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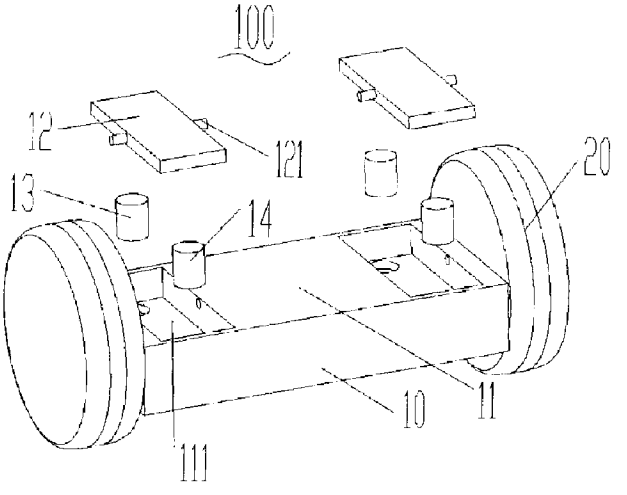
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(54) Title: HUMAN-MACHINE INTERACTION BODY-SENSING VEHICLE



(57) Abrégé/Abstract:
A human-machine interaction body-sensing vehicle is disclosed. The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. the wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals disposed on the support frame, a first position sensor, and an actuation device. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are independent to each other and rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. The actuation device drives the wheels to rotate based on the tilt information. The human-machine interaction body-sensing vehicle includes a support frame that plays a role of supporting, the pedal is arranged on the support frame independently, two rotatably connected structures configured to install the pedal are omitted, and its structure is simple.

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ABSTRACT

A human-machine interaction body-sensing vehicle is disclosed. The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. the wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals disposed on the support frame, a first position sensor, and an actuation device. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are independent to each other and rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. The actuation device drives the wheels to rotate based on the tilt information. The human-machine interaction body-sensing vehicle includes a support frame that plays a role of supporting, the pedal is arranged on the support frame independently, two rotatably connected structures configured to install the pedal are omitted, and its structure is simple.

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HUMAN-MACHINE INTERACTION BODY-SENSING VEHICLE

FIELD OF THE DISCLOSURE

The present disclosure relates to human-machine interaction balancing vehicles, and more particularly, to a human-machine interaction body-sensing vehicle.

BACKGROUND OF THE DISCLOSURE

Human-machine interaction body-sensing vehicles, also called electric balancing vehicles or sensor controlled vehicles, generally work based on a basic principle of "dynamic stabilization". In a vehicle body of a human-machine interaction body-sensing vehicle, a gyroscope may cooperate with an accelerometer to detect change of the vehicle body's attitude, and a servo control system can precisely control the vehicle body to adjust its posture, thereby balancing the vehicle.

The human-machine interaction body-sensing vehicles generally have two categories: with a handle bar, and without a handle bar. In particular, a human-machine interaction body-sensing vehicle with a handle bar can be manipulated to move forward, move backward, and make turns by controlling the handle bar. A human-machine interaction body-sensing vehicle without a handle bar can move forward and backward by tilting the vehicle body, and can make turns by rotating two pedals by user's feet. An example of a human-machine interaction body-sensing vehicle without a handle bar can be a two-wheel balancing vehicle disclosed by Chinese Patent Application No. CN201320300947. The two-wheel balancing vehicle includes an internal cover, and the internal cover is composed of a left internal cover and a right internal cover symmetric with each other. The left internal cover is rotatably connected to the right internal cover.

However, the internal cover of the two-wheel balancing vehicle used as frame supporting is composed of the left internal cover and a right internal cover. It is too complicate.

SUMMARY OF THE DISCLOSURE

To solve the above-mentioned problem, a human-machine interaction body-sensing vehicle of simple structure is provided.

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A human-machine interaction body-sensing vehicle is disclosed. The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. The controller is configured to drive the wheels to rotate based on the detected tilt information.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area is a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedal, and the pedal is pivoted to the vehicle body via the protrusion.

Preferably, the vehicle body comprises a plurality of flexible supports arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch comprises at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further comprises a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the first position sensor comprises at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the human-machine interaction body-sensing vehicle further comprises a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the support frame is sheathed in the pedal.

Preferably, the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

Preferably, the first position sensor is arranged between the pedal and the support frame, and is configured to detect a rotation angle of the pedal relative to the support frame.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The first position sensor is configured to detect position information of a user standing on the pedal. The controller is configured to drive the wheels to rotate based on the detected position information.

Preferably, the vehicle body further comprises at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal.

Preferably, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further comprises a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move

forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. The controller is configured to drive the wheels to rotate based on the detected tilt information. And an extractable shell is arranged on the support frame.

Preferably, the extractable shell comprises a first shell and a second shell, the first shell and the second shell are able to be extracted along a direction perpendicular to an axle of the wheels, the extractable shell comprises two end portions facing to the wheels, a side portion using for connecting the two end portions, a top portion away from the ground, and a bottom portion facing to the top portion, a groove is arranged on the top portion and configured to accommodate the pedal.

Preferably, the first shell and the second shell are able to be extracted forward or backward parallel to the ground.

Preferably, the first shell and the second shell are symmetric.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, the two pedals are respectively disposed in the two pedal areas, and the groove is corresponding to the pedal area.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area is a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedal, and the pedal is pivoted to the vehicle body via the protrusion.

Preferably, the vehicle body comprises a plurality of flexible supports arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch is located on the pedal, below the pedal, inside the pedal, or in the groove.

Preferably, the inductive switch comprises at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further comprises a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the first position sensor comprises at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the first position sensor is integrated into a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal and swaying with the pedal.

Preferably, the human-machine interaction body-sensing vehicle further comprises a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the support frame is sheathed in the pedal.

Preferably, the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

Preferably, the first position sensor is arranged between the pedal and the support frame, and is configured to detect a rotation angle of the pedal relative to the support frame.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

The human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The

support frame is an integrated structure and rotatably connected to the wheels. The first position sensor is configured to detect position information of a user standing on the pedal. The controller is configured to drive the wheels to rotate based on the detected position information, and an extractable shell is arranged on the support frame.

Preferably, the vehicle body further includes at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal, and a groove is located on the extractable shell and configured to accommodate the pedal.

Preferably, the extractable shell includes a first shell and a second shell, the first shell and the second shell are able to be extracted along a direction perpendicular to an axle of the wheels, the extractable shell includes two end portions facing to the wheels, a side portion using for connecting the two end portions, a top portion away from the ground, and a bottom portion facing to the top portion, a groove is arranged on the top portion and configured to accommodate the pedal.

Preferably, the first shell and the second shell are able to be extracted forward or backward parallel to the ground.

Preferably, the first shell and the second shell are symmetric.

Preferably, the first position sensor is configured to detect deformation amounts of the flexible supports basing on balancing position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, at least one pedal, a first position sensor, and a controller. The pedal is located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The pedal is capacitor installation or inductance device. The first position sensor is configured to detect pressure information of the pedal. The controller is configured to drive the wheels to rotate based on the detected pressure information.

