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(54) Title: CONVERTIBLE SCOOTER

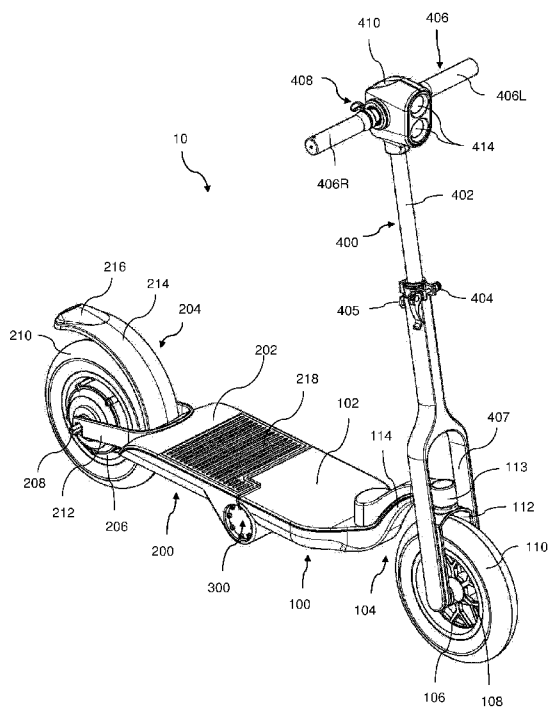


FIG. 1B

(57) Abstract: The present disclosure relates to a scooter convertible between first configuration and a second configuration. The scooter comprises: a front platform and a rear platform for a user to stand on; a front wheel assembly attached to the front platform; a front wheel coupled to the front wheel assembly for rotation about a front wheel axis; an attachment mechanism for moveably coupling the front platform and rear platform together; a rear wheel assembly attached to the rear platform; a rear wheel coupled to the rear wheel assembly for rotation about a rear wheel axis, wherein the front platform and rear platform are moveable with respect to each other, such that the front wheel axis and rear wheel axis are moveable with respect to each other to convert the scooter between the first and second configurations; wherein in the first configuration, the front wheel axis and rear wheel axis are separated from each other; and wherein in the second configuration, the front wheel axis and rear wheel axis are coincident with each other.



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CONVERTIBLE SCOOTER

Technical Field

5 The present disclosure generally relates to a convertible scooter. More particularly, aspects of the present disclosure are directed to a scooter or a scooter assembly that is convertible or changeable to and between a first configuration and a second configuration.

Background

10 Scooters are becoming a popular mode of transport for individuals. Due to such scooters being relatively lightweight and compactness, there is good mobility or portability and the scooters can be conveniently carried around by people. Users ride on these scooters by standing on a platform or footplate or deck. These scooters typically run on an electric motor and are powered by rechargeable batteries. Some
15 scooters have compactable or collapsible structures or components, allowing users to fold them into a more compact state for better portability and convenience.

United States Patent No. 7,954,831 discloses a scooter having a collapsible structure. The scooter comprises a head tube connecting the main frame (foot
20 platform) to the handlebar stem (steering stem). When the user is riding on the scooter, the main frame is horizontal and the handlebar stem is vertical. The head tube enables the scooter to collapse into a more compact state by operation of a rotation mechanism. In the collapsed state, the handlebar stem is folded or rotated down toward the main frame, such that they are parallel to each other. The
25 compacted scooter thus has a more streamline profile that is more convenient for the user to carry. In the compacted state, the user can hold by the handlebar and drag the compacted scooter by rolling on the front wheels.

However, a problem associated with the scooter in US 7,954,831 is that in its
30 compacted state, only the front wheels are used to move the scooter. When the user is pulling the compacted scooter by the handlebar, the front wheels are rolling on the ground while the rear wheel remains suspended in mid-air between the handlebar and the front wheels. This may pose a problem because the rear wheel gets dirty

from rolling on the ground (when the user is riding on the scooter in its uncompact state), as with the front wheels. The dirt on the rear wheel may transfer to the user when the user is dragging the compacted scooter, particularly when the user is standing next to the compacted scooter. Another problem is that the front wheels are used by the scooter in both uncompact and compacted states, while the rear wheel is only used in the uncompact state. This results in an imbalance in the wear and tear of the wheels. In other words, the front wheels will tend to wear out faster than the rear wheels, thereby requiring the user to repair or replace the wheel(s) more frequently.

Therefore, in order to address or alleviate at least one of the aforementioned problems and/or disadvantages, there is a need to provide a convertible scooter, in which there are at least some improved features over the prior art.

Summary

According to a first aspect of the present disclosure, there is a scooter convertible between first configuration and a second configuration. The scooter comprises: a front platform and a rear platform for a user to stand on; a front wheel assembly attached to the front platform; a front wheel coupled to the front wheel assembly for rotation about a front wheel axis; an attachment mechanism for moveably coupling the front platform and rear platform together; a rear wheel assembly attached to the rear platform; a rear wheel coupled to the rear wheel assembly for rotation about a rear wheel axis, wherein the front platform and rear platform are moveable with respect to each other, such that the front wheel axis and rear wheel axis are moveable with respect to each other to convert the scooter between the first and second configurations; wherein in the first configuration, the front wheel axis and rear wheel axis are separated from each other; and wherein in the second configuration, the front wheel axis and rear wheel axis are coincident with each other.

According to a second aspect of the present disclosure, there is a scooter convertible between first configuration and a second configuration. The scooter comprises: a front platform and a rear platform for a user to stand on; a front wheel assembly attached to the front platform; a front wheel coupled to the front wheel

assembly for rotation about a front wheel axis; an attachment mechanism for rotatably coupling the front platform and rear platform together; a rear wheel assembly attached to the rear platform; a rear wheel coupled to the rear wheel assembly for rotation about a rear wheel axis, wherein the front platform and rear platform are rotatable with respect to each other, such that the front wheel axis and rear wheel axis are moveable with respect to each other to convert the scooter between the first and second configurations; and wherein the attachment mechanism is further configured for laterally separating the front wheel and rear wheel with respect to each other, during rotation of the front platform and rear platform with respect to each other.

An advantage of the present disclosure is that the scooter can automatically convert between the first and second configurations. The scooter is able to fold itself such that the front and rear wheels come together. At the same time, the folding allows the wheels to laterally separate apart. In the second configuration or compacted / folded state of the scooter, the wheels are positioned side-by-side such that the scooter occupies a small volume or space, providing it with a small footprint that allows the user or rider to conveniently carry the scooter. In the compacted / folded state, the scooter can be moved around like a trolley or luggage with wheels because the wheel axes are coincident. In both the first and second configurations, both wheels are simultaneously utilized, i.e. driven or rolled on the ground. This significantly prevents any imbalance of wear and tear on the wheels, thereby reducing the frequency of repair or replacement of the wheels. The present disclosure thus provides a convertible scooter with a transformation mechanism that is simple to activate and enables the compacted / folded scooter to have a small volume.

A convertible scooter according to the present disclosure is thus disclosed hereinabove. Various features, aspects, and advantages of the present disclosure will become more apparent from the following detailed description of the embodiments of the present disclosure, by way of non-limiting examples only, along with the accompanying drawings in which like numerals represent like components.

Brief Description of the Drawings

FIG. 1A is a rear or back isometric view of a scooter in a first / open configuration, according to an embodiment of the present disclosure.

5 FIG. 1B is a front isometric view of the scooter of FIG. 1A.

FIG. 1C is a left side view of the scooter of FIG. 1A.

FIG. 1D is a top planar view of the scooter of FIG. 1A.

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FIG. 1E is a front view of the scooter of FIG. 1A.

FIG. 2A is a rear or back isometric view of a scooter in a second / closed configuration, according to an embodiment of the present disclosure.

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FIG. 2B is a front isometric view of the scooter of FIG. 2A.

FIG. 2C is a left side view of the scooter of FIG. 2A.

20 FIG. 2D is a front view of the scooter of FIG. 2A.

FIG. 2E is a top planar view of the scooter of FIG. 2A.

FIG. 3 is an illustration of a control instrument of the scooter, according to an
25 embodiment of the present disclosure.

FIG. 3A is another illustration of a control instrument of the scooter, according to another embodiment of the present disclosure.

30 FIG. 3B is a close-up view of the closed and open buttons of FIG. 3A.

FIG. 4 is an illustration of an attachment mechanism of the scooter, according to an embodiment of the present disclosure.

FIG. 5A is an illustration of a person using the scooter of FIG. 1A in the first / open configuration.

- 5 FIG. 5B is an illustration of a person using the scooter of FIG. 2A in the second / closed configuration.

FIG. 6A is an illustration of an alternative design of a scooter in a first / open configuration, according to an alternative embodiment of the present disclosure.

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FIG. 6B is an illustration of the scooter of FIG. 6A in a second / closed configuration.

FIG. 7A is an illustration of a person using the scooter of FIG. 6A in the first / open configuration.

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FIG. 7B is an illustration of a person using the scooter of FIG. 6B in the second / closed configuration.

FIG. 8 is an illustration of a conversion of the scooter converting from the first / open configuration of FIG. 6A to the second / closed configuration of FIG. 6B.

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Detailed Description

In the present disclosure, depiction of a given element or consideration or use of a particular element number in a particular FIG. or a reference thereto in corresponding descriptive material can encompass the same, an equivalent, or an analogous element or element number identified in another FIG. or descriptive material associated therewith. The use of “/” in a FIG. or associated text is understood to mean “and/or” unless otherwise indicated. The recitation of a particular numerical value or value range herein is understood to include or be a recitation of an approximate numerical value or value range, for instance, within +/- 20%, +/- 15%, +/- 10%, +/- 5%, or +/- 0%. With respect to recitations herein directed to dimensional or numerical comparisons or equivalence, reference to the terms “generally,” “approximately,” or “substantially” is understood as falling within +/- 20%,

25

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+/- 15%, +/- 10%, +/- 5%, or +/- 0% of a representative / example comparison, or a specified or target value or value range; and reference to the term “essentially” is understood as falling within +/- 10%, +/- 5%, +/- 2%, +/- 1%, or +/- 0% of a representative / example comparison, or a specified or target value or value range.

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For purposes of brevity and clarity, descriptions of embodiments of the present disclosure are directed to a convertible scooter, in accordance with the drawings in FIG. 1A to FIG. 8. While aspects of the present disclosure will be described in conjunction with the embodiments provided herein, it will be understood that they are not intended to limit the present disclosure to these embodiments. On the contrary, the present disclosure is intended to cover alternatives, modifications and equivalents to the embodiments described herein, which are included within the scope of the present disclosure as defined by the appended claims. Furthermore, in the following detailed description, specific details are set forth in order to provide a thorough understanding of the present disclosure. However, it will be recognized by an individual having ordinary skill in the art, i.e. a skilled person, that the present disclosure may be practiced without specific details, and/or with multiple details arising from combinations of aspects of particular embodiments. In a number of instances, well-known systems, methods, procedures, and components have not been described in detail as not to unnecessarily obscure aspects of the embodiments of the present disclosure.

In representative or exemplary embodiments of the present disclosure, a convertible, configurable, foldable, compactable and/or transformable scooter 10 is described hereinafter. The scooter 10 is convertible or foldable to between a first configuration and a second configuration. The first configuration is an open configuration or arrangement of the scooter 10 whereby the scooter 10 is usable by an individual or user or riding thereon. FIG. 1A to FIG. 1E illustrate various views of the scooter 10 in the first / open configuration. The second configuration is a closed configuration or arrangement of the scooter 10 whereby the scooter 10 is compacted or folded into a smaller and more compact configuration. FIG. 2A to FIG. 2E illustrate various views of the scooter 10 in the second / closed configuration. The compacted scooter 10

provides the user with greater flexibility, portability, mobility, and convenience when carrying or moving the scooter 10 around without riding on it.

5 With reference to FIG. 1A to FIG. 2E in general, the scooter 10 includes a front portion / structure 100 and a rear portion / structure 200 that are connected, coupled, joined, or attached together. The front portion 100 and rear portion 200 are moveably connected together, such that the front portion 100 and rear portion 200 are moveable with respect to each other, while maintaining the physical connection or coupling therebetween. The front portion 100 and rear portion 200 are moveably
10 connected or coupled by an attachment mechanism 300. For example, when either of the front portion 100 and rear portion 200 is moving with respect to the other, the front portion 100 and rear portion 200 remains joined together via the attachment mechanism 300.

15 The front portion 100 of the scooter 10 comprises a front footplate or front platform 102 for the user to stand on while riding the scooter 10 in the first / opened configuration. The rear portion 200 of the scooter 10 comprises a rear footplate or rear platform 202 for the user to stand on while riding the scooter 10 in the first / opened configuration. Both the front footplate or front platform 102 and the rear
20 footplate or rear platform 202 together provide the support for the user to stand thereon with both legs.

