure provides a mounting configuration of a motor of a washing device.

[0003] Patent literature 1: Japanese Patent Laid-Open No. 2015-000362

SUMMARY

[0004] According to an embodiment of the disclosure, a washing device includes a motor having a shaft, a battery electrically connected to the motor, and a pump driven by the motor. The pump is adapted to pressurize a liquid. The pump is disposed on the motor so that the motor is disposed between the pump and a ground.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. **1** is a schematic diagram illustrating a perspective view of a washing device according to an embodiment of the disclosure.

[0006] FIG. **2** is a schematic diagram illustrating a front view of the washing device of FIG. **1**.

[0007] FIG. **3** is a schematic diagram illustrating a side view of the washing device of FIG. **1**.

[0008] FIG. **4** is a schematic diagram illustrating a battery casing and a battery of the washing device according to an embodiment of the disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0009] FIG. **1** is a schematic diagram illustrating a perspective view of a washing device according to an embodiment of the disclosure. FIG. **2** is a schematic diagram illustrating a front view of the washing device of FIG. **1**. FIG. **3** is a schematic diagram illustrating a side view of the washing device of FIG. **1**. Referring to FIG. **1** through FIG. **3**, a washing device **100** is provided. The washing device **100** may be, for example, a high pressure washer. In the present embodiment, the washing device **100** includes a motor **10**, a battery **20**, a frame **30**, and a pump **40**.

[0010] The frame **30** may include a base **31**. The base **31** may be, for example, a rigid substrate. A material of the base **31** may be, for example, metal, steel, aluminum, plastic, composite material and the like. In the present embodiment, the base **31** is a substantially rectangular shaped plate. However, the disclosure is not limited thereto. A shape of the base **31** is not intended to limit the disclosure and may be set according to requirements. In another embodiment of the disclosure, the base **31** may be omitted from the washing device **100**.

[0011] The motor **10** is an electric motor powered by electricity. That is to say, the motor **10** is not powered by gas, and there is no gas tank connected to the motor **10**. The motor **10** may be, for example, a brushless DC motor. In more detail, the motor **10** may be, for example, a 3 phase brushless DC motor. The motor **10** has a shaft **15** rotated by the motor **10**. An axial direction of the shaft **15** extends parallel to an axial direction of the motor **10**. In the present embodiment, the motor **10** is disposed on the base **31**. The motor **10** may be fixed to the base **31** by, for example, a fastener to secure the motor **10** to the base **31**. However, the disclosure is not limited thereto. In another embodiment of the disclosure, the base **31** may be omitted and the motor **10** may be disposed on a ground G.

[0012] The battery **20** may be, for example, a portable, swappable battery that stores electricity generated by renewable energy. In the present embodiment, the battery **20** is a rechargeable battery. The battery **20** may be recharged with renewable energy. The battery **20**, for example, includes a plurality of battery cells inside the battery **20**. The battery **20** may be detachably attached to the base **31**. When the battery **20** is detachably attached to the base **31**, a new battery **20** may be simply swapped such that supplying a power source to the motor **10** becomes easy. In the present embodiment, the battery **20** is disposed on the base **31** of the frame **30**. The battery **20** may be fixed to the base **31** by, for example, a fastener to secure the battery **20** to the base **31**. However, the disclosure is not limited thereto. In another embodiment of the disclosure, the base **31** may be omitted and the battery **20** may be disposed on the ground G. The battery **20** may be a lithium-ion battery. In the present embodiment, the battery **20** weighs, for example, approximately 10 kilograms.

[0013] The battery **20** is electrically connected to the motor **10**. In the present embodiment, a wire **60** electrically connects the battery **20** to the motor **10**. In this way, the motor **10** is powered by the battery **20** through the wire **60**. The wire **60** may be, for example, a power cable wherein one end of the power cable is coupled to a positive terminal and a negative terminal of the battery **20**, while another end of the power cable is coupled to the motor **10**. When the battery **20** and motor **10** are electrically connected by the wire **60**, electrical power may be supplied to the motor **10** even when the battery **20** is disposed at different locations of the washing device **100** or when the battery **20** is provided on the ground G instead of on the base **31**. However, in another embodiment of the disclosure, the battery **20** may be electrically connected to the motor **10** by, for example, a terminal and the like without the wire **60**.