Preferably, the vehicle body includes two pedals.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

Preferably,the support frame is a rigid plate-type structure.

Preferably, the pedal area is a receiving groove recessed towards an inside of the support frame, the vehicle body includes a plurality of flexible supports arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the first position sensor is located on a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the second position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the support frame is sheathed in the pedal.

Preferably, the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

Preferably, the first position sensor is arranged between the pedal and the support frame, and is configured to detect pressure information of the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, at least one pedal, a first position sensor, and a controller. The pedal is located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The pedal is capacitor installation or inductance device. The first position sensor is configured to detect pressure information of the pedal. The controller is configured to drive the wheels to rotate based on the detected pressure information.

Preferably, the vehicle body includes two pedals.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, the second position sensor is configured to detect tilt information of the support frame relative to the wheels, the controller is configured to drive the wheels to move forward or backward based on the detected tilt information, and the controller is configured to drive the wheels to make turns based on the detected position information.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. A plurality of flexible supports are arranged on the pedal and configured to make the pedal return or cushion. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. The controller is configured to drive the wheels to rotate based on the detected tilt information.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area is a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedal, and the pedal is pivoted to the vehicle body via the protrusion.

Preferably, the plurality of flexible supports are arranged between the pedal and a bottom of the receiving groove.

Preferably, the plurality of flexible supports are at least one of spring, pressure sensor, elastic flexible structure, or torsion spring.

Preferably, the first position sensor is located inside the pressure sensor or elastic flexible structure.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch is located on the pedal, below the pedal, inside the pedal, or in the groove.

Preferably, the inductive switch includes at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the first position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the first position sensor is located on a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal and moving with the pedal.

Preferably, the support frame is sheathed in the pedal.

Preferably, the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

Preferably, the first position sensor is arranged between the pedal and the support frame, and is configured to detect pressure information of the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. A plurality of flexible supports are arranged on the pedal. The first position sensor is configured to detect position information of a user standing on the pedal. The controller is configured to drive the wheels to rotate based on the detected position information.

Preferably, the plurality of flexible supports are at least one of spring, pressure sensor, or torsion spring.

Preferably, the first position sensor is located inside the pressure sensor.

Preferably, the vehicle body further includes at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal.

Preferably, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. A receiving area is defined inside the support frame and configured to accommodate the controller. And the controller is configured to drive the wheels to rotate based on the detected tilt information.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

Preferably, the controller is integrated into a main circuit board.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area is a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedal, and the pedal is pivoted to the vehicle body via the protrusion.

Preferably, the vehicle body includes a plurality of flexible supports arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch is located on the pedal, below the pedal, inside the pedal, or in the groove.

Preferably, the inductive switch includes at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the power source is arranged in the receiving area, and a clipboard is arranged in the receiving area and configured to separate the power source from the controller.

Preferably, the first position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the first position sensor is integrated into a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal and swaying with the pedal.

Preferably, the support frame is sheathed in the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect position information of a user standing on the pedal. A receiving area is defined inside the support frame and configured to accommodate the controller. And the controller is configured to drive the wheels to rotate based on the detected position information.

Preferably, the vehicle body further includes at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect

deformation amounts of the flexible supports to detect the position information of the user standing on the pedal.

Preferably, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. A receiving area is defined inside the support frame and configured to accommodate the controller. A cover is arranged over the receiving area. And the controller is configured to drive the wheels to rotate based on the detected tilt information.

Preferably, the cover is located on a rigid plate-type structure of the support frame.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, the two pedals are respectively disposed in the two pedal areas, and the receiving area and the cover are located between the two pedal areas.

Preferably, the controller is integrated into a main circuit board.

Preferably, an extractable shell is arranged outside of the support frame and the cover.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area and the receiving area are a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedal, and the pedal is pivoted to the vehicle body via the protrusion.

Preferably, the plurality of flexible supports are arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch is located on the pedal, below the pedal, inside the pedal, or in the groove.

Preferably, the inductive switch includes at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the power source is arranged in the receiving area, the cover is overlapped on the power source and the controller, and a clipboard is arranged in the receiving area and configured to separate the power source from the controller.

Preferably, the first position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the first position sensor is integrated into a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal and swaying with the pedal.

Preferably, the support frame is sheathed in the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect position information of a user standing on the pedal. A receiving area is defined inside the support frame and configured to accommodate the controller. A cover is arranged over the receiving area. And the controller is configured to drive the wheels to rotate based on the detected position information.

Preferably, the cover is located on a rigid plate-type structure of the support frame.

Preferably, an extractable shell is arranged outside of the support frame and the cover.

Preferably, the vehicle body further includes at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal.

Preferably, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect tilt information of the two pedals relative to the support frame. A protrusion facing towards the wheels is provided at each side of the pedal. The pedal is pivoted to the vehicle body via the protrusion, A support structure is arranged on the frame structure and configured to support and pivoted to the protrusion. And the controller is configured to drive the wheels to rotate based on the detected tilt information.

Preferably, a receiving area is defined inside the support frame and configured to accommodate the controller, two symmetrical pedal areas are defined on a side of the support frame away from the ground, the two pedals are respectively disposed in the two pedal areas, and the receiving area and the cover are located between the two pedal areas.

Preferably, the support structure is integrated into the support frame, or assembled to the support frame.

Preferably, a pivoted recess is located in the support structure and configured to pivot to the protrusion, and a fixing structure is located above the pivoted recess and configured to fix the protrusion.

Preferably, the controller is integrated into a main circuit board.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the pedal area and the receiving area are receiving grooves recessed towards an inside of the support frame.

Preferably, the plurality of flexible supports are arranged between the pedal and a bottom of the receiving groove.

Preferably, an inductive switch is arranged in the pedal area and is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the inductive switch is located on the pedal, below the pedal, inside the pedal, or in the groove.

Preferably, the inductive switch includes at least one of a pressure sensor and a photoelectric sensor, both configured to detect whether the pedal is pressed or not.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on tilt information detected by the first position sensor, to drive the wheels to rotate.

Preferably, the actuation device is located inside of the support frame or inside of the wheels.

Preferably, the power source is arranged in the receiving area, and a clipboard is arranged in the receiving area and configured to separate the power source from the controller.

Preferably, the first position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

Preferably, the first position sensor is located on a subsidiary circuit board, the subsidiary circuit board is fixed on the pedal and moving with the pedal.

Preferably, the support frame is sheathed in the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The two pedals are rotatably connected on the support frame. The first position sensor is configured to detect position information of a user standing on the pedal, a protrusion facing towards the wheels is provided at each side of the pedal,. The pedal is pivoted to the vehicle body via the protrusion, a protrusion facing towards the wheels is provided at each side of the pedal. The pedal is

pivoted to the vehicle body via the protrusion. A support structure is arranged on the frame structure and configured to support and pivoted to the protrusion. And the controller is configured to drive the wheels to rotate based on the detected position information.