The front portion 100 further comprises a front wheel assembly 104 attached to the front platform 102. The front wheel assembly 104 includes a front wheel 106 that is
25 supported by a front axle 108 for driving on the road. The front wheel 106 may further include a front tyre 110, e.g. a pneumatic tyre made from a rubber material. Alternatively, the front tyre 110 may be made from a solid material, e.g. plastic or nylon. The front wheel assembly 104 may also include a front fender for preventing road debris from being thrown into the air by the rotating front wheel 106. The front
30 axle 108 is supported by and connected to an inner front fork 112. The inner front fork 112 is in turn connected to a steering assembly 400 of the scooter 10. The steering assembly 400 provides the user or rider with control of the scooter 10 by allowing the inner front fork 112 to pivot about a steering axis passing through an

integrated hinge 113 between the front wheel assembly 104 and the steering assembly 400, thereby controlling the driving direction of the scooter 10 when the user is riding on it in its first / open configuration. The front wheel 106 is rotatable about a front wheel axis 12a passing through the front axle 108 and inner front fork 112 when the scooter 10 is being driven on the road. The front wheel assembly 104 further includes a front cover 114 extending from the front platform 102 to above the front wheel 106. The front cover 114 provides a structural connection between the front platform 102 and the inner front fork 112. The front cover 114 also protects the rider's feet from contacting the front wheel 106, specifically the rotating front tyre 110 when the scooter 10 is being driven on the road, thereby mitigating the risk of injury to the rider that could be caused by the rotating front tyre 110.

The rear portion 200 further comprises a rear wheel assembly 204 attached to the rear platform 202. The rear wheel assembly 204 includes a rear wheel 206 that is supported by a rear axle 208 for driving on the road. The rear wheel 206 may further include a rear tyre 210, e.g. a pneumatic tyre made from a rubber material. Alternatively, the rear tyre 210 may be made from a solid material, e.g. plastic or nylon. The rear wheel assembly 204 may also include a rear fender for preventing road debris from being thrown into the air by the rotating rear wheel 206. The rear axle 208 is supported by and connected to a rear fork 212. In various embodiments, the rear fork 212 does not allow the rear wheel 206 to pivot, as the directional control of the scooter 10 is performed by the steering assembly 400 and at the front wheel 106. The rear wheel 206 is rotatable about a rear wheel axis 12b passing through the rear axle 208 and rear fork 212 when the scooter 10 is being driven on the road.

The rear wheel assembly 204 further includes a rear cover 214 extending from the rear platform 202 to above the rear wheel 206. The rear cover 214 protects the rider's feet from contacting the rear wheel 206, specifically the rotating rear tyre 210 when the scooter 10 is being driven on the road, thereby mitigating the risk of injury to the rider that could be caused by the rotating rear tyre 210. The rear cover 214 includes a taillight 216 disposed thereon. The taillight 216 increases the visibility and conspicuity of the scooter 10, allowing other drivers and pedestrians to see the presence and motion of the scooter 10 on the road. Additionally, the taillight 216 can

be integrated with the brake system of the scooter 10 such that the taillight 216 is activated, or increases its brightness, when the rider presses the brake button 418 to activate the brake system. Sidelights may also be included on the scooter 10. Detailed functionalities of the taillight 216 and sidelights are similar to taillights of motor vehicles, and would be readily apparent to and understood by the skilled person.

The steering assembly 400 includes a steering pipe structure 402 which connects to and supports the inner front fork 112. The steering pipe 402 may also be referred to as a tube structure, structural tubing, or any hollow structural sections, as readily understood by the skilled person. The steering pipe structure 402 may comprise a singular pipe, or a plurality of pipes nested together. In some embodiments, the nesting of the plurality of pipes in the steering pipe structure 402 allows the steering assembly 400 to be telescopic, i.e. comprise a telescopic structure. The steering pipe structure 402 is thus extendable and retractable to different lengths, depending on user requirements, and is lockable at a selected height by a locking device 404. For example, the steering pipe structure 402 may comprise a plurality of grooves that are engageable by the locking device 404 to adjust the height of the steering assembly 400. Alternatively, the locking device 404 may apply a frictional force or grip on the steering pipe structure 402 to fix the selected height of the steering assembly 400. The telescopic structure of the steering assembly 400 advantageously enables the rider to vary the height of the steering pipe structure 402, so that the scooter 10 can be modified and catered to suit different riders of different heights. In one embodiment, the maximum height of the scooter 10 based on the maximum extension of the steering pipe structure 402 is approximately 1027 mm.

The steering assembly 400 includes a mounting device 405, e.g. a hook, disposed around the locking device 404 and facing the rear of the scooter 10. In one embodiment, the mounting device 405 is integrated with the locking device 404. The mounting device 405 allows the rider to hang his belongings or bags thereon while riding the scooter 10, so he does not need to carry them on his body during the ride.

The steering assembly 400 further includes a handlebar 406 disposed at an upper end thereof. The handlebar 406 includes a pair of handles or handle grips, specifically a left handle grip 406L and a right handle grip 406R. The rider can grasp the handle grips 406L,R and pivotally rotate them about the steering axis of the integrated hinge 113 to turn the inner front fork 112, front axle 108, and the front wheel 106 left or right, thereby controlling the scooter's direction of travel. In some embodiments, at least one or both of the left handle grip 406L and right handle grip 406R are foldable downward, i.e. pivotable, with respect to the handlebar 406, thereby making the steering assembly 400 more compact. In one embodiment, only the left handle grip 406L is foldable / pivotable. The various mechanisms for enabling the folding / pivoting of the handle grips 406L,R would be readily known and understood by the skilled person. In one embodiment, the maximum width of the handlebar 406 when the handle grips 406L,R are not folded down, which corresponds to the overall width of the scooter 10, is approximately 400 mm.

At the front portion 100 of the scooter 10, an outer front fork 407 of the steering assembly 400 is coupled to the inner front fork 112 of the front wheel assembly 104. The control of the handlebar 406 by the rider is communicated from the steering assembly 400 to the front wheel 106 via the outer front fork 407. The outer front fork 407 is lockable to the inner front fork 112 by a locking mechanism. When the outer front fork 407 is locked, the outer front fork 407 and inner front fork 112 are maintained at a fixed angular position, e.g. aligned with each other such that the front platform 102 is horizontal and the steering assembly 400 is vertical. When the outer front fork 407 is unlocked, the steering assembly 400 is moveable or pivotable with respect to the front wheel assembly 104. Particularly, when the outer front fork 407 is unlocked, the outer front fork 407 is pivotable with respect to the inner front fork 112. Accordingly, the steering assembly 400 is moveably coupled to the front wheel assembly 104 for steering the front wheel 106.

The steering assembly 400 further includes a control panel or control instrument 408 disposed around the centre portion of the handlebar 406. Referring to FIG. 3, the control instrument 408 includes a set of actuators or buttons that enable the rider to control various functions of the scooter 10. The control instrument 408 may also

include a display screen 410 for providing indications and/or alerts to the rider. The display screen 410 may further include a touch-screen panel for the rider to control functions of the scooter 10. In some embodiments, the display screen 410 can indicate the battery level of the battery powering an in-built motor of the scooter 10, the current speed of the scooter 10 when it is being driven on the road (i.e. a speedometer), and the distance covered by the scooter 10 (i.e. an odometer). In one embodiment, the average travelling speed of the scooter 10 is 12-15 km/h and the top speed is 20 km/h. It would be readily understood by the skilled person that the average and maximum speed can be adjusted, such as by changing the motor of the scooter 10.

The control instrument 408 includes a headlights button 412 among the set of actuators / buttons for turning on/off headlights 414 of the scooter 10. The headlights 414 are disposed in front of the steering assembly 400 and comprise a set of illumination devices, e.g. a pair of LEDs. An intelligent lighting system may be incorporated with the headlights 414 to automatically control operation thereof. For example, when the rider is riding the scooter 10 in a dark area or an area with low illumination, sensors in the headlights 414 can detect the low illumination and automatically turn on the headlights 414. The control instrument also includes a horn button 415 for sounding a horn or alarm integrated with the scooter 10. Activation of the horn button 415 emits an audible alert to drivers and pedestrians around the scooter 10.

Additionally, the control instrument 408 includes an acceleration button 416 for accelerating or speeding up the scooter 10, and a brake button 418 for braking or slowing down the scooter 10. For example, pressing the acceleration button 416 increases the battery power supplied to the motor of the scooter 10, thereby speeding up the scooter 10. Pressing the brake button 418 activates the braking system of the scooter 10. In some embodiments, the braking system uses reverse magnetic force to slow down the rotation of the front wheel 106 and rear wheel 206 and eventually bring the scooter 10 to a stop. A person skilled in the art will understand how eddy current induced magnetic field can be used to slow down a moving object. The same concept can be adapted into the braking system for the

scooter 10. The braking system may be pneumatically and/or hydraulically powered brake discs on at least one of the front wheel 106 and rear wheel 206. For example, in a pneumatic or air brake system, compressed air is used to press against a piston which is used to apply pressure to the brake discs or brake pads needed to stop the scooter 10. A person having ordinary skill in the art would be able to appreciate and understand the various types of brake systems suitable for the scooter 10. In some embodiments, the acceleration button 416 is disposed around the front portion of the right handle grip 406R and the brake button 418 is disposed around the rear portion of the right handle grip 406R. Alternatively, the acceleration button 416 may be disposed around the rear portion of the right handle grip 406R and the brake button 418 may be disposed around the rear portion of the left handle grip 406L.

In various embodiments, the attachment mechanism 300 connects, joins, or mounts the front portion 100 and rear portion 200 of the scooter 10 together. Particularly, the attachment mechanism 300 moveably couples the front platform 102 and rear platform 202 together, allowing the front platform 102 and rear platform 202 to move relative to each other, while maintaining the structural / physical connection there between. The front platform 102 and rear platform 202 are moveable with respect to each other to convert the scooter 10 to and between the first / open configuration and second / closed configuration. The movement of the front platform 102 and rear platform 202 consequently causes the front wheel axis 12a and rear wheel axis 12b to move with respect to each other.

In some embodiments, the attachment mechanism 300 is configured for rotating the front platform 102 and rear platform 202 with respect to each other. Alternatively, the front platform 102 and rear platform 202 may be moveable with respect to each other by a sliding motion, e.g. with sliding tracks, or by other mechanical motions as would be readily understood by the skilled person based on the present disclosure. In a representative embodiment as shown in FIG. 4, the attachment mechanism 300 comprises a lead screw 302 and a corresponding threaded hole 304. The attachment mechanism 300 also includes an outer casing 306 for covering and protecting the lead screw 302 and threaded hole 304. The lead screw 302 may be associated with the front platform 102 and the threaded hole 304 with the rear

platform 202, or vice versa. The rotation of the front platform 102 and rear platform 202 with respect to each other thus occurs through the lead screw 302 and threaded hole 304. In another embodiment, the attachment mechanism 300 can be a simple lift-off hinge, similar to that used for mounting and rotating doors, where after
5 unlocking, the front platform 102 and the rear platform 202 can be separated by pulling the two platforms apart laterally in opposite direction.

Each of the lead screw 302 and threaded hole 304 comprises a helical thread or profile having predetermined threading parameters for translating rotational motion
10 into linear motion. Other thread forms and/or threading parameters may be used instead, as would be readily understood by the skilled person. The helical thread allows the attachment mechanism 300 to be configured for laterally or sidewardly separating the front wheel 106 and rear wheel 206 with respect to each other, during movement or rotation of the front platform 102 and rear platform 202 with respect to
15 each other. The predetermined threading parameters of the helical thread determine the linear distance or lateral separation between the front wheel 106 and rear wheel 206 when the front platform 102 and rear platform 202 are rotated. For example, in one embodiment, a 180-degree rotation of the lead screw 302 translates into a linear motion of 100 mm. The lateral separation of the front wheel 106 and rear wheel 206
20 with respect to each other is associated with the rotation angle of the front platform and 102 rear platform 202 with respect to each other, wherein such association is based on the predetermined threading parameters.

In some other embodiments, instead of the helical lead screw 302 and threaded hole
25 304, the attachment mechanism 300 may have a helical cam gear / device or a gear rack and pinion assembly, that can allow the front platform 102 and rear platform 202 to rotate with respect to each other, while simultaneously causing lateral or sideways separation of the front wheel 106 and rear wheel 206 with respect to each other.

30 In the first / open configuration, the front platform 102 and rear platform 202 are positioned flatly in a horizontal arrangement, such that the rider is able to stand on them to ride the scooter 10, as shown in FIG. 5A. More specifically, the top surfaces of the front platform 102 and rear platform 202 are substantially flush or continuous

with each other, as shown in FIG. 1C. In one embodiment, the overall width of the front platform 102 and rear platform 202 is approximately 180 mm, and the overall length of the scooter 10 is approximately 1053 mm. Referring to FIG. 1B, the rear platform 202 includes a slip-resistant layer 218 that significantly prevents the rider from slipping off the rear platform 202. The slip-resistant layer 218 may be made from a rough material, e.g. rubber, and/or comprise a plurality of grooves that provide adequate grip for the rider's foot. The front platform 102 may also include a similar slip-resistant layer.