[0014] FIG. **4** is a schematic diagram illustrating a battery casing and a battery of the washing device according to an embodiment of the disclosure. Referring to FIG. **4**, the washing device **100** includes a casing **25** for housing the battery **20**. The casing **25** may be disposed on the base **31** of the washing device **100**. The casing **25** may be fixed to the base **31**. In another embodiment, the casing **25** may be disposed on the ground G instead of the base **31**. The casing **25** may be hollow such that the battery **20** may be inserted into a hollow portion HP of the casing **25** and the battery **20** may be removed from the casing **25** when swapping or removing the battery **20**. That is to say, the battery **20** is configured to be accommodated inside the hollow portion HP of the casing **25**. The battery **20** includes a handle **21** for easy swapping of the battery **20**. In an embodiment of the disclosure, the hollow portion HP of the casing **25** may have a substantially similar shape as an outer casing of the battery **20** so as to better house the battery **20**.

[0015] The casing **25** includes a first connection terminal **25***a*. More specifically, the first connection terminal **25***a* is disposed at the bottom of the hollow portion HP of the casing **25**. The first connection terminal **25***a* is disposed at the bottom of the casing **25** to face toward an opening of the casing **25**. The battery **20** is configured to be inserted through the opening of the casing **25**. The first connection terminal **25***a* of the casing **25** is electrically connected to the one end of the wire **60**. In addition, the casing **25** includes a cover **26** which is pivoted on a hinge (not shown), wherein the cover **26** may be opened or closed about the hinge to prevent dust or particles to enter the hollow portion HP of the casing **25**.

[0016] The battery **20** includes a second connection terminal **20***a* on a bottom surface of the battery **20**. The second connection terminal **20***a* is electrically connected to the battery **20**. The casing **25** and the battery **20** are configured such that, when the battery **20** is inserted into the hollow portion HP of the casing **25**, the first connection terminal **25***a* of the casing **25** physically engages with the second connection terminal **20***a* of the battery **20**, such that the motor **10** may be electrically powered by the battery **20**. In the present embodiment, the first connecting terminal **25***a* is a male connector and the second connecting terminal **20***a* is a female connector wherein the male connector **25***a* is inserted into the female connector **20***a*. In another embodiment of the disclosure, the first connecting terminal may be a female connector and the second connecting terminal may be a male connector. The washing device **100** may have an operation panel including a switch to turn the motor **10** ON and OFF.

[0017] In the present embodiment, the motor **10** and the battery **20** are disposed on the ground G via the base **31**. In another embodiment, the motor **10** and the battery **20** may be disposed on the ground G with the base **31** omitted. The battery **20** may be disposed so that when viewed in a direction orthogonal to an axial direction of the shaft **15**, the battery **20** and the motor **10** overlap with each other such as shown in FIG. **2**. By disposing the battery **20** near or at a level of the motor **10**, the center of gravity of the washing device **100** may be lowered closer to the ground G such that stability of the washing device **100** may be improved.

[0018] The motor **10** is disposed on the ground G or on the base **31** such that the shaft **15** of the motor **10** extends in a direction substantially orthogonal to a surface of the ground G. More specifically, the shaft **15** of the motor **10** extends vertically with respect to the ground G. When the washing device **100** includes the base **31**, the shaft **15** of the motor **10** extends in a direction substantially orthogonal to a mounting surface of the base **30**. The ground G may be, for example, a grass field, a floor in a building, a dirt ground, a concrete ground, a bottom of a cabinet and the like. The type of ground G is not intended to limit the disclosure. In more detail, a direction from the pump **40** towards the motor **10** is a direction of gravity. In other words, an extending direction of the shaft **15** is parallel to the direction of gravity.

[0019] The pump **40** is disposed on the motor **10** so that the motor **10** is disposed between the pump **40** and the ground G. The shaft **15** protrudes from the motor **10** to extend in a direction away from the ground G towards a first end. The first end of the shaft **15** is coupled to the pump **40**. That is to say, the motor **10** is disposed between the shaft **15** and the ground G. In other words, the motor **10** is disposed below the pump **40** and on top the ground G so that the motor **10** is disposed between the pump **40** and the ground G. More specifically, when viewed in a direction orthogonal to an axial direction of the shaft **15**, the motor **10** is disposed between the pump **40** and the ground G. In an embodiment where the base **31** is included in the washing device **100**, the motor **10** and the pump **40** are disposed on the frame **31**, and the frame **31** is disposed between the motor **10** and the ground G. By disposing the motor **10** under the pump **40**, a center of gravity of the washing device **100** is lowered closer to the ground G such that stability of the washing device **100** may be improved. Furthermore, since the shaft **15** of the motor **10** extends upward directly towards the pump **40** that is disposed on the motor **10**, a transmission distance of the rotation from the motor **10** to the pump **40** may be shortened.