Preferably, a receiving area is defined inside the support frame and configured to accommodate the controller, two symmetrical pedal areas are defined on a side of the support frame away from the ground, the two pedals are respectively disposed in the two pedal areas, and the receiving area and the cover are located between the two pedal areas.

Preferably, the support structure is integrated into the support frame, or assembled to the support frame.

Preferably, the vehicle body further includes at least two flexible supports arranged between the pedal and the support frame, and the first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal.

Preferably, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. And the first position sensor is

configured to detect position information, gravity information, or pressure information of a user standing on the pedal.

Preferably, the gravity information is tilt information.

Preferably, the vehicle body takes turns when the detect position information, gravity information, or pressure information of one of the two pedals are unequal to that of the other of the two pedals.

Preferably, the vehicle body moves forward or backward when the vehicle body tilts forward or backward.

Another human-machine interaction body-sensing vehicle is provided.

A human-machine interaction body-sensing vehicle includes a vehicle body and two wheels coupled with the vehicle body. The wheel is rotated with the vehicle body along an axle of the wheel. The vehicle body includes a support frame, two pedals, a first position sensor, and a controller. The two pedals are located on the support frame. The support frame is an integrated structure and rotatably connected to the wheels. The first position sensor is configured to detect pressure information of a user standing on the pedal. And the controller is configured to drive the wheels to rotate based on the detected pressure information and make turns based on speed difference of the two wheels.

Preferably, the first position sensor is a pressure sensor.

Preferably, the first position sensor is configured to detect minor change of tilt angle of the pedal.

Preferably, the first position sensor is configured to detect deformation information of the pedal relative to the support frame.

Preferably, the pedal is fixed to the support frame.

Preferably, two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

Preferably, the support frame is a rigid plate-type structure.

Preferably, the first position sensor is configured to detect whether the pedal is pressed or not in order to control the wheels to rotate or stop.

Preferably, the human-machine interaction body-sensing vehicle further includes a power source and an actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is

configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on pressure information detected by the first position sensor, to drive the wheels to rotate.

The human-machine interaction body-sensing vehicle of claim 178, characterized in that the actuation device is located inside of the support frame or inside of the wheels.

The human-machine interaction body-sensing vehicle of claim 178, characterized in that the pedal includes a footboard and a mat located on the footboard, and the first position sensor is arranged under the footboard.

Preferably, the human-machine interaction body-sensing vehicle further includes a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

The human-machine interaction body-sensing vehicle of claim 181, characterized in that the first position sensor includes at least one of gyroscope, a pressure sensor and a photoelectric sensor.

Preferably, the support frame is sheathed in the pedal.

The human-machine interaction body-sensing vehicle of claim 183, characterized in that the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

The human-machine interaction body-sensing vehicle of claim 184, characterized in that the first position sensor is arranged between the pedal and the support frame, and is configured to detect pressure information of the pedal.

Preferably, the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

The above human-machine interaction body-sensing vehicles may have the following advantages.

The human-machine interaction body-sensing vehicle includes a support frame of integrated structure that plays a role of supporting. The pedal is arranged on the support frame independently. Compared to a balance vehicle in the prior art, the human-machine interaction body-sensing vehicle has a simple structure, omitting two rotatably connected structure configured to install two pedals separately.

BRIEF DESCRIPTION OF THE DRAWINGS

References are made to the accompanying drawing(s) to better illustrate the present invention. However, the accompanying drawings represents only some embodiments of the disclosure, and are not meant to be exhaustive.

FIG. 1 is an exploded diagram of a human-machine interaction body-sensing vehicle according to the first embodiment of the disclosure.

FIG. 2 is a perspective view of the human-machine interaction body-sensing vehicle according to the first embodiment of the disclosure.

FIG. 3 is an exploded diagram of the human-machine interaction body-sensing vehicle of FIG. 2.

FIG. 4 is an partly exploded diagram of the human-machine interaction body-sensing vehicle of FIG. 2.

FIG. 5 is an partly exploded diagram of the human-machine interaction body-sensing vehicle of FIG. 4.

FIG. 6 is a perspective view of the pedal and the plurality of flexible supports of the human-machine interaction body-sensing vehicle of FIG. 4.

FIG. 7 is a perspective view of a human-machine interaction body-sensing vehicle according to the second embodiment of the disclosure.

FIG. 8 is a perspective view of a human-machine interaction body-sensing vehicle according to the third embodiment of the disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

The following description will render a clear and complete description of the present disclosure in combination with the embodiments and accompanying drawings. Obviously, the embodiments described herein are only part but not all embodiments of the disclosure. Any other embodiments obtained by those of skill in the art without making inventive efforts shall all be covered within the protection of the disclosure.

Referring to FIGS. 1 to 5, a human-machine interaction body-sensing vehicle 100 of the first embodiment is provided. The human-machine interaction body-sensing vehicle 100 includes a vehicle body 10 and two wheels 20 coupled with the vehicle body 10.

Preferably, planes of the two wheels 20 may be parallel with each other, and axles of the two wheels 20 is aligned in substantially the same imaginary straight line. The two wheels 20 may be assembled to opposite sides of the vehicle body 10 through the respective axles. For example, the two wheels 20 may be assembled to opposite ends of the vehicle body 10, respectively, or assembled at two sides under the vehicle body 10. In this embodiment, the two wheels 20 may be rotatably coupled with opposite ends of the vehicle body 10. The two wheels 20 can rotate on an axis of the vehicle body 10, which may substantially coincide with the above imaginary straight line, thereby enabling movement of the human-machine interaction body-sensing vehicle 100.

The vehicle body 10 may include a support frame 11, two pedals 12 disposed on the support frame 11, a plurality of first position sensors 13, and a controller 15. The support frame 11 is formed into an integrated structure and be rotatably coupled with the two wheels 20. The words "integrated structure" means that the constituent parts of the support frame 11 cannot be moved with respect to each other so that the support frame is substantially an integral piece, which is different from the prior art that in a conventional human-machine interaction body-sensing vehicle a left internal cover can rotate relative to the right internal cover. The support frame 11 can be formed into an integrated structure by molding, welding, or riveting. The support frame 11 can be of any shape, such as a rigid plate-type structure or a rigid shaft. In this embodiment, the support frame 11 is a rigid plate-type structure. Two symmetrical pedal areas 111 are defined on a side of the support frame 11 away from the ground. The two pedals 12 are respectively disposed in the two pedal areas 111. At least one of the plurality of first position sensors 13 is arranged in the pedal areas 111. The pedal areas 111 may be receiving grooves 1110 recessed towards an inside of the support frame 11. A protrusion 121 facing towards the wheels 20 is provided at each side of the pedal 12, and the pedal 12 is pivoted to the vehicle body 10 via the protrusion 121, thereby the two pedals 12 is rotatably connected to the support frame 11. The pedal areas 111 may be a plane, not a groove, and the pedals 12 may be arranged on the support frame 11.

The pedal 12 may be independently mounted on the support frame 11. The words "independently mounted" means that the pedal 12 is not fixedly disposed on the support frame 11, but to a certain extent loosely assembled to the support frame 11 through intermediate connections such that the pedal 12 can move relative to the support frame 11.