Referring to FIG. 1D, the front wheel axis 12a and rear wheel axis 12b are parallel to and separated from each other, such that the front wheel 106 and rear wheel 206 are aligned with each other. In one embodiment, the wheelbase of the scooter 10, or the separation distance between the front wheel axis 12a and rear wheel axis 12b, is approximately 800 mm. The wheel alignment ensures that the travelling or driving of the scooter 10 is straight and true, without tendency to shift to the side or laterally, as readily understood by the skilled person. The scooter 10 includes the battery-powered in-built motor as mentioned above, e.g. an electric motor, for driving thereof. Particularly, the motor is connected to the rear wheel 206 of the scooter 10 for driving the rear wheel 206. When the rider is riding or driving the scooter 10 in its first / open configuration, the rear wheel 206 is directly driven by the motor and the front wheel 106, where the directional control of the scooter 10 is applied, is indirectly driven by the rear wheel 206.

To convert the scooter 10 from the first / open configuration to the second / closed configuration, the front platform 102 and rear platform 202 are rotated toward each other, such that the front wheel 106 and rear wheel 206 are consequently rotated toward each other. In the first / open configuration, the locking mechanism between the outer front fork 407 and inner front fork 112 locks the steering assembly 400 to the front wheel assembly 104. As such, the locking mechanism also locks the steering pipe structure 402 and front platform 102 in a fixed angular arrangement. Accordingly, the front platform 102 is prevented or restricted from moving or rotating with respect to the steering pipe structure 402. The locking of the steering assembly 400 to the front wheel assembly 104 restricts movement of the front platform 102,

and consequently restricts movement or rotation of the front platform 102 and rear platform 202 with respect to each other. In short, the locking mechanism also functions as a locking means to maintain the first / open configuration of the scooter 10. The rider is thus required to unlock the locking mechanism in order to commence the conversion of the scooter 10 from the first / open configuration to the second / closed configuration. The unlocking may be performed by actuating a lever attached to the locking mechanism. For example, the lever may be disposed at position that can be conveniently actuated by the rider's foot. Thus, when the rider stops the scooter 10, he can step off and easily kick the lever to unlock the locking mechanism.

In some embodiments, the attachment mechanism 300 rotationally biases the front platform 102 and rear platform 202 toward each other, such as with a biasing mechanism, e.g. a torsion spring in the attachment mechanism 300. The front platform 102 and rear platform 202 are biased toward each other such that the biasing mechanism or torsion spring is in tension when the platforms are horizontally flush with each other. In the neutral position of the biasing mechanism, the angle between the front platform 102 and rear platform 202 is obtuse, e.g. 160 degrees. The attachment mechanism 300 may further include a biasing lock for locking the biasing mechanism in its tensioned configuration. The biasing lock may be an electronic lock that can be unlocked or disengaged by pressing a button, such as electromagnetic locks or solenoids. Alternatively, the biasing lock may be a manual lock that requires the user or rider to manually disengage the lock. The rotational bias provided by the attachment mechanism 300 enables the scooter 10 to quickly convert into a position that prepares the scooter 10 for its conversion from the first / open configuration to the second / closed configuration.

During the conversion from the first / open configuration to the second / closed configuration, the front platform 102 and rear platform 202 rotates an angle of approximately 180 degrees, such that their top surfaces move from a parallel arrangement to an anti-parallel arrangement. Simultaneously, the attachment mechanism 300 enables linear motion, along the lateral direction, of the rear wheel 206 with respect to the front wheel 106. The lateral separation between the front wheel 106 and rear wheel 206 when the front platform 102 and rear platform 202 has

rotated approximately 180 degrees is at least the wheel width of the front wheel 106, e.g. approximately 100 mm. This would allow the rear wheel 206 to be positioned laterally next to the front wheel 106 when the scooter 10 has converted into the second / closed configuration, whereby the front wheel axis 12a and rear wheel axis 12b are coincident with each other, as shown in FIG. 2C to FIG. 2E.

Referring to FIG. 3, the control instrument 408 includes a conversion button or mode button 420 for activating or commencing the conversion of the scooter 10 between the first / open configuration and second / closed configuration. Alternatively, separate buttons, closed button 421 and open button 422, can be provided for bringing the scooter 10 into first / open configuration or second / closed configuration as shown in FIG. 3A and FIG. 3B. When the scooter 10 is in the first / open configuration, upon unlocking of the locking mechanism between the steering assembly 400 and front wheel assembly 104, the rider presses the mode button 420 or closed button 421 to begin the conversion of the scooter 10 to the second / closed configuration. The pressing of the mode button 420 or closed button 421 causes the electromagnetic / solenoid lock of the biasing mechanism in the attachment mechanism 300 to disengage, thereby releasing the tension in the biasing mechanism. The release of the tension nullifies the rotational bias in the attachment mechanism 300, thereby enabling the front platform 102 and rear platform 202 to be positioned at an obtuse angle between them.

The pressing of the mode button 420 or closed button 421 also activates the motor to drive the rear wheel 206 toward the front wheel 106. With both the front wheel 106 and rear wheel 206 on the ground, the driving of the rear wheel 206 toward the front wheel 106 automatically moves the rear wheel axis 12b toward the front wheel axis 12a to convert the scooter 10 from the first / open configuration to the second / closed configuration. Due to the obtuse angle between the front platform 102 and rear platform 202, the forward-moving force on the rear wheel 206 creates a positive moment with respect to the attachment mechanism 300, specifically the lead screw 302 and threaded hole 304. The positive moment in turn causes the front platform 102 and rear platform 202 to rotate toward each other. If the motor is on the front wheel 106, the process is similar to that where the motor is at the rear wheel, except

that the motor will drive the front wheel 106 towards the rear wheel 206. Thus, the activation of the motor automatically converts the scooter 10 from the first / open configuration to the second / closed configuration. During the rotation of the front platform 102 and rear platform 202, the front platform 102 also rotates or folds
5 toward the steering pipe structure 402 of the steering assembly 400, due to the unlocking of the outer front fork 407 with the inner front fork 112, thereby compacting the scooter 10 even more.

In a similar manner, to convert the scooter 10 from the second / closed configuration
10 to the first / open configuration, the rider presses the mode button 420 or the open button 422 to activate the motor to drive the rear wheel 206 away from the front wheel 106. The driving of the rear wheel 206 away from the front wheel 106 automatically moves the rear wheel axis 12b away from the front wheel axis 12a to
15 convert the scooter 10 from the second / closed configuration to the first / open configuration. The rearward-moving force on the rear wheel 206 creates a positive moment with respect to the attachment mechanism 300, in turn causing the front platform 102 and rear platform 202 to rotate away from each other. If the motor is on
the front wheel 106, the process is similar to that where the motor is at the rear
20 wheel 206, except that the motor will drive the front wheel 106 away from the rear wheel 206. Thus, the activation of the motor automatically converts the scooter 10 from the second / closed configuration to the first / open configuration. During the rotation of the front platform 102 and rear platform 202, the front platform 102 also rotates or folds away from the steering pipe structure 402.

25 Therefore, the motor of the scooter 10 is activatable to automatically convert the scooter from one to the other of the first and second configurations. Further, the motor is activatable to drive the rear wheel with respect to the front wheel, thereby automatically moving the rear wheel axis 12b with respect to the front wheel axis 12a to convert the scooter between the first and second configurations.

30 In the second / closed configuration of the scooter 10, the front wheel 106 and rear wheel 206 are positioned laterally next to each other, with the front wheel axis 12a and rear wheel axis 12b coincident with each other. The side-by-side arrangement of

the front wheel 106 and rear wheel 206 allows the compacted or folded scooter 10 to take up a small space or volume, making it easier for the rider to carry it around. The overall length of the compacted scooter 10 is reduced to approximately 335 mm and the overall height, based on the minimum extension of the steering pipe structure 402, is approximately 788 mm. The size of the compacted scooter 10 provides it with a small footprint so that the user would not find it cumbersome to transport the scooter 10. It is also possible that the compacted or folded scooter 10 can be stored as in-flight cabin luggage.

The scooter 10 may be made of an aluminium material to keep it lightweight, e.g. below 10 kg. However, even at 10 kg, the scooter 10 may be too heavy for some, especially smaller sized persons, to carry. Another advantage of the side-by-side positioning of the front wheel 106 and rear wheel 206 is that the compacted scooter 10 can be moved around like a trolley or luggage with wheels, as shown in FIG. 5B. As the front wheel axis 12a and rear wheel axis 12b are coincident with each other, both the front wheel 106 and rear wheel 206 can move and rotate in tandem. Moreover, as the front wheel 106 and rear wheel 206 are on the ground when the scooter 10 is being moved like a trolley, there are two regions of contact between the scooter 10 and the ground. There is thus an improved balance when the rider moves the compacted scooter 10 by rolling the front wheel 106 and rear wheel 206.

Further, there is little or no chance of the user accidentally contacting the front wheel 106 or rear wheel 206, which can be dirty due to the scooter 10 being driven on the ground when it was in the first / open configuration. The telescopic structure of the steering assembly 400 allows the height of the steering pipe structure 402 to be adjusted. Different riders have different preferences on the suitable height of the steering pipe structure 402, just as with the handle of a luggage. The compacted scooter 10 can thus be modified and catered to suit different riders of different heights.

In one embodiment as shown in FIG. 2D, the rear wheel 206 is positioned on the right side of the front wheel 106. The steering assembly 400, particularly the steering pipe structure 402, remains aligned with the front wheel 106. However, in the second

/ closed configuration, the centre of mass or gravity of the folded scooter 10 is around the region of the gap 14 between the front wheel 106 and rear wheel 206. The gap 14 is positioned on the right side of the steering assembly 400. Thus, when the rider moves the folded scooter 10 like a trolley or luggage, the rider pulls by the handlebar 406, either by the left handle grip 406L or right handle grip 406R. In this particular embodiment, the position of the right handle grip 406R is more aligned with the centre of mass or gravity of the folded scooter 10. Thus, it would be easier for the rider to move the folded scooter 10 by pulling it by the right handle grip 406R. Pulling by the left handle grip 406L could cause difficulties in moving the folded scooter 10 due to a weight imbalance with respect to the rider's grip. The left handle grip 406L may be configured to be foldable or pivotable downward with respect to the handlebar 406, thereby preventing the rider from accidentally pulling on the left handle grip 406L.

In both the first / open configuration and second / closed configuration of the scooter 10, both the front wheel 106 and rear wheel 206 are simultaneously utilized, i.e. driven or rolled on the ground. This significantly prevents any imbalance of wear and tear on the wheels. The wear and tear would be relatively consistent on each of the front wheel 106 and rear wheel 206, such that there is a low risk of the rider requiring to repair or replace only a single wheel, thereby reducing the frequency of repair or replacement of the wheels.

In an alternative embodiment of the present disclosure, there is an alternative design of the scooter 10 as shown in FIG. 6A to FIG. 7B. FIG. 6A is an illustration of the alternative scooter 10 in the first / open configuration, and FIG. 6B is an illustration of the alternative scooter 10 in the second / closed configuration. The alternative scooter 10 is largely similar to the scooter 10 of the aforementioned embodiments, specifically as shown in FIG. 1A to FIG. 2E. Particularly, the left handle grip 406L is folded / pivoted downward with respect to the handlebar 406, so that the rider will pull on the right handle grip 406R to move the compacted / folded scooter 10. It would be easier for the rider to move by pulling by the right handle grip 406R because of its alignment with the centre of gravity of the compacted / folded scooter 10.

Additionally, the alternative scooter 10 comprises a pair of sidelights 220 disposed around the rear portion 200 of the scooter 10. Specifically, the pair of sidelights 220 are positioned on both sides of the scooter 10, and the sidelights 220 work in conjunction with the taillight 218 to increase the visibility and conspicuity of the scooter 10. The alternative scooter 10 further includes a brake step 222 disposed on the rear side of the rear platform 202. The brake step 222 provides an alternative actuator to the brake button 418 for activating the brake system of the scooter 10. The brake step 222 may also be an additional actuator such that the rider can activate the brake system by pressing on either the brake step 222 or brake button 418. The brake step 222 is useful in emergency situations, such as when the rider needs to avoid an obstacle, because the brake step 222 is positioned such that the rider can easily stop or brake the scooter 10 by quickly directing his foot backwards. In this design, the underside of the rear cover 214 is made of rubber or other material suitable for use as a brake pad to slow down the rear wheel rotation by friction.

A person having ordinary skill in the art would readily understand that the aforementioned description on the conversion of the scooter 10 (in representative embodiments as shown in FIG. 1A to FIG. 2E) between the first / open and second / closed configurations apply analogously to the alternative scooter 10 (in an alternative embodiment as shown in FIG. 6A and FIG. 6B). FIG. 7A and FIG. 7B show illustrations of the rider using or operating the alternative scooter 10 in the first / open configuration and second / closed configuration, respectively.

FIG. 8 is an illustration of a conversion process 20 of the alternative scooter 10 converting from the first / open configuration to the second / closed configuration. In step 21, the scooter 10 is in the first / open configuration, such as when the rider is driving or riding it.

In step 22, the rider unlocks the locking mechanism between the steering assembly 400 and front wheel assembly 104, and presses the mode button 420 or the closed button 421 to convert the scooter 10 to the second / closed configuration. The

electromagnetic / solenoid lock disengages and releases the tension in the attachment mechanism 300, thereby positioning the front platform 102 and rear platform 202 at an obtuse angle.

5 In step 23, the pressing of the mode button 420 or the closed button 421 also activates the motor to drive the rear wheel 206 toward the front wheel 106. With both the front wheel 106 and rear wheel 206 on the ground, the driving of the rear wheel 206 toward the front wheel 106 automatically moves the rear wheel axis 12b toward the front wheel axis 12a, and also causes the front platform 102 and rear platform
10 202 to rotate toward each other.

In step 24, the rotation of the front platform 102 and rear platform 202 toward each other simultaneously causes linear motion due to the components of the attachment mechanism 300, e.g. lead screw 302 and threaded hole 304. Specifically, the rear
15 wheel 206 is displaced toward the right during the rotational movement, simultaneously creating a lateral separation between the front wheel 106 and rear wheel 206.

In step 25, during the rotation of the front platform 102 and rear platform 202, the
20 front platform 102 also rotates or folds toward the steering pipe structure 402 of the steering assembly 400, thereby compacting / folding the scooter 10 even more.

In step 26, the rear wheel 206 has moved toward the front wheel 106 such that the front wheel axis 12a and rear wheel axis 12b are coincident with each other, and that
25 the rear wheel 206 is positioned on the right side of the front wheel 106. At this point, the rider may actuate the locking mechanism between the steering assembly 400 and the front wheel assembly 104 to prevent the compacted / folded scooter 10 from unfolding.

30 In step 27, the compacted / folded scooter 10 is allowed to lean forward, due to the natural rolling motion of the wheels. The compacted / folded scooter 10 can balance and stand by itself on the front wheel 106, rear wheel 206, and steering assembly 400.

In the foregoing detailed description, embodiments of the present disclosure in relation to a convertible scooter are described with reference to the provided figures. The description of the various embodiments herein is not intended to call out or be limited only to specific or particular representations of the present disclosure, but merely to illustrate non-limiting examples of the present disclosure. For example, instead of a single wheel at the front and rear of the scooter, the scooter may have a pair of or multiple front wheels and/or a pair of or multiple rear wheels for added stability.

The present disclosure serves to address at least some of the mentioned problems and issues associated with the prior art. Although only some representative and alternative embodiments of the present disclosure are disclosed herein, it will be apparent to a person having ordinary skill in the art in view of the present disclosure that a variety of changes and/or modifications can be made to the disclosed embodiments without departing from the scope of the present disclosure. The scope of the present disclosure as well as the scope of the following claims is not limited to embodiments described herein.

Claims

1. A convertible scooter comprising:
- 5 a front platform;
- a rear platform;
- an attachment mechanism whereto the front platform and the rear platform are coupled for displacing the rear platform along and about a first axis relative the front platform between a first configuration and a second configuration;
- 10 a front wheel assembly attached to the front platform and comprising a front wheel: and
- a rear wheel assembly attached to the rear platform and comprising a rear wheel,
- wherein the front platform and the rear platform presents a support for supporting a user thereon and between the front wheel and the rear wheel when in
- 15 the first configuration, and
- wherein the front wheel is displaced towards the rear wheel with one of the front wheel and the rear wheel coinciding with a rotational axis of the other thereof when in the second configuration.
- 20 2. The scooter as in claim 1, wherein the rotational axis is one of front wheel axis and rear wheel axis.
3. The scooter as in claim 1, wherein the attachment mechanism is configured for rotating the front platform and rear platform with respect to each other.
- 25 4. The scooter as in claim 3, wherein the attachment mechanism rotationally biases the front platform and rear platform toward each other.
5. The scooter as in claims 3 or 4, wherein the attachment mechanism is further
- 30 configured for laterally separating the front wheel and rear wheel with respect to each other, during movement of the front platform and rear platform with respect to each other.

6. The scooter as in claim 5, wherein the attachment mechanism comprises a lead screw and a threaded hole.

7. The scooter as in claim 6, wherein the lead screw and a threaded hole have predetermined threading parameters, such that the lateral separation of the front wheel and rear wheel with respect to each other is associated with a rotation angle of the front platform and rear platform with respect to each other.

8. The scooter as in claim 1, further comprising a motor connected to the rear wheel for driving the rear wheel.

9. The scooter as in claim 8, wherein the motor is activatable to automatically convert the scooter from one to the other of the first and second configurations.

10. The scooter as in claims 8 or 9, wherein the motor is activatable to drive the rear wheel with respect to the front wheel, thereby automatically moving the rear wheel axis with respect to the front wheel axis to convert the scooter between the first and second configurations.

11. The scooter as in claim 1, further comprising a steering assembly moveably coupled to the front wheel assembly for steering the front wheel.

12. The scooter as in claim 11, wherein the steering assembly is lockable to the front wheel assembly for restricting movement of the front platform and rear platform with respect to each other.

13. The scooter as in claims 11 or 12, the steering assembly comprising a handlebar with a pair of handles, at least one handle being pivotable with respect to the handlebar.

14. The scooter as in claims 11 or 12, the steering assembly comprising a telescopic structure.

15. A scooter convertible between first configuration and a second configuration, the scooter comprising:

a front platform and a rear platform for a user to stand on;

a front wheel assembly attached to the front platform;

5 a front wheel coupled to the front wheel assembly for rotation about a front wheel axis;

an attachment mechanism for rotatably coupling the front platform and rear platform together;

a rear wheel assembly attached to the rear platform;

10 a rear wheel coupled to the rear wheel assembly for rotation about a rear wheel axis,

wherein the front platform and rear platform are rotatable with respect to each other, such that the front wheel axis and rear wheel axis are moveable with respect to each other to convert the scooter between the first and second configurations; and

15 wherein the attachment mechanism is further configured for laterally separating the front wheel and rear wheel with respect to each other, during rotation of the front platform and rear platform with respect to each other.

20 16. The scooter as in claim 15, wherein the attachment mechanism rotationally biases the front platform and rear platform toward each other.

17. The scooter as in claims 15 or 16, wherein the attachment mechanism comprises a lead screw and a threaded hole.

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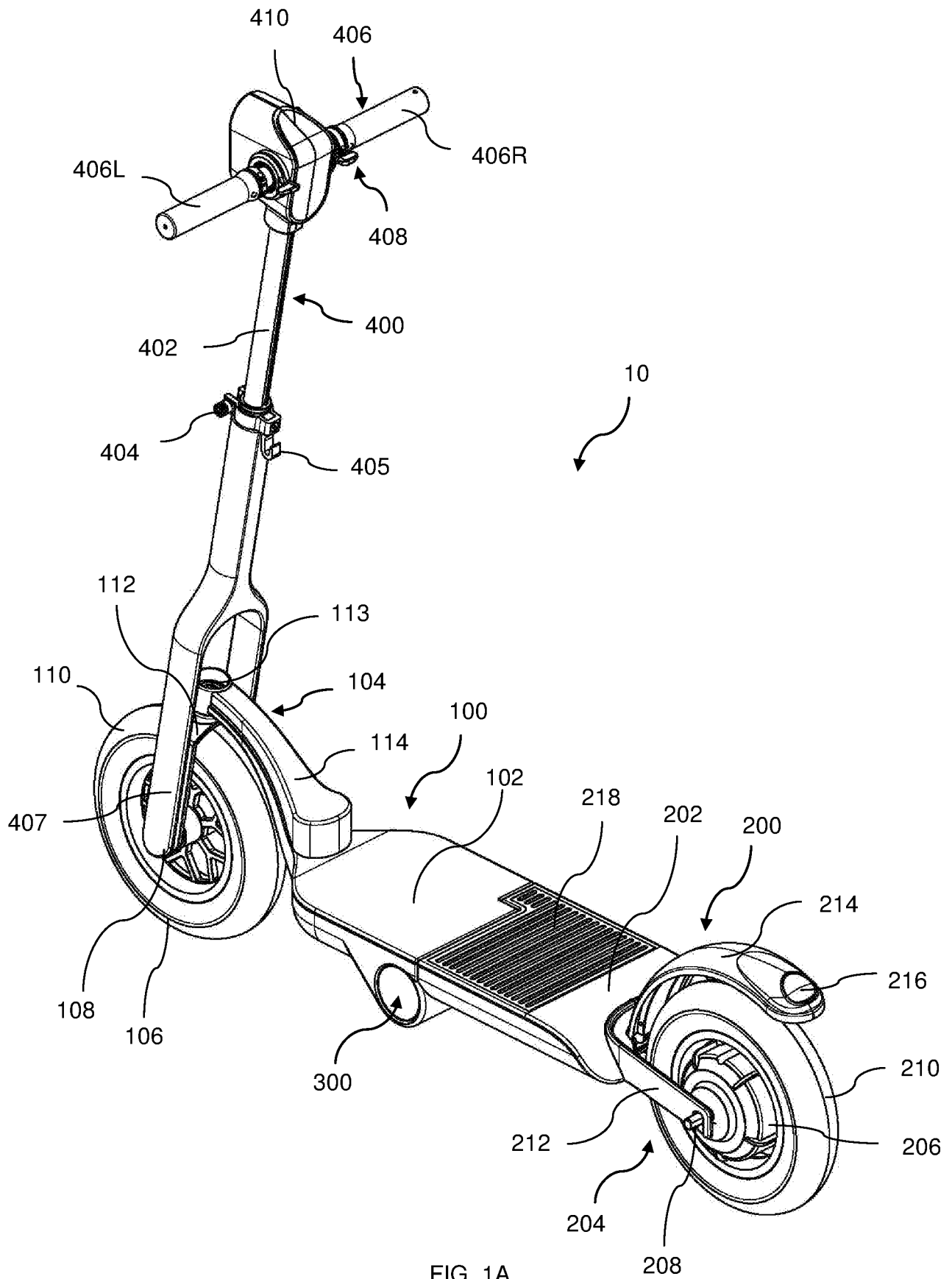
18. The scooter as in claim 17, wherein the lead screw and a threaded hole have predetermined threading parameters, such that the lateral separation of the front wheel and rear wheel with respect to each other is associated with a rotation angle of the front platform and rear platform with respect to each other.

30

19. The scooter as in claim 15, further comprising a motor connected to the rear wheel for driving the rear wheel.

20. The scooter as in claim 19, wherein the motor is activatable to automatically convert the scooter from one to the other of the first and second configurations.

5 21. The scooter as in claims 19 or 20, wherein the motor is activatable to drive the rear wheel with respect to the front wheel, thereby automatically moving the rear wheel axis with respect to the front wheel axis to convert the scooter between the first and second configurations.



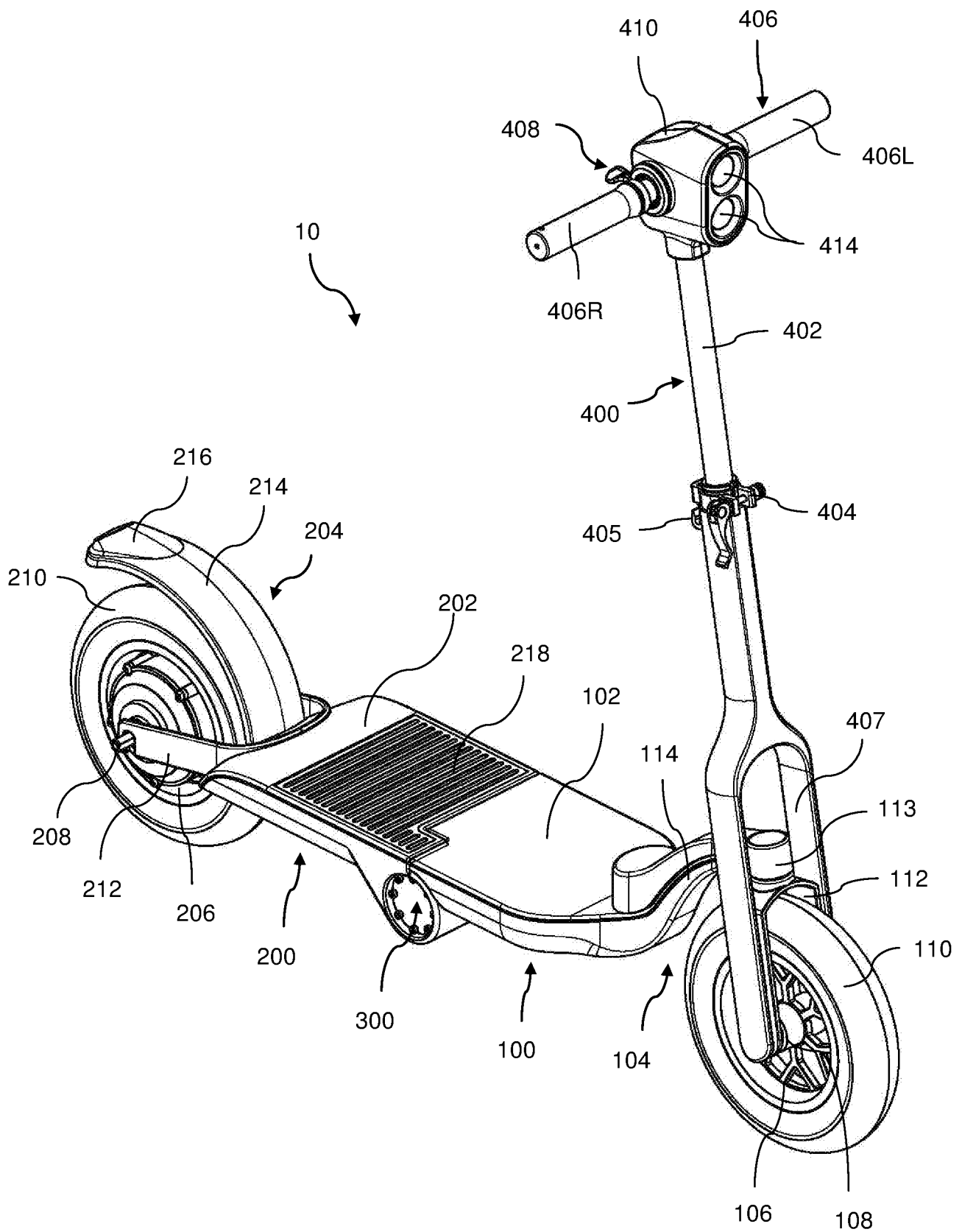


FIG. 1B

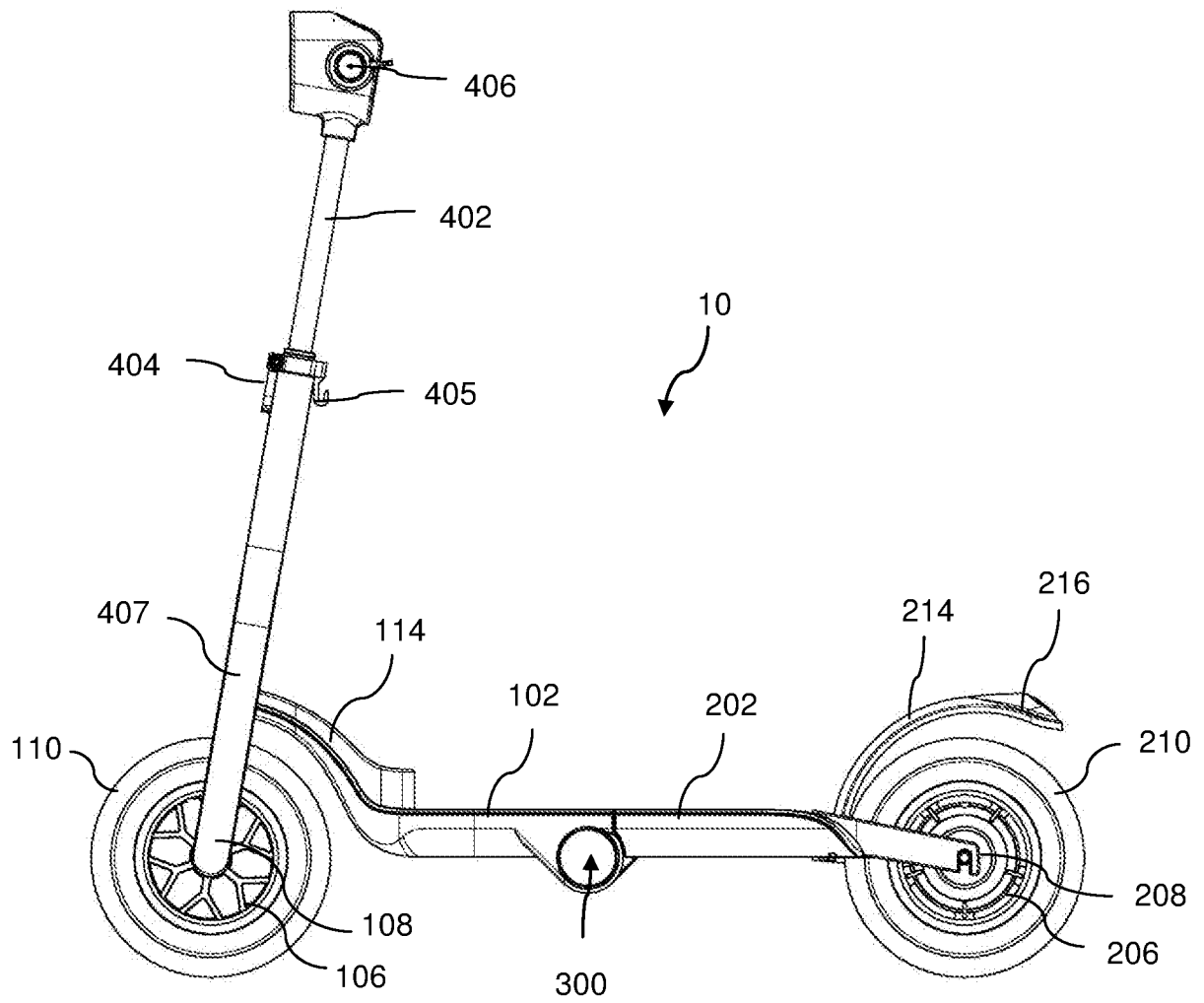


FIG. 1C

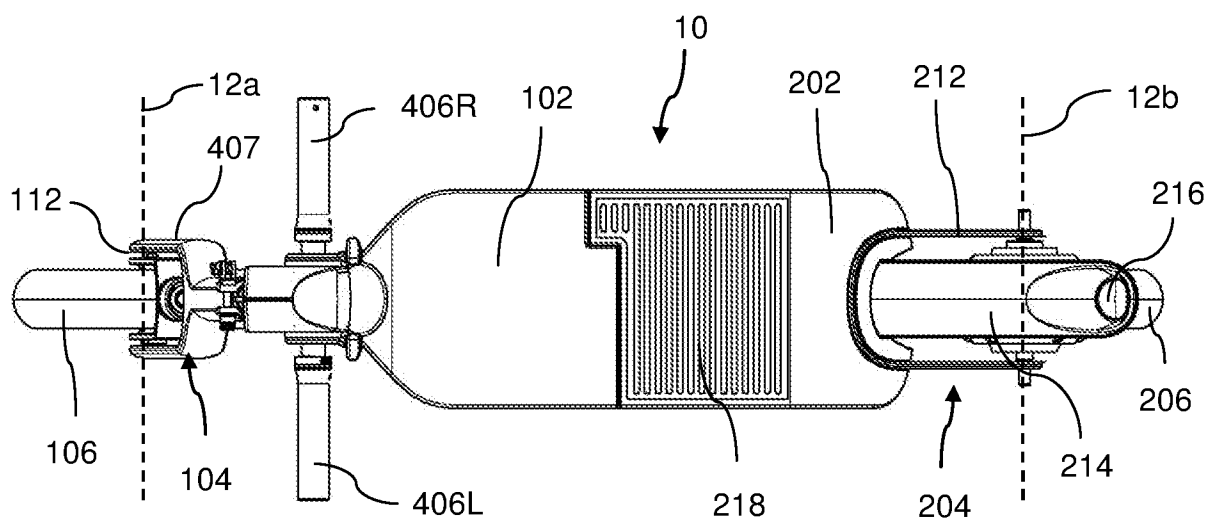


FIG. 1D

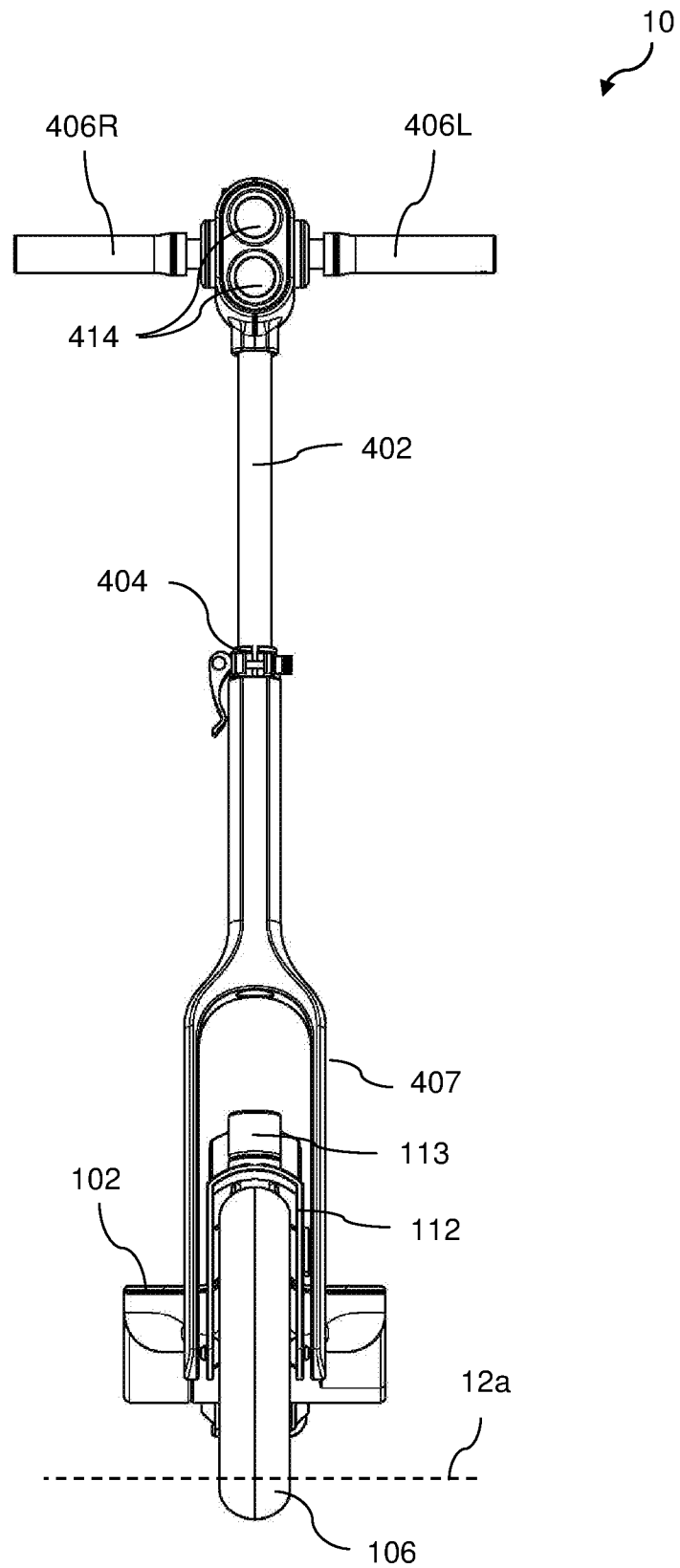


FIG. 1E

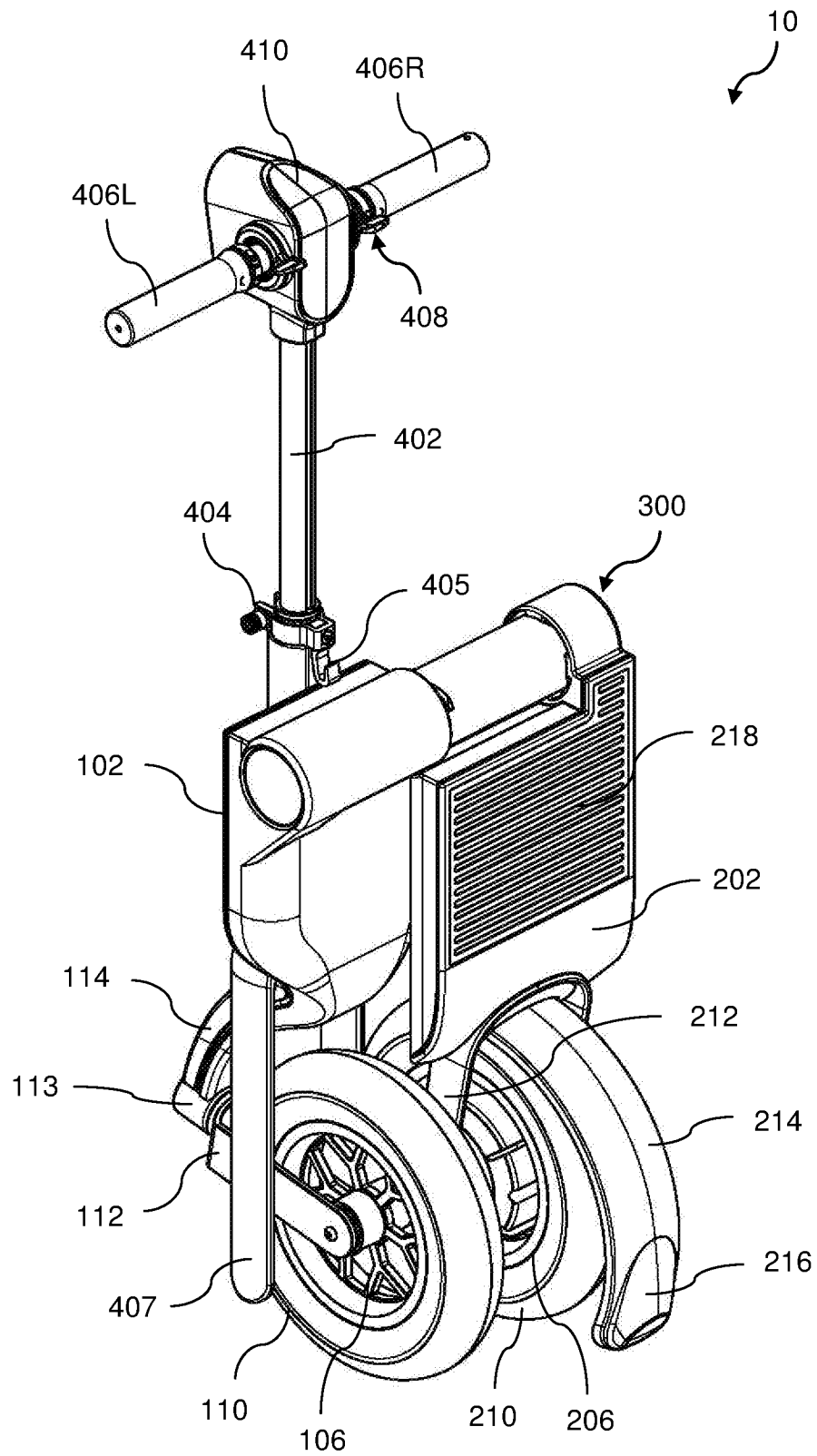


FIG. 2A