[0020] The washing device **100** may include a bracket **32**. The bracket **32** is configured to support the weight of the pump **40**. In addition, the bracket may be configured to prevent relative rotation between the pump **40** and the motor **10** such that the shaft **15** rotates relative to the pump **40** to drive the pump **40**. For example, one part of the bracket **32** may be fixed to the pump **40** while another part of the bracket **32** may be fixed to the motor **10** by, for example, fasteners. In another embodiment, one part of the bracket **32** may be fixed to the pump **40** while another part of the bracket **32** may be fixed to the base **31** by, for example, fasteners. A shape of the bracket **32** is not intended to limit the disclosure. The number of brackets **32** is not intended to limit the disclosure. The number of brackets **32** and a shape of the bracket **32** may be set according to requirements.

[0021] In the present embodiment, when the washing device **100** is viewed in the axial direction of the shaft **15**, the pump **40** overlaps with the motor **10**, and the pump **40** further overlaps with the shaft **15** of the motor **10**. However, the disclosure is not limited thereto. In another embodiment of the disclosure, when the washing device **100** is viewed in the axial direction of the shaft **15**, the pump **40** may not overlap with the motor **10**, or may not overlap with the shaft **15** of the motor **10**. However, the pump **40** is disposed on the motor **10** such that a first distance D**1** between the ground G and a surface of the battery **20** closest to the ground G is smaller than a second distance D**2** between the ground G and a surface of the pump **40** closest to the ground G. By disposing the battery **20** closer to the ground G, the center of gravity of the washing device **100** may be lowered closer to the ground G such that stability of the washing device **100** may be improved.

[0022] The pump **40** is driven by the motor **10**. The pump **40** is driven by the motor **10** to pressurize a liquid. In the present embodiment, the liquid is water. However, the disclosure is not limited thereto. In another embodiment of the disclosure, the liquid may be, for example, soap water, a washing solution and the like. The type of liquid is not intended to limit the disclosure.

[0023] In the present embodiment, a rotation from the motor **10** is transmitted to the pump **40** via the shaft **15**. That is to say, the rotation of the shaft **15** is coupled to the pump **40** to pressurize the liquid. In an embodiment of the disclosure, a gear may be coupled between the motor **10** and the pump **40** to vary the rotation per minute (RPM) received by the pump **40** according to requirements. The pump **40** may be, for example, a positive displacement pump or a centrifugal pump and the like. The workings of the pump **40** to pressurize a liquid may be understood by a person skilled in the art and will not be detailed here. The type of pump **40** is not intended to limit the disclosure.

[0024] The pump **40** includes a liquid inlet **40***a* and a liquid outlet **40***b*. The motor **10** is disposed between the liquid inlet **40***a* and the ground G, and the motor **10** is disposed between the liquid outlet **40***b* and the ground G. The liquid enters the pump **40** from the liquid inlet **40***a* and is pressurized by the pump **40**. The liquid that entered the pump **40** is pressurized by the pump **40** and is then output from the outlet **40***b* of the pump **40**. A pressure of the liquid that is output from the liquid outlet **40***b* is greater than a pressure of the liquid that is input from the liquid inlet **40***a*. In other words, a pressure of the liquid that is input from the liquid inlet **40***a* is smaller than a pressure of the liquid that is output from the liquid outlet **40***b*.

[0025] One end of a first hose (not shown) may be connected to the liquid inlet **40***a* and another end of the first hose may be connected to a water supply source such as a water faucet or the like. In addition, one end of a second hose (not shown) may be connected to the liquid outlet **40***b* and another end of the second hose may be connected to a water discharging device such as a nozzle gun (not shown). The nozzle gun may include a trigger to start and stop the ejection of pressurized water from the nozzle gun. In another embodiment of the disclosure, a water pipe may also be connected to the liquid inlet **40***a* and/or the liquid outlet **40***b*. By disposing the liquid inlet **40***a* and the liquid inlet **40***b* above the motor **10**, it may be easier for a user to operate the washing device **100** such as when connecting or disconnecting the hoses to the liquid inlet **40***a* and/or the liquid outlet **40***b*.