For example, the pedal 12 can be rotatably connected to the support frame 11 along an axle of the wheel 20 or an axis of the wheel 20. In this embodiment, the pedal 12 is rotatably connected to the support frame 11 along the axle of the wheel 20. When a user stands on the pedal 12, the pedal 12 can rotate and have a tilt angle relative to the support frame 11. The pedal 12 can be of any shape, such as a plate-type structure. In this embodiment, the pedal 12 is a plate-type structure. The pedal 12 includes a plate-type footboard 127, a fixing element 122 assembled to or integrated into downside of the pedal 12, and a mounting shaft 120 assembled to or integrated into the fixing element 122. The protrusion 121 facing towards the wheels 20 is provided at the mounting shaft 120 and covers part of the pedal 12. So the mounting shaft 120 makes the pedal 12 stronger. The protrusion 121 can be formed at the fixing element 122 or the footboard 127, or assembled on fixing element 122 or the footboard 127.

The first position sensor 13 is configured to detect rotation information or tilt information of a user standing on the pedal 12, and send the rotation information or the tilt information to the controller 15. The controller 15 thus controls the wheels 20 to rotate according to the tilt information, so that the user can manipulate the human-machine interaction body-sensing vehicle 100 to move. Not only the wheels 20 can rotate via just the first position sensor 13, but also the wheels 20 can move forward and backward if the tilt information or rotation information of the two pedals 12 have minor difference, or make turns, like turn right or turn left, if the tilt information or rotation information of the two pedals 12 have large difference. The attitude information may include posture information of the user standing on the pedal 12. The first position sensor 13 can be of any sensing-type. For example, the first position sensor 13 can be gyroscope, a pressure sensor, or a photoelectric sensor. When the first position sensor 13 is a photoelectric sensor, the pedal 12 can rotatably connected to the support frame 11 or fixed on the support frame 11. The number of the first position sensor 13 can be any, for example, the number of the first position sensor 13 can be single or multiple. In this embodiment, the number of the first position sensor 13 is single. The position of the first position sensor 13 is not limited. For example, the first position sensor 13 is located on a inductive switch 14, or integrated into the inductive switch 14. A second position sensor can be provided on the vehicle body 10 and configured to detect tilt information of the support frame 11 relative to the wheels 20, in order to detect the tilt information of the support frame

11 relative to the ground. The human-machine interaction body-sensing vehicle 100 can be move forward or backward according to the tilt information detected by the second position sensor. The human-machine interaction body-sensing vehicle 100 can be move forward or backward according to tilt of the vehicle body 10, that is, same angular speeds of the two wheels 20 drove by an actuation device. The actuation device can drive the wheels 20 to make turns according to the tilt information detected by the first position sensor 13. In this embodiment, the human-machine interaction body-sensing vehicle 100 takes turns according to tilt angle of the pedal 12, that is, different angular speeds of the two wheels 20 drove by the actuation device. In this embodiment, the first position sensor 13 and/or the second position sensor is integrated into a subsidiary circuit board 124. The subsidiary circuit board 124 is fixed to the pedal 12. The first position sensor 13 on the subsidiary circuit board 124 can sway with the footboard 127, in order to sensing the movement of the footboard 127. A plurality of mounting pillar 125 is extended from the footboard 127 and configured to fix the subsidiary circuit board 124. Also the first position sensor 13 can be connected to the footboard 127 by any means, in order to sway with the footboard 127.

In this embodiment, the inductive switches 14 are located in the pedal areas 111 of the vehicle body 10 of the human-machine interaction body-sensing vehicle 100, and configured to sense the pedal 12 pressed or not in order to control the wheels 20 to rotate or stop. In detail, when the inductive switches 14 are pressed by the two pedals 12 individually, and the strength of the pressure to the inductive switches 14 is the same, the human-machine interaction body-sensing vehicle 100 will start to move, in order to prevent the human-machine interaction body-sensing vehicle 100 starting to move and unexpected injury when just one pedal 12 is pressed by the user. In this embodiment, the inductive switches 14 are arranged on the footboard 127. In other embodiments, the inductive switches 14 can be arranged under the footboard 127, and sense dropping of the footboard 127 to control the wheels 20 rotate or stop. Also a groove can be located on the footboard 127 to accommodate the inductive switches 14. In this embodiment, the vehicle body 10 further includes a plurality of flexible supports 17. The plurality of flexible supports 17 are arranged between the pedal 12 and a bottom of the receiving groove 1110 and form a buffer to pressing of the pedal 12 relative to the first position sensor 13 and the inductive switches 14 and make the pedal 12 return. The plurality of flexible supports are springs. The springs can be fixed on a fixing protrusion 112 of the

receiving groove 1110, or the pedal 12. . In other embodiment, the plurality of flexible supports can be torsion springs (not shown).

In another embodiment, the plurality of flexible supports 17 can be pressure structure. In detail, a pressure sensor is arranged between springs or in the footboard 127. For example, the pedal 12 tilt, the pressure sensor can detect pressure information, gravity information, or position information. The controller 15 can control the vehicle body 10 move or rotate according to the pressure information, gravity information, or position information. The pedal 12 is rotatably connected to the support frame 11.

In another embodiment, the plurality of flexible supports 17 can be capacitor installations or inductance devices. That is, the volume of the vehicle 10 can be decreased without the rotate of the pedal 12. When the user stands on the pedal 12, the capacitor installations or inductance devices can detect a pressure and control the wheels 20 to rotate. The wheels 20 can move forward or backward, make turns, accelerate, or slow down according to the different pressures of different positions detected by the capacitor installations or inductance devices. The pedals 12 can be installed with a combination of pressure sensor and capacitor installations or inductance devices. The number of capacitor installations or inductance devices installed on the pedal 12 can be arbitrary. The pedals 12 can be installed with one capacitor installations or one inductance devices. The pedals can be installed with two capacitor installations or two inductance devices. The pedals can be installed with a plurality of capacitor installations or a plurality of inductance devices.

Alternatively, the vehicle body 10 may further include a power source 16 and an actuation device (not shown). The power source 16 can supply electrical energy to the actuation device, the first position sensor 13, and the controller 15. The controller 15 can control the power source 16, the actuation device, and the first position sensor 13, and send an actuation signal to the actuation device based on the tilt information detected by the first position sensor 13, thereby driving the wheels 20 to rotate. Typically, the vehicle body 10 may include two actuation devices respectively assembled in the two wheels 20 to control the corresponding wheels 20. In other embodiment, the actuation devices can be installed in the support frame 11, to minimize the volume of the wheels 20.

In this embodiment, the support frame 11 has a shape of boat and includes two receiving grooves 1110 and a receiving area 116 located between the two receiving grooves 1110 and

used for accommodating the power source 16 and the controller 15. The controller 15 can be a main circuit board. A clipboard 115 is arranged between the power source 16 and the controller 15 and configured to separate and prevent effecting each other.

A cover 117 is arranged over the receiving area 116 and used for protecting the power source 16 and the controller 15.