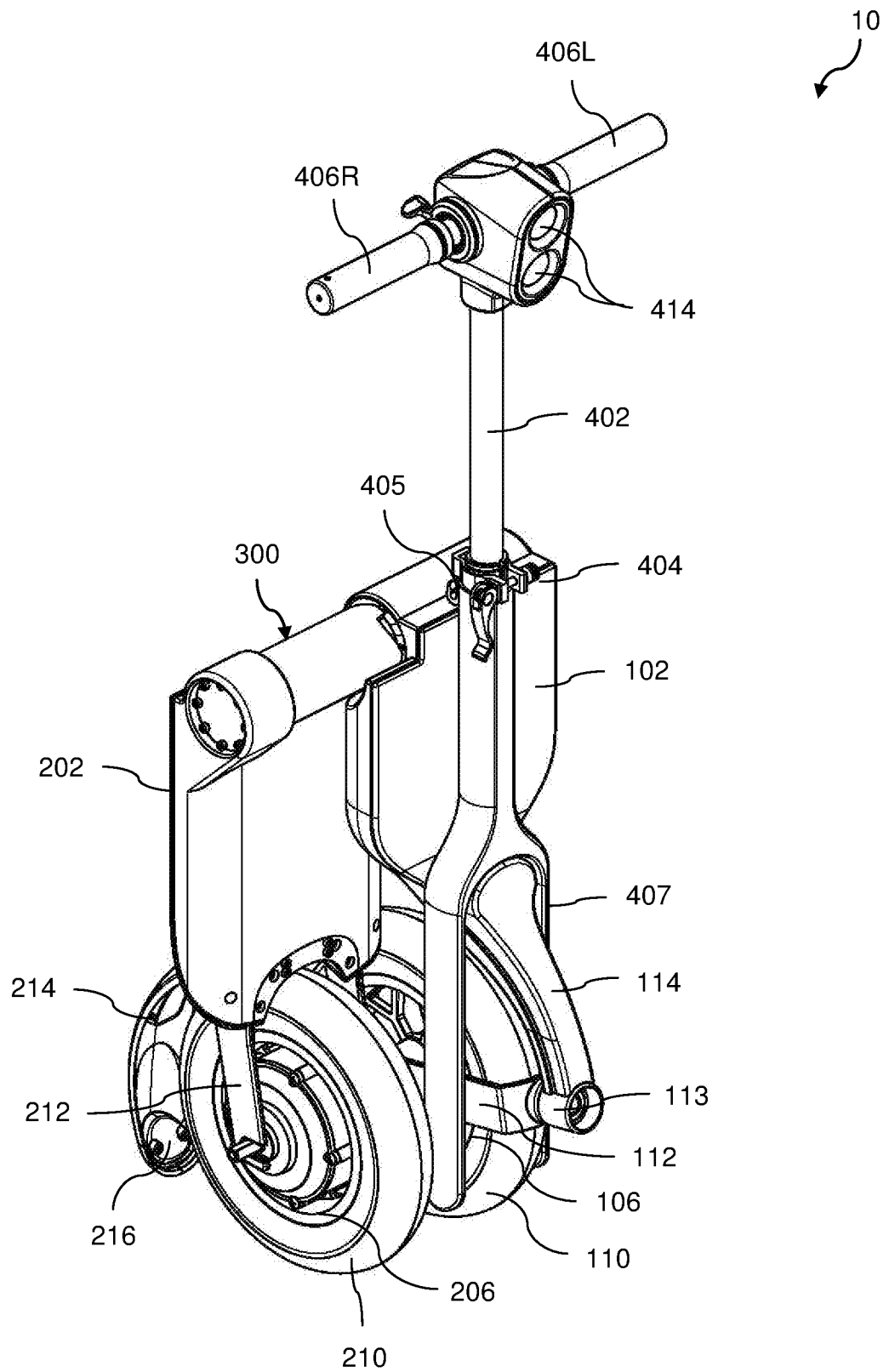


FIG. 2B

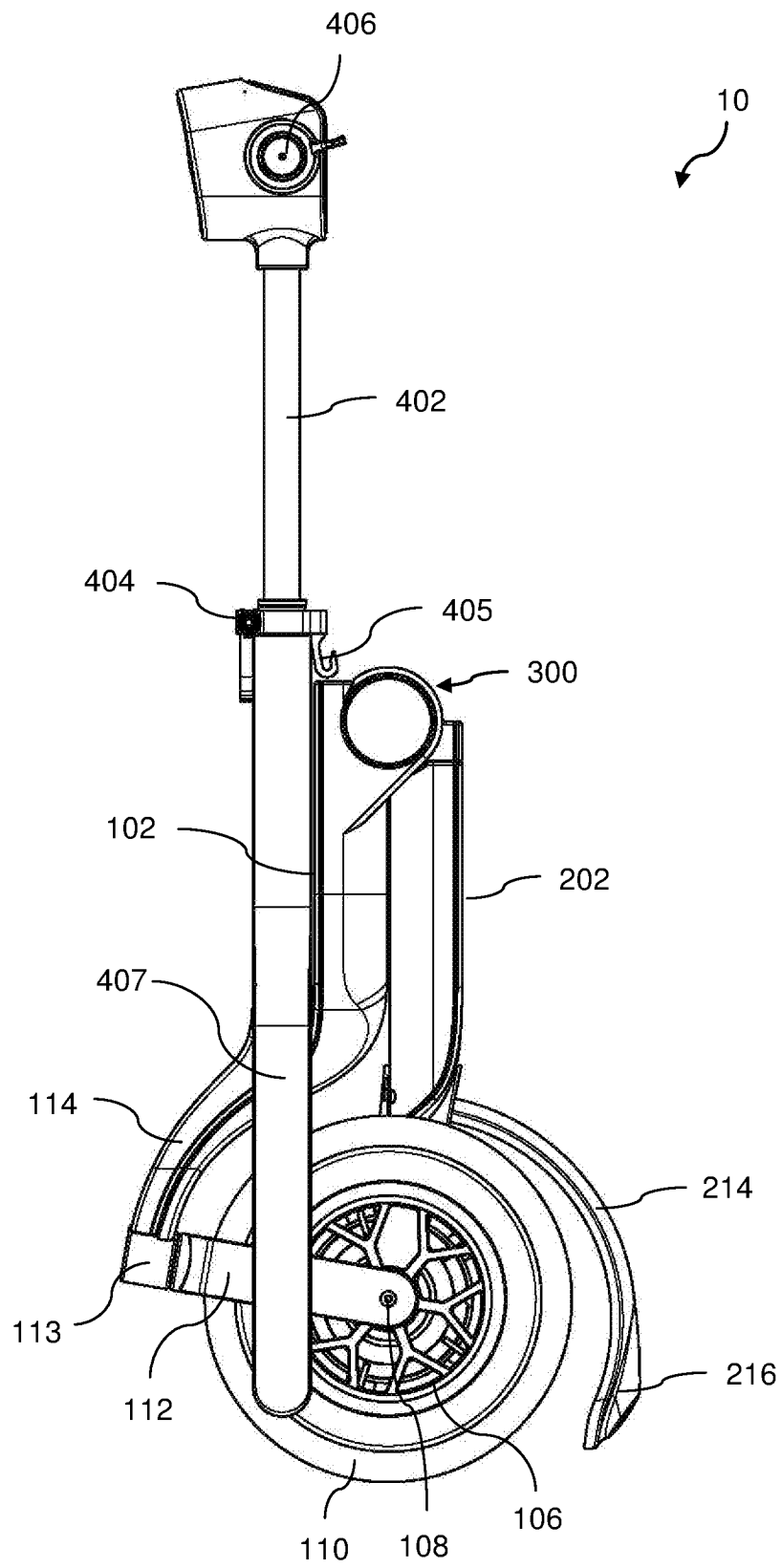


FIG. 2C

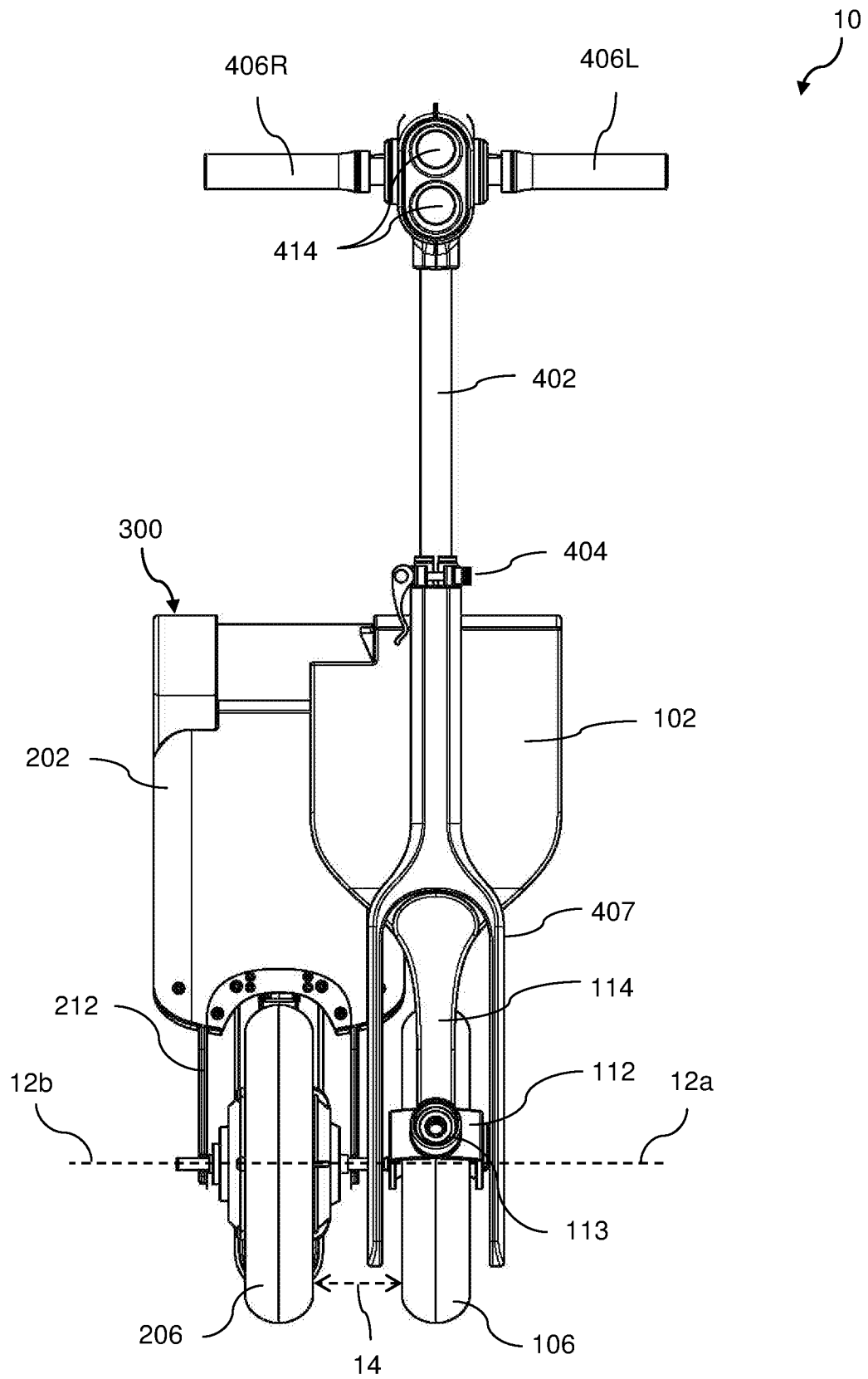


FIG. 2D

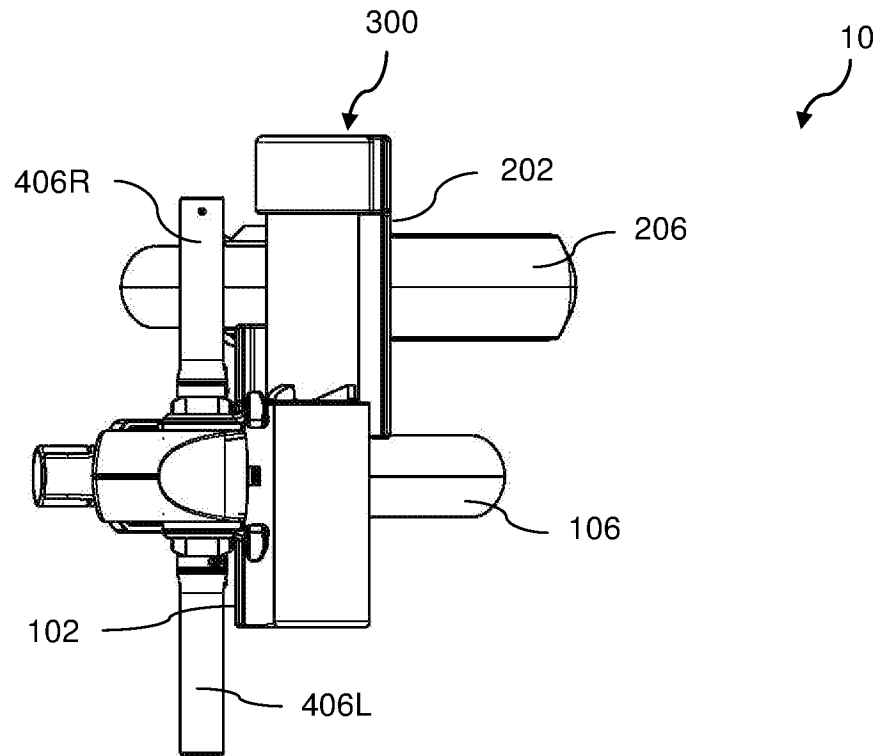


FIG. 2E

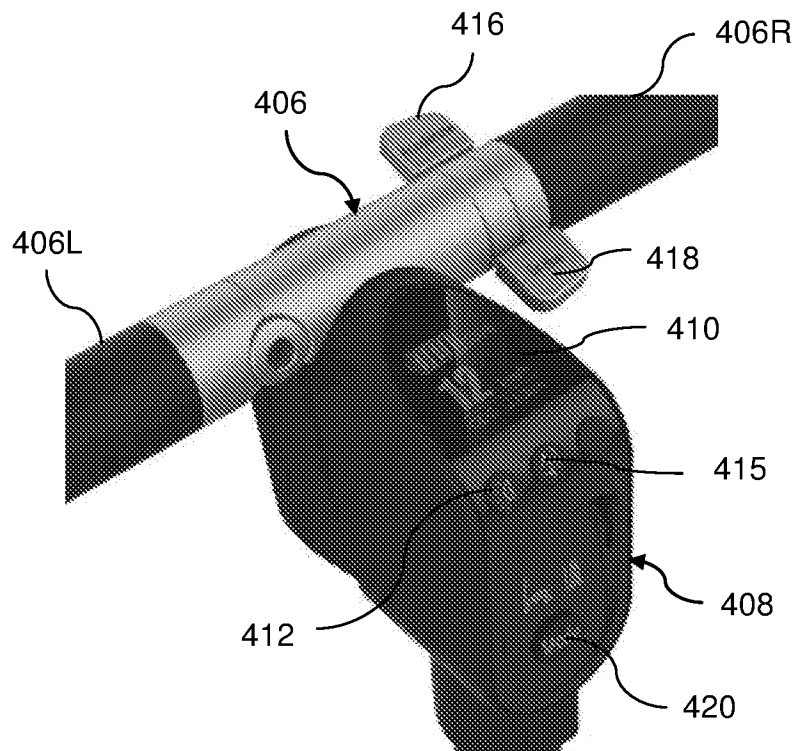


FIG. 3

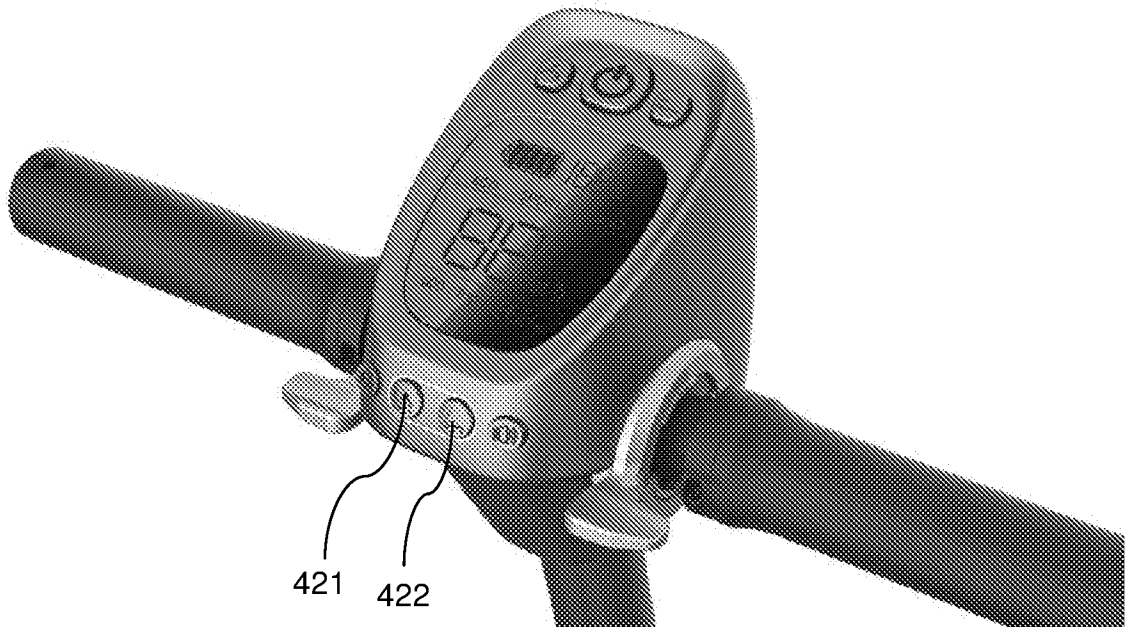


FIG. 3A

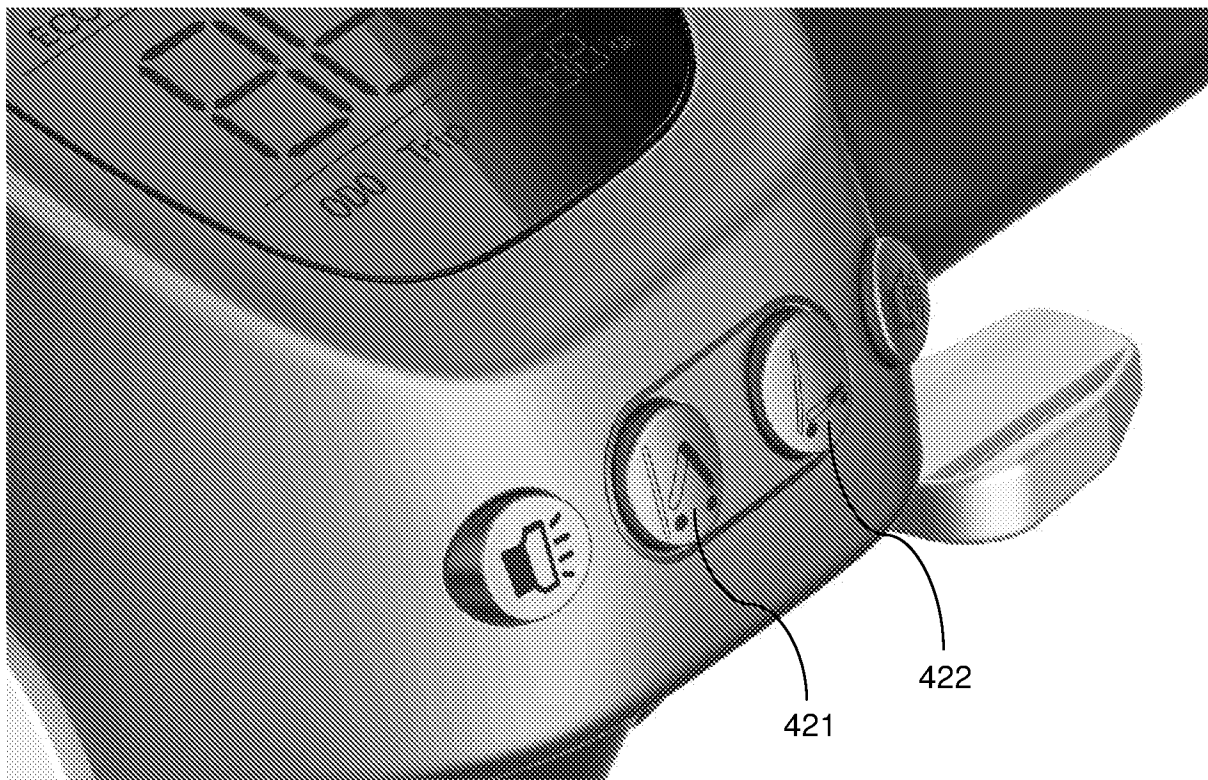


FIG. 3B

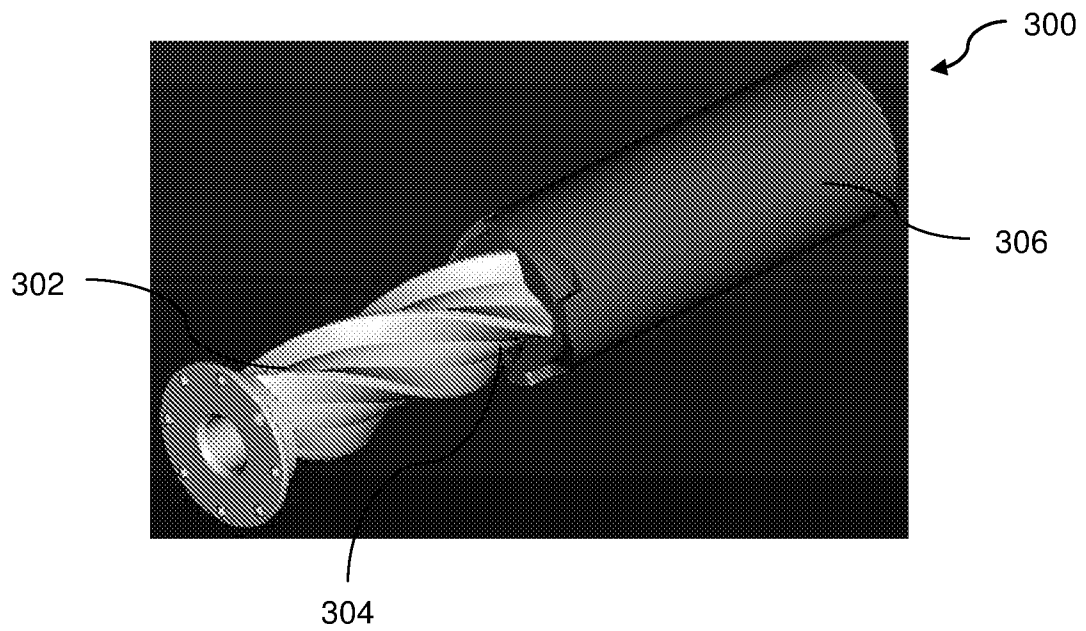


FIG. 4

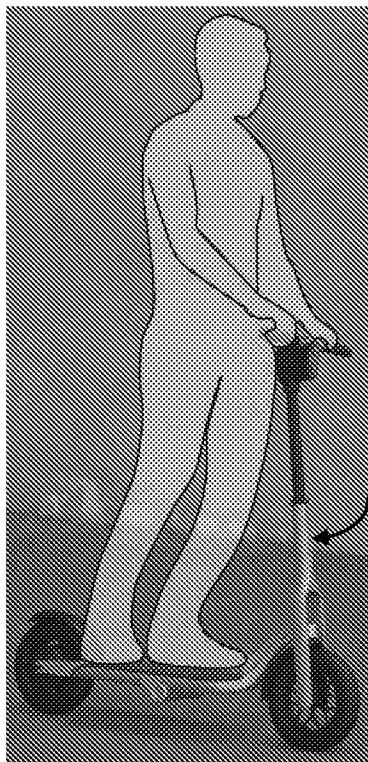


FIG. 5A

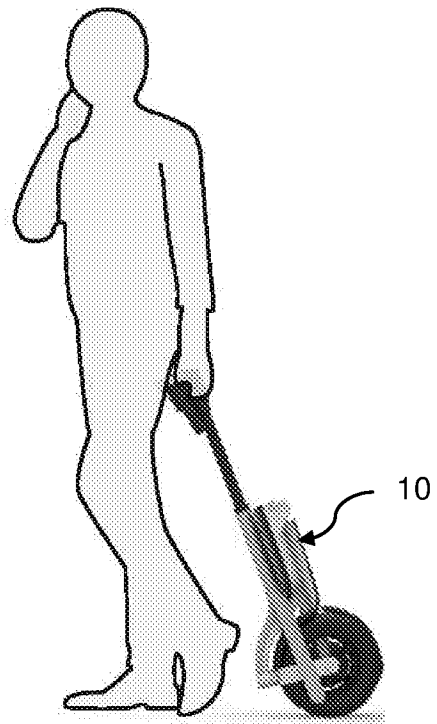


FIG. 5B

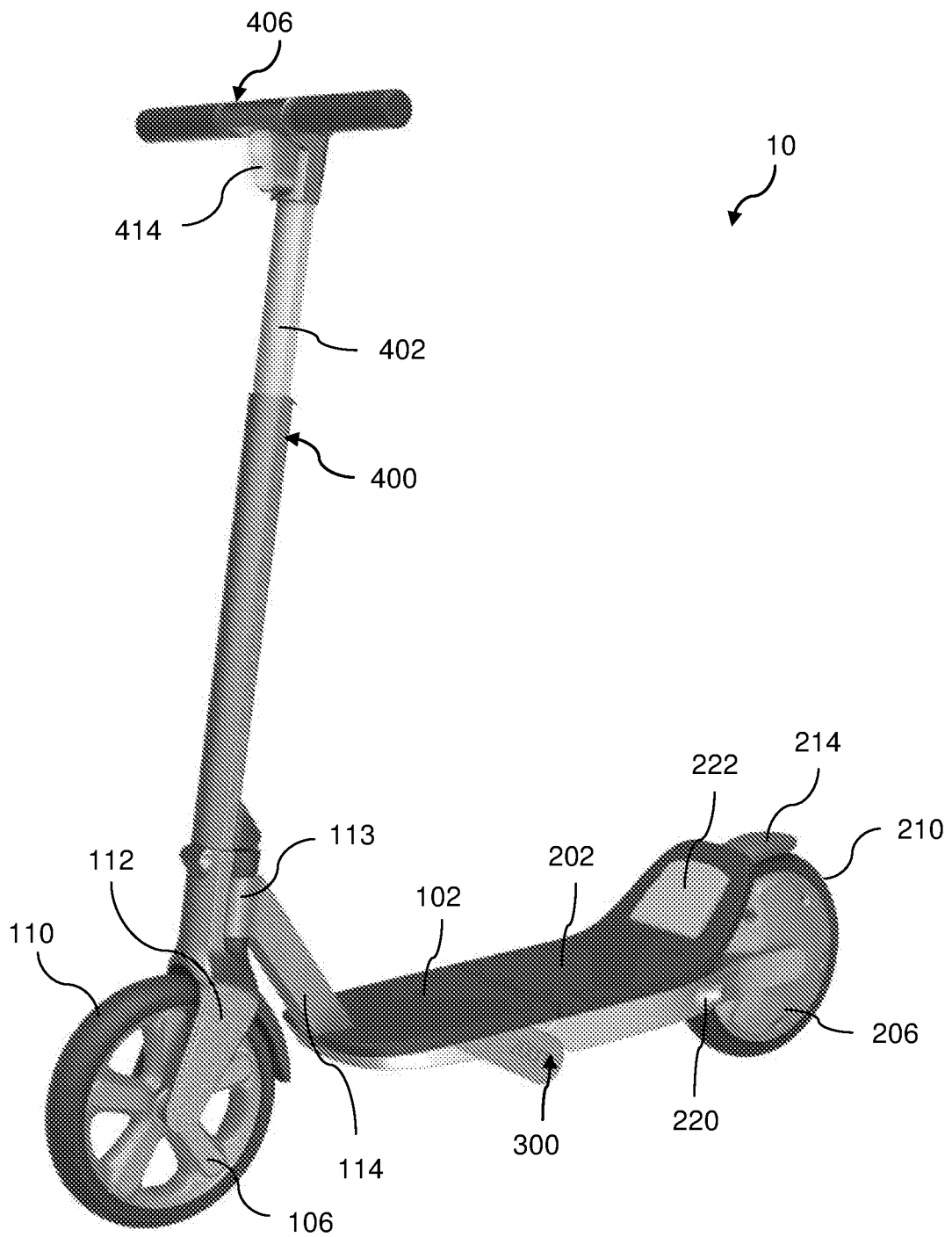


FIG. 6A

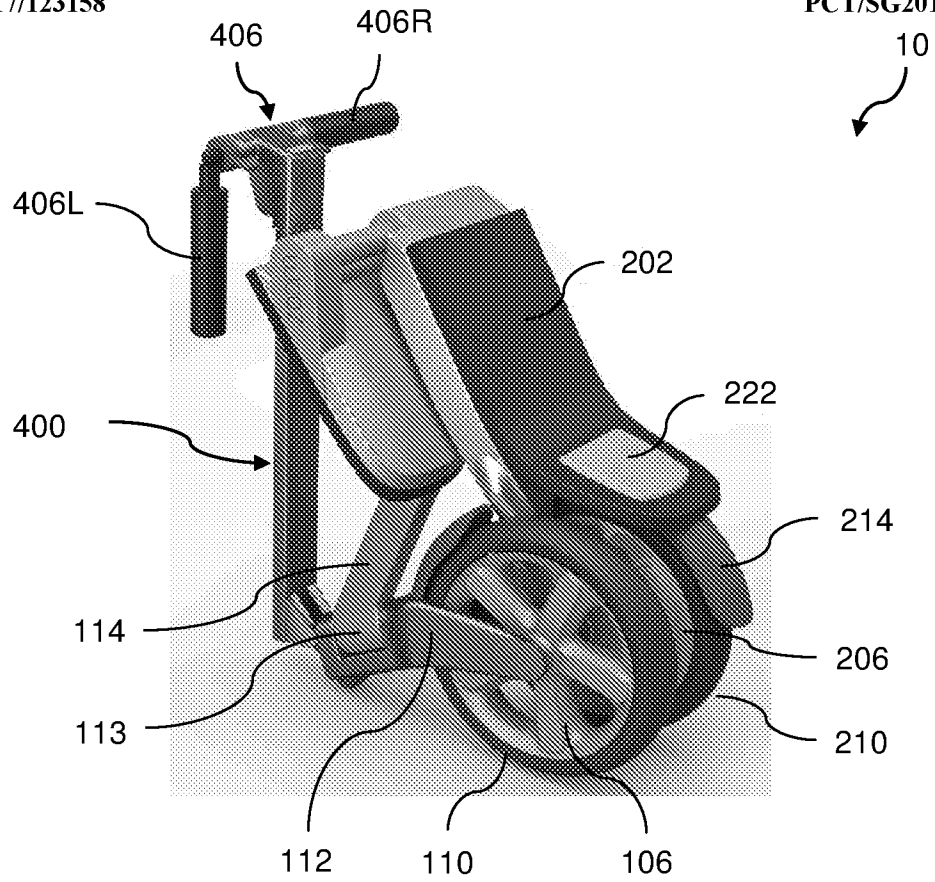


FIG. 6B

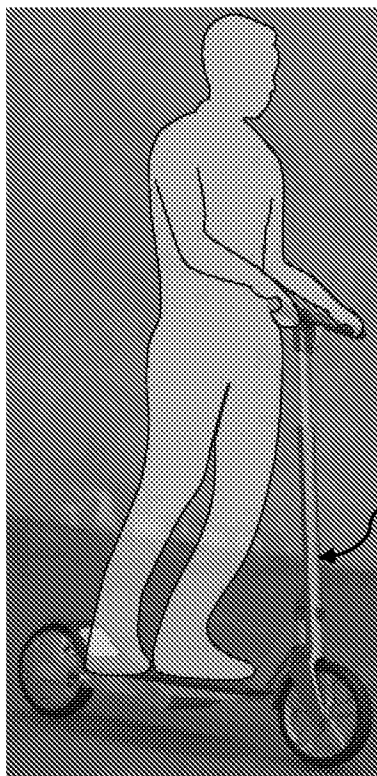


FIG. 7A

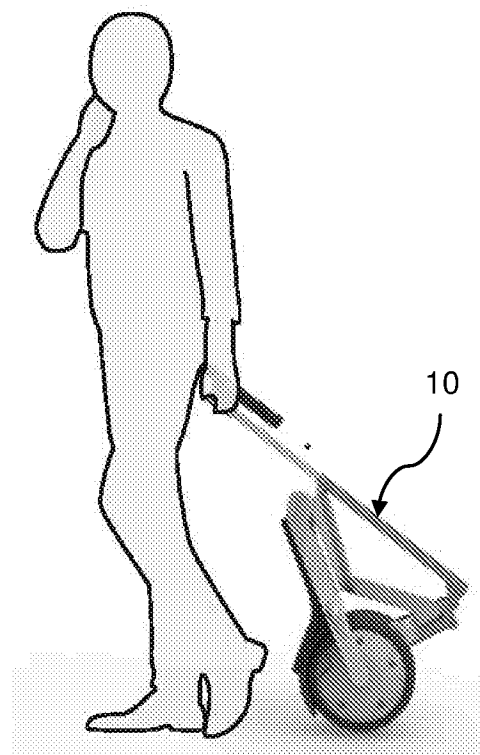


FIG. 7B

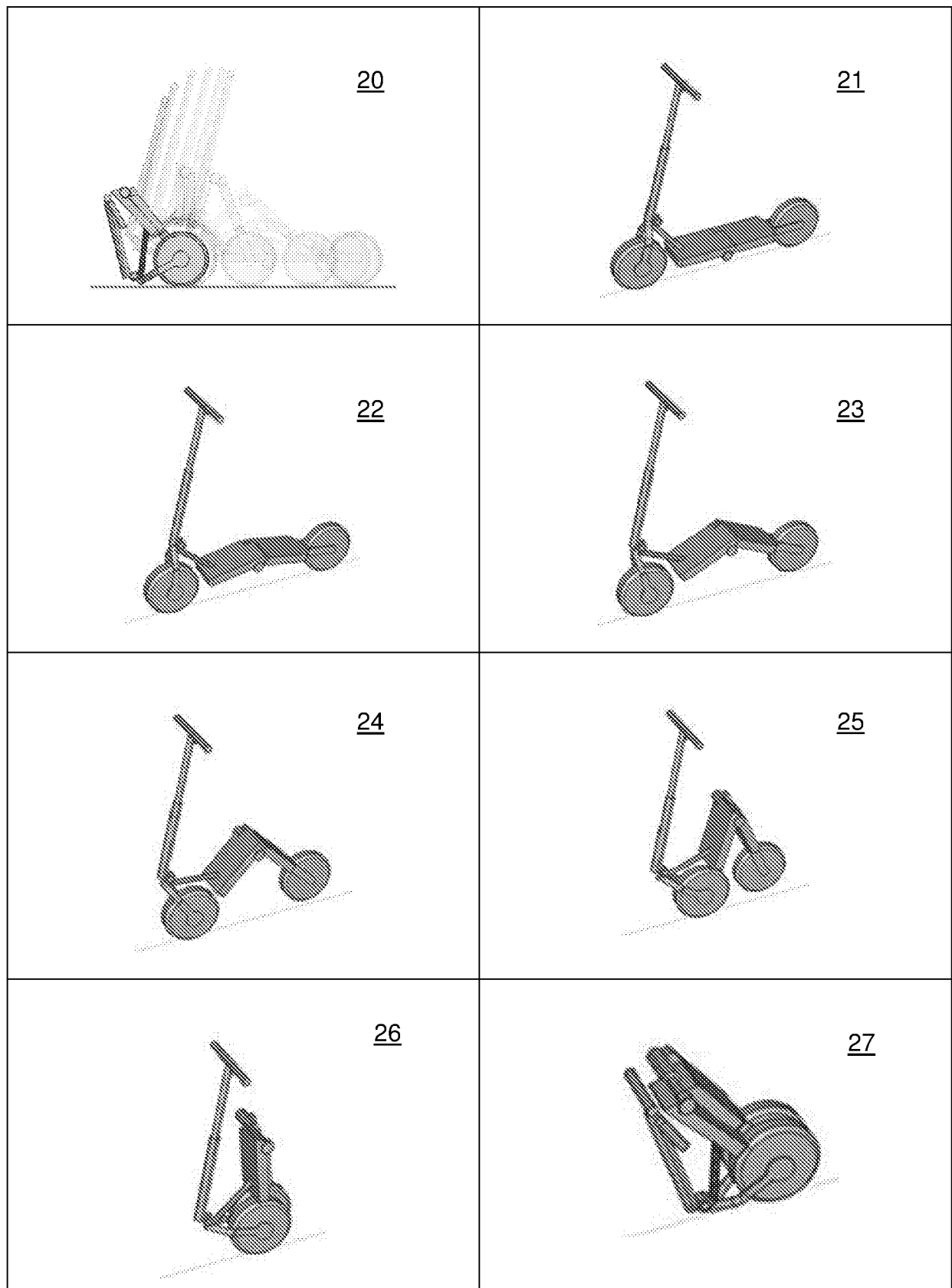


FIG. 8