[0026] Referring to FIG. **1**, an opening of the inlet pipe **40***a* and an opening of the outlet pipe **40***b* face away from the shaft **15**. However, the disclosure is not limited thereto, and the inlet pipe **40***a* and the outlet pipe **40***b* may be configured to face other directions and/or disposed on other surfaces of the pump **40** according to requirements.

[0027] The washing device **100** may include a plurality of wheels **70** attached to the frame **30**. In the present embodiment, the plurality of wheels **70** are fixed to the base **31**. However, the disclosure is not limited thereto and the plurality of wheels **70** may be attached to other portions of the washing device **100** instead of the base **31** according to requirements. A number of the wheels **70** is not intended to limit the disclosure. The wheel **70** may allow for easy transportation of the washing device **100**, since the washing device **100** may be transported on the wheels **70**.

[0028] In an embodiment of the disclosure, the base **31** may include stands (not shown) such that the wheels **70** may be elevated off the ground to prevent the washing device **100** from rolling on the wheels **70** during usage. The stands may also be used to level the washing device **100**. The stands may include threads such that the stands may be fastened into the base **31** or out of the base **31** such that a protruding distance of the stands from the base **31** may be adjusted according to requirements. A number of the stands is not intended to limit the disclosure.

[0029] The washing device **100** may further include a hand bar **50** attached to the frame **30**. In the present embodiment, the hand bar **50** is fixed to the base **31**. However, the disclosure is not limited thereto and the hand bar **50** may be attached to other portions of the washing device **100** instead of the base **31** according to requirements. The hand bar **50** may be fixed to the washing device **100** by welding or a fastener and the like. The hand bar **50** allows for easy transportation of the washing device **100** by an operator, since the washing device **100** may be transported on the wheels **70** by pushing or pulling the hand bar **50**.

[0030] In an embodiment of the disclosure, the battery **20** may include a plurality of batteries **20**. That is to say, the washing device **100** may include a first battery **20** and a second battery **20** disposed electrically connected to the motor **10**. By providing a plurality of batteries **20**, a usage time of the washing device **100** may be extended. In addition, the plurality of batteries **20** may be connected in series or parallel according to power requirements, and/or according to the specification of the motor **10**. A number of the plurality of batteries **20** are not intended to limit the disclosure and may be set according to requirements. The plurality of batteries **20** may be disposed at various location such as on the ground G and/or on the base **31**.

[0031] It will be apparent to those skilled in the art that various modifications and variations can be made to the disclosed embodiments without departing from the scope or spirit of the disclosure. In view of the foregoing, it is intended that the disclosure covers modifications and variations provided that they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A washing device, comprising:
- a motor, having a shaft;
- a battery, electrically connected to the motor;
- a pump, driven by the motor, the pump is adapted to pressurize a liquid;
- wherein the pump is disposed on the motor so that the motor is disposed between the pump and a ground.

2. The washing device according to claim **1**, wherein the shaft of the motor extends in a direction substantially orthogonal to a surface of the ground.

3. The washing device according to claim **2**, wherein the pump includes a liquid inlet and a liquid outlet, and the motor is disposed between the liquid inlet and the ground, and the motor is disposed between the liquid outlet and the ground.

4. The washing device according to claim **3**, wherein the battery is disposed so that when viewed in a direction orthogonal to an axial direction of the shaft, the battery and the motor overlap with each other.

5. The washing device according to claim **4**, wherein a distance between the ground and a surface of the battery closest to the ground is smaller than a distance between the ground and a surface of the pump closest to the ground.

6. The washing device according to claim **5**, wherein the battery is detachably attached to the washing device.

7. The washing device according to claim **6**, wherein the battery is a rechargeable battery.

8. The washing device according to claim **7**, further comprising a frame including a base, wherein the motor and the pump are disposed on the frame, and the frame is disposed between the motor and the ground.

9. The washing device according to claim **8**, further comprising:
- a wire, electrically connecting the battery to the motor; and
- a wheel attached to the frame.

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