A support structure 113 is arranged between the receiving area 116 and the receiving groove 1110 structure and configured to support and pivoted to the protrusion 121 of the pedal 12. The support structure 113 is integrated into the support frame 11, or assembled to the support frame 11. A pivoted recess 1130 is located on the support structure 113 and the support frame 11 and configured to pivot to the protrusion 121. And a fixing structure 114 is located above the pivoted recess 1130 and configured to fix the protrusion 121. The fixing structure 114 is integrated into the support frame 11, or assembled to the support frame 11.

The vehicle body further includes an extractable shell arranged on the support frame 11 and able to be extracted along a direction perpendicular to an axle of the wheels 10. The extractable shell can be extracted along a direction of the human-machine interaction body-sensing vehicle 100 moving forward or backward. The extractable shell includes a first shell 101 and a second shell 102. The first shell 101 is able to be extracted along a direction from forward to backward and sheathed in the support frame 11. The second shell 102 are able to be extracted along from backward to forward and sheathed in the support frame 11. In detail, the extractable shell includes two end portions 104 facing to the wheels 20, a side portion 103 using for connecting the two end portions 104, a top portion 106 away from the ground, and a bottom portion 105 facing to the top portion 106. A groove 107 is arranged on the top portion 106 and configured to accommodate the pedal 12. In this embodiment, the second shell 102 is symmetrical with the first shell 101. Alternatively, the second shell 102 can be unsymmetrical with the first shell 101, the first shell 101 and the second shell 102 are assembled along upward or downward, an arbitrary angle with the axis of the wheels, or the axle of the wheels.

A pedal cover 126 is located on the pedal 12. The pedal cover 126 is fixed on the pedal 12. A non-slip mat 123 is arranged on the pedal cover 126 and used for the user's standing. Alternatively, the pedal cover 126 can be fixed on the support frame 11 or the extractable shell. Middle of the pedal cover 126 can be hollow or be flexible structure, so the pedal 12 can be move upward or downward or tilt when the non-slip mat 123 is pressed by the user.

A wheel shell 21 is arranged over the wheel 20. A fixing portion 22 is extended from side of the wheel shell 21. The fixing portion 22 is assembled to the support frame 11 or the extractable shell. Alternatively, the wheel shell 21 can be integrated into the support frame 11 or the extractable shell.

Referring to FIG. 7, a human-machine interaction body-sensing vehicle 200 of the second embodiment is provided. The first position sensor can detect a rotate angle of the pedal 212 to detect a tilt angle of the pedal 212 relative to the support frame 211.

Wherein, the support frame 211 is a rigid shaft. The pedal 212 is sheathed in the rigid shaft and rotatably connected to the support frame 211. The first position sensor is arranged between the support frame 211 and the rigid shaft and configured to detect a tilt angle of the support frame 211 relative to the rigid shaft. when the first position sensor is a pressure sensor, the pressure sensor is used to detect a pressure information, a gravity information, or a position information of the pedal. The pressure sensor can detect minor rotate angle or tilt angle of the support frame 211 relative to the rigid shaft. Although the rotate angle or tilt angle is in a tiny scale, the support frame 211 and the rigid shaft can be regarded as rotatably connected.

Another human-machine interaction body-sensing vehicle is provided. The human-machine interaction body-sensing vehicle includes a vehicle body. The vehicle body includes at least two flexible supports arranged between the pedal and the support frame. The first position sensor is configured to detect deformation amounts of the flexible supports to detect the position information of the user standing on the pedal. In detail, the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

Preferably, the pedal is rotatably connected to the support frame along an axle of the wheels. The first position sensor is configured to detect rotation information of the pedal along a direction parallel to the axle of the wheels.

Referring to FIG. 8, another human-machine interaction body-sensing vehicle 300 is provided. The human-machine interaction body-sensing vehicle 300 includes a vehicle body 30 and two wheels 304 arranged to the vehicle body 30. The wheels 304 can rotate on the vehicle body 30 along an axle of the wheels. The vehicle body 30 further includes a support frame 31 and two pedals 32 located on the support frame 31. The support frame 31 is an integrated structure and

rotatably connected to the wheels 304. A pressure sensor is arranged on the pedal 32 and configured to detect pressure information, gravity information, or position information of the two pedals 32. The human-machine interaction body-sensing vehicle 300 further includes a controller configured to drive the wheels to rotate based on the detected pressure information, gravity information, or position information. The controller is arranged inside of the vehicle body. The pedals 32 can be fixed to the support frame 31, or rotatably connected to the support frame 31. The words "rotatably connect" means that the pedals 32 rotate on an axis of the support frame 31, and the rotate information can be understood as tilt information. Furthermore, the rotate angle can be arbitrary, for example, in the embodiment of the pedal rotate on the axle of wheel or flexible support arranged in the pedal, the tilt angle or rotate angle may be large. Except for the pressure sensor of ratatably connecting, when a pressure sensor is provided in a plane surface of the pedal area, the although the rotate angle or tilt angle is in a tiny scale, the support frame31 and the rigid shaft can be regarded as rotatably connected. If the pressure sensor is attached on the support frame 31, the rotate angle or tilt angle detected by pressure distribution is in a tiny scale, the support frame 31 and the pedal can be regarded as rotatably connected. Alternatively, when the pedal area is plane, the pedal 32 can be fixed to the support frame 31.

In detail, when the user stands on the two pedals 32 and the position information, gravity information, or pressure information of the two pedals 32 is unequal, the vehicle body 30 takes turns.

For example, the controller is used to control the wheels 304 to rotate according to pressure information of the two pedals 32. The vehicle body takes left- or right- turn according to pressure information of left- and right- pedals 32. If the pressure information of left- and right- pedals 32 are unequal, the left wheel 304 has larger speed than the right wheel, resulting in the vehicle body takes left-turn, and a tilt angle between the left pedal and the right pedal is minor and the left pedal and the right pedal tilt to rightside and downside. The gravity information can be regarded as tilt information and a gravity distribution is detected by the pressure sensor. Although the rotate angle or tilt angle is in a tiny scale, the pedals are regarded as being tilt and have a minor tilt angle.

The pressure sensor can detect if there is a user standing on the pedal or not and control the wheels 304 to rotate or stop. In this embodiment, an inductive switch configured to detect

whether the pedal is pressed or not is unnecessary, in order to simplify the structure of the vehicle body.

The pedal 32 includes a footboard and a non-slip mat arranged on the footboard. The pressure sensor is arranged under the footboard. In detail, when an user stands on the pedal, the pressure information is detected by the pressure sensor and sent o the controller by an electric conductive coil.

When the whole of the vehicle body 30 tilts forward or backward integrity, the vehicle body 30 moves forward or backward.

In detail, the human-machine interaction body-sensing vehicle 300 further includes a second position sensor configured to detect tilt information of the support frame 31 relative to the wheels 304. The second position sensor can include a gyroscope, a pressure sensor, a photoelectric sensor, and so on. The gyroscope can be fixed on a circuit board inside the support frame 31. The circuit board can be a whole piece, or divided into two pieces. The gyroscope can be configured to "self-balance". When the user and the support 31 tilt forward, a tilt information can be detected by the gyroscope and sent to the controller. The controller can control the wheels 304 to move forward, and a whole of the vehicle body is controlled by a backward tilt force, resulting in self-balance effect.

Therefore, the above human-machine interaction body-sensing vehicle includes a support frame of integrated structure that plays a role of supporting. The pedal is arranged on the support frame independently. Two rotatably connected structures configured to install the pedal are unnecessary. Compared to a balance vehicle in the prior art, the provided human-machine interaction body-sensing vehicle has a simple and whole structure, and can of strong expandability, omitting a direction pillar and two rotatably connected structure configured to install two pedals separately. The vehicle body of the provided human-machine interaction body-sensing vehicle is much more robust.

The description above is merely exemplary embodiments of present disclosure, but is not intended to limit the disclosure. Any modifications, substitutions, or improvements made without departing from the spirits and scope of the disclosure shall all fall within the protection of the disclosure.

CLAIMS:

1. A human-machine interaction body-sensing vehicle comprising a vehicle body and two wheels coupled with the vehicle body, the wheel is rotated relative to the vehicle body along an axle of the wheel, characterized in that the vehicle body comprises a support frame, two pedals, a first position sensor, and a controller, the two pedals are located on the support frame, the support frame is an integrated structure and rotatably connected to the wheels, the two pedals are rotatably connected on the support frame, the first position sensor is configured to detect pressure information of a user standing on the pedals, and the controller is configured to drive the wheels to rotate based on the detected pressure information and make turns based on speed difference of the two wheels.

2. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the first position sensor is a pressure sensor.

3. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the first position sensor is configured to detect minor change of tilt angle of the pedals.

4. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the first position sensor is configured to detect deformation information of the pedals relative to the support frame.

5. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the pedals are fixed to the support frame.

6. The human-machine interaction body-sensing vehicle of claim 1, characterized in that two symmetrical pedal areas are defined on a side of the support frame away from the ground, and the two pedals are respectively disposed in the two pedal areas.

7. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the support frame is a rigid plate-type structure.

8. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the first position sensor is configured to detect whether the pedals are pressed or not in order to control the wheels to rotate or stop.

9. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the human-machine interaction body-sensing vehicle further comprises a power source and an

actuation device, the power source is configured to supply electrical energy to the actuation device, the first position sensor, and the controller, and the controller is configured to control the power source, the actuation device, and the first position sensor, and to send an actuation signal to the actuation device based on pressure information detected by the first position sensor, to drive the wheels to rotate.

10. The human-machine interaction body-sensing vehicle of claim 9, characterized in that the actuation device is located inside of the support frame or inside of the wheels.

11. The human-machine interaction body-sensing vehicle of claim 1, characterized in that each pedal comprises a footboard and a mat located on the footboard, and the first position sensor is arranged under the footboard.

12. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the human-machine interaction body-sensing vehicle further comprises a second position sensor, and the second position sensor is configured to detect tilt information of the support frame relative to the wheels.

13. The human-machine interaction body-sensing vehicle of claim 12, characterized in that the second position sensor comprises at least one of gyroscope, a pressure sensor and a photoelectric sensor.

14. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the support frame is sheathed in the pedals.

15. The human-machine interaction body-sensing vehicle of claim 14, characterized in that the support frame is a rigid shaft, and opposite ends of the support frame are rotatably connected to the two wheels.

16. The human-machine interaction body-sensing vehicle of claim 15, characterized in that the first position sensor is arranged between the pedals and the support frame, and is configured to detect pressure information of the pedals.

17. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the two wheels are rotatably assembled to opposite sides of the support frame, and rotatably connected to the support frame.

18. The human-machine interaction body-sensing vehicle of claim 1, characterized in that each pedal is a capacitive or inductive device.

19. The human-machine interaction body-sensing vehicle of claim 6, characterized in that an inductive switch is arranged in each pedal area and is configured to detect whether the respective pedal is pressed or not in order to control the wheels to rotate or stop.

20. The human-machine interaction body-sensing vehicle of claim 6, characterized in that each pedal area is a receiving groove recessed towards an inside of the support frame, a protrusion facing towards the wheels is provided at each side of the pedals, and each pedal is pivoted to the vehicle body via the protrusion.

21. The human-machine interaction body-sensing vehicle of claim 20, characterized in that a support structure is arranged on the frame structure and configured to support and pivoted to the protrusion.

22. The human-machine interaction body-sensing vehicle of claim 20, characterized in that the vehicle body further comprises a plurality of flexible supports arranged between each pedal and a bottom of the receiving groove.

23. The human-machine interaction body-sensing vehicle of claim 22, characterized in that the plurality of flexible supports are at least one of spring, pressure sensor, elastic flexible structure, or torsion spring.

24. The human-machine interaction body-sensing vehicle of claim 23, characterized in that the first position sensor is located inside the pressure sensor or the elastic flexible structure.

25. The human-machine interaction body-sensing vehicle of claim 24, characterized in that the first position sensor is configured to detect deformation quantity of the flexible supports basing on balanced position of the flexible supports, in order to detect the deformation of the flexible supports.

26. The human-machine interaction body-sensing vehicle of claim 24, characterized in that at least two flexible supports are arranged between each pedal and the support frame.

27. The human-machine interaction body-sensing vehicle of claim 1, characterized in that a receiving area is defined inside the support frame and configured to accommodate the controller, and a cover is arranged over the receiving area.

28. The human-machine interaction body-sensing vehicle of claim 27, characterized in that a power source is arranged in the receiving area.

29. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the human-machine interaction body-sensing vehicle further comprises a second position sensor,

and the second position sensor is configured to detect tilt information of the support frame relative to the ground, the controller is configured to drive the wheels to move forward or backward based on the tilt information detected by the second position sensor, and the controller is configured to drive the wheels to make turns based on the rotation information detected by the first position sensor.

30. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the first position sensor is located on a subsidiary circuit board, the subsidiary circuit board is fixed on each pedal and swaying with the pedal.

31. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the pedals are rotatably connected to the support frame along an axle of the wheels, and the first position sensor is configured to detect rotation information of the pedals along a direction parallel to the axle of the wheels.

32. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the vehicle body makes turns when pressure information of one of the two pedals are unequal to that of the other of the two pedals.

33. The human-machine interaction body-sensing vehicle of claim 1, characterized in that the vehicle body moves forward or backward when the vehicle body tilts forward or backward.

34. The human-machine interaction body-sensing vehicle of claim 1, characterized in that an extractable shell is arranged outside of the support frame.

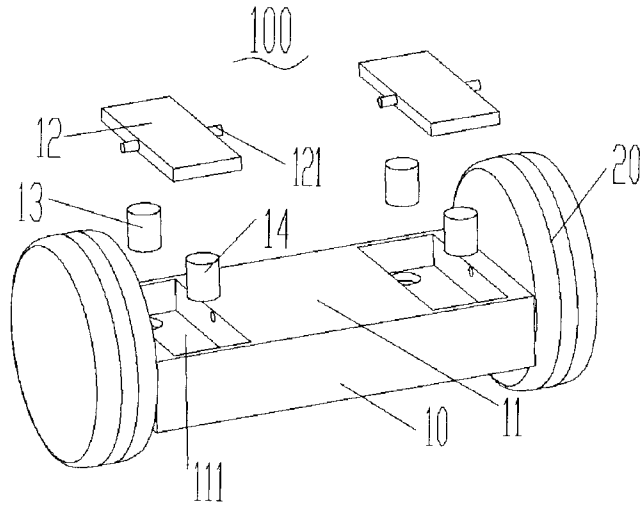


FIG. 1

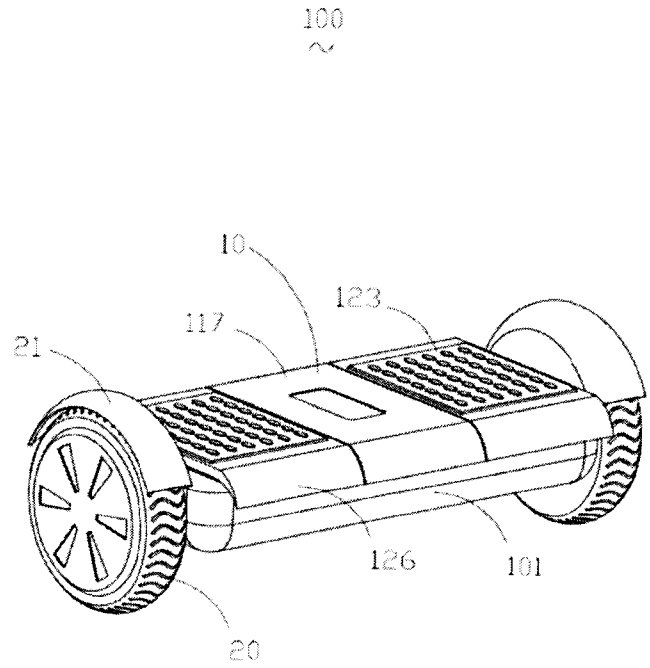


FIG. 2

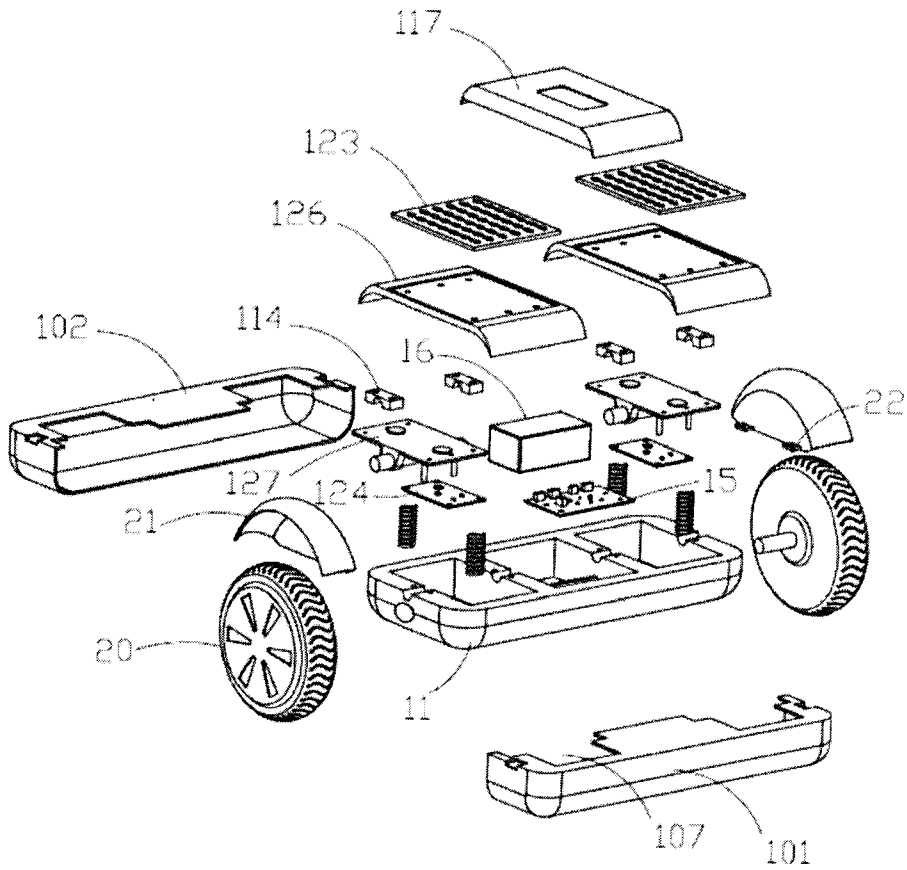


FIG.3

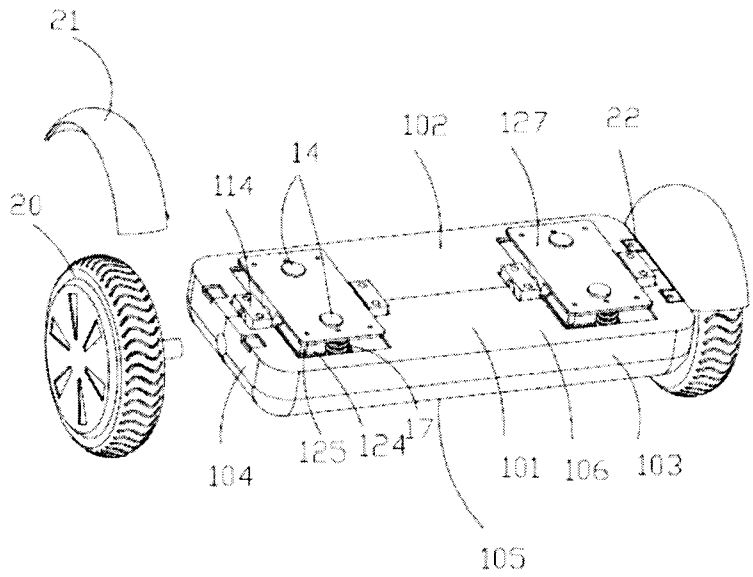

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FIG. 4

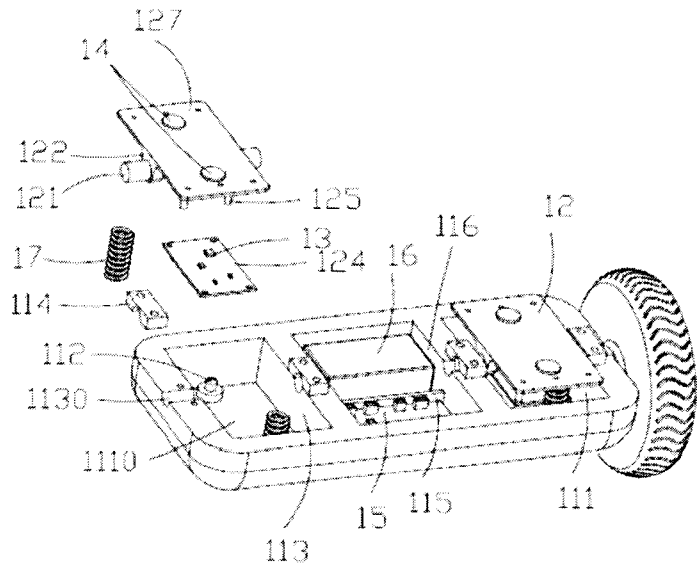

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FIG. 5

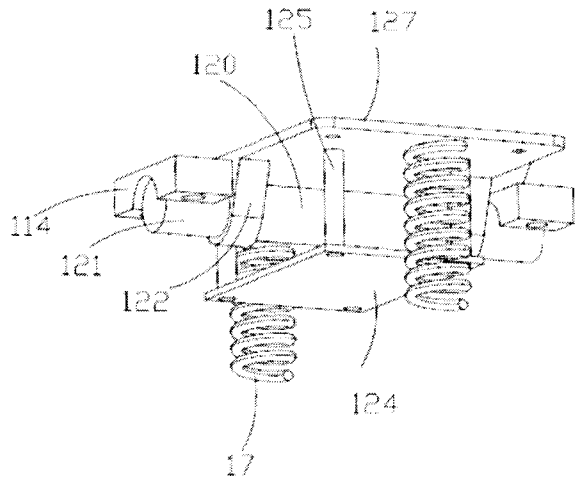


FIG. 6

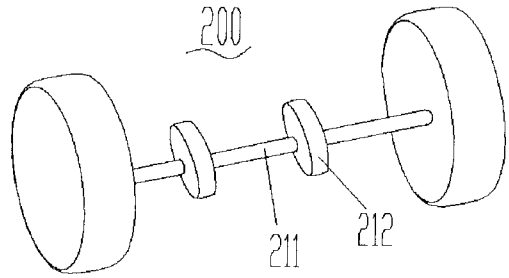


FIG. 7

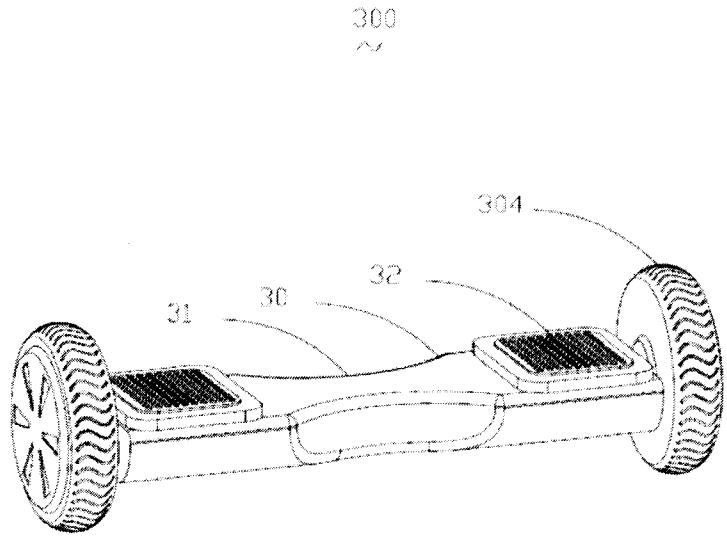
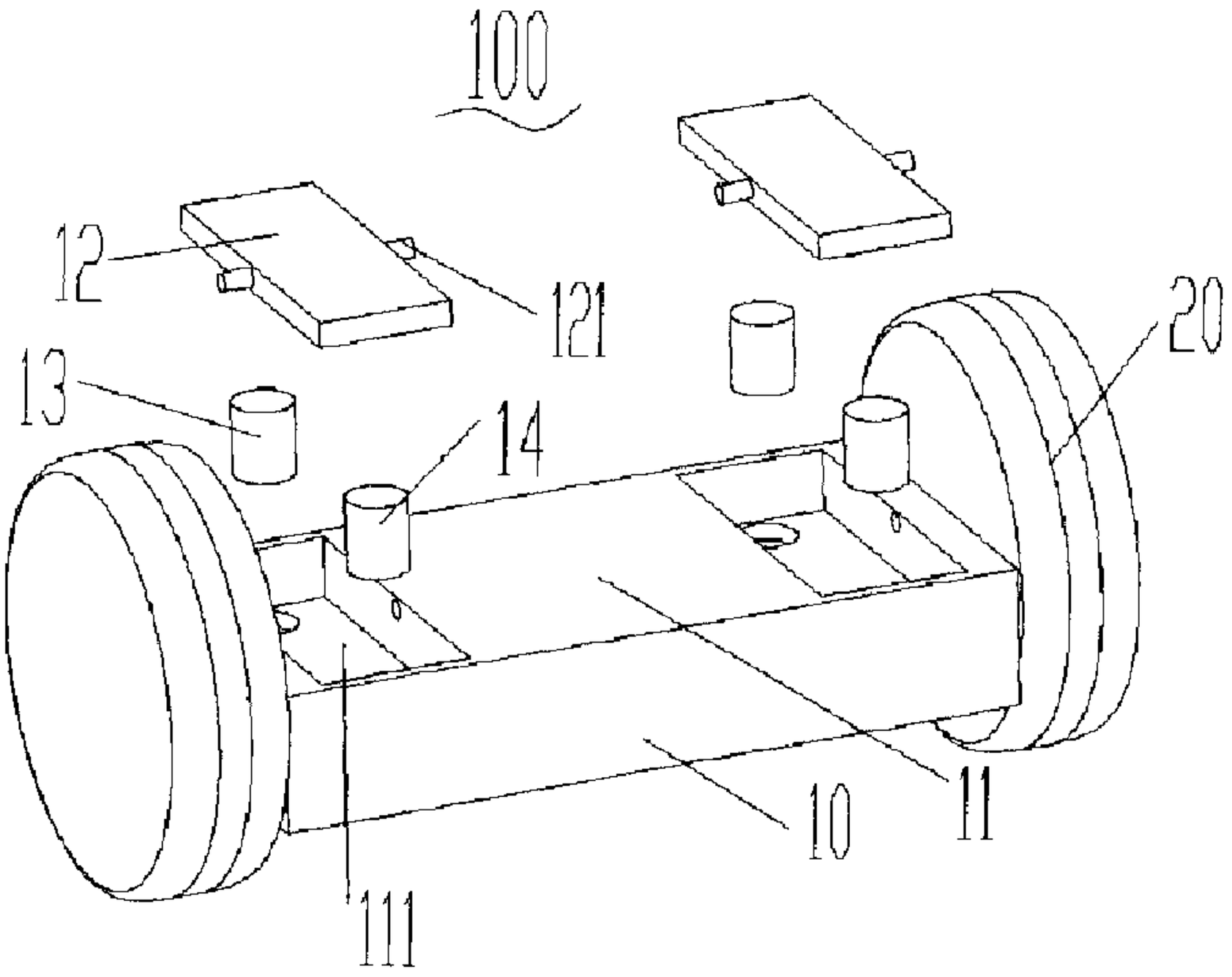


FIG. 8


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