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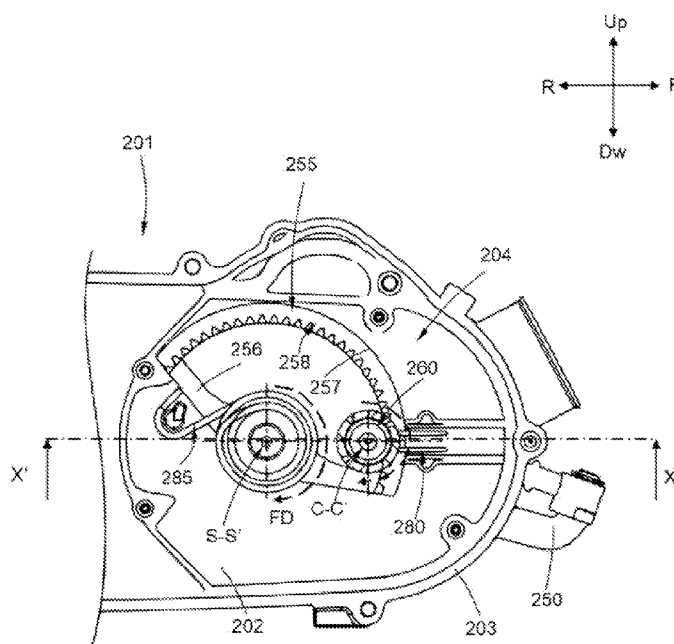


Fig. 3

(57) Abstract: The present subject matter relates to a power unit (200) with a kick-start system (205). The kick-start system (205) comprising a kick-shaft (250) rotatably supported by the power unit (200). A first rotating member (255), and a second rotating member (260) are functionally connected to the kick-shaft (250). The first rotating member (255) functionally connected to the kick-shaft (250) rotates along with the kick-shaft (250). The first rotating member (255) is capable of rotating in a first direction of rotation (FD) during an operation of the kick-shaft (250). The first rotating member (255) causes the second rotating member (260) to rotate in the first direction of rotation (FD) during the operation of said kick-shaft (250) thereby causing cranking of the power unit (200).





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VEHICLE WITH A POWER UNIT AND A KICK-START SYSTEM FOR SAID POWER UNIT

TECHNICAL FIELD

[0001] The present subject matter, in general, relates to a vehicle with a power unit like an internal combustion engine, and, in particular relates to a kick-start system for the vehicle.

BACKGROUND

5 [0002] Generally, vehicle with a power unit comprises with at least two wheels which are used as popular means of transport. In the vehicle with the power unit like an internal combustion (IC) engine, the IC engine is to be cranked for starting the IC engine (interchangeably referred to as 'engine'). Typically, in the vehicle
10 with IC engine acting as one of the power units, a kick-start mechanism is provided to let the user crank the engine for starting it. Also, electric start mechanism may also be provided for cranking the engine with the push of a button by the user, which reduced human effort offering comfort. However, the electric start mechanism requires an auxiliary power source that electrically drives an electric machine,
15 which is crucial for the electric start mechanism. The electric machine can be a starter motor or an integrated starter generator. Thus, the user has option of starting the engine either through the kick-start mechanism or through the electric start mechanism or through a hand operated lever in a three wheeled vehicle.

[0003] However, the kick-start mechanism is crucial for starting the vehicle. For
20 example, the auxiliary power source, like a battery, provided in the vehicle may get drained with insufficient charge for driving the electric machine, whereby the user has to start the vehicle using the kick-start mechanism. Moreover, the vehicle with small capacity engines are, typically, provided with a small capacity auxiliary power source, which tends to drain quickly with time or due to vehicle being in
25 unused condition. Thus, the kick-start mechanism becomes crucial.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The detailed description is described with reference to embodiment of a two wheeled vehicle with the accompanying figures. In the figures, similar numbers are used throughout the drawings to reference like features and components.

[0005] Fig. 1 depicts a left side view of an exemplary motor vehicle, in accordance with an embodiment of the present subject matter.

[0006] Fig. 2 illustrates a left-side view of the power unit with selected parts, in accordance with an embodiment of the present subject matter.

5 [0007] Fig. 3 depicts an inner lateral side view of first cover of the power unit supporting a kick-start system, in accordance with an embodiment of the present subject matter.

[0008] Fig. 4 depicts a sectional view of the first cover, taken along axis X-X', in accordance with an embodiment of the present subject matter.

10 [0009] Fig. 5 depicts a detailed perspective view of selected parts of the kick-start system, in accordance with an embodiment of the present subject matter.

[00010] Fig. 6 (a) depicts a top view of a first rotating member, in accordance with an embodiment of the present subject matter.

15 [00011] Fig. 6 (b) depicts a perspective view of a first rotating member, in accordance with an embodiment of the present subject matter.

[00012] Fig. 7 depicts another left side view of motor vehicle, in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

20 [00013] Generally, in some vehicle with the power units having the engine fixedly mounted to the frame between the front wheel and the rear wheel, wherein the engine is closer to the at least one front wheel when compared to the at least one rear wheel of the vehicle. However, in the aforementioned vehicles, as the engine is disposed near the front wheel, which is substantially ahead of the rider seat, the rider can access the kick-start lever while sitting on the vehicle which enables
25 him/her to kick-start the vehicle with ease.

[00014] Moreover, in some vehicle with the engine disposed either fixedly mounted to the frame or swingable mounted to the vehicle, the engine is disposed closer to at least one rear wheel of the vehicle when compared to at least one front wheel of the vehicle. In such vehicles, the engine is disposed substantially below a
30 seat assembly of the vehicle. The user can start the vehicle by using the kick-start mechanism. In the art, the aforementioned vehicles with the engine disposed closer

to the at least one rear wheel, the engine has to be put on main-stand to kick-start the engine. This would require the user to get down from the vehicle, put the vehicle on main-stand (as the main-stand may obstruct the pivotal motion of the kick-start lever), and then perform the kick-start operation, which cumbersome for the user.

- 5 Some solutions are proposed in the art that enable the user to kick-start the vehicle while sitting on the vehicle, which would reduce the effort by the user to get down from the vehicle and to put the vehicle on stand.

[00015] However, in vehicles with the engine disposed closer to at least one rear wheel of the vehicle, the kick-start posture is relatively challenging (when
10 compared to the posture in a vehicle having the engine closer to the at least one front wheel) as the user has to extend his/her foot rearward to access the kick-start lever and perform the kick-start operation. Thus, user may have to put effort for starting the vehicle, which may cause imbalance in lateral direction due to exertion of force towards one side. For example, considering a vehicle with a step-through
15 portion, the kick-start lever is disposed towards left side of vehicle. If the user desires to start the vehicle, he has to extend his/her left foot rearward towards the kick-start lever and exert force downward. As the engine components of the engine are at high inertia, the user may have to exert force on the kick-start lever. This may cause the vehicle to tilt towards the left side, causing imbalance and may result in
20 vehicle completely falling to the side. Moreover, in some vehicles with the engine disposed closer to at least one rear wheel, the transmission system like a continuously variable transmission (CVT) is disposed at lateral off-set from lateral center of the vehicle and the kick-start mechanism is disposed near the CVT. Thus, the vehicles have substantial weight towards the lateral side of the engine which
25 may cause imbalance if the user tries to kick-start the engine due to excessive force.

[00016] Moreover, the conventional kick-start system uses plurality of gears which would require substantial distance between the input gear and the output gear of the kick-start system which would require substantial space towards lateral side of the IC engine. Moreover, vehicles having a continuously variable transmission (CVT)
30 engine have a drive-pulley, driven-pulley, belt drive and other gears that require space and are to be accommodated in proximity to the kick-start system, which

makes the IC engine tightly packed all the rotating components. The assembly and servicing of such systems is complex as multiple parts are to be accessed. Moreover, presence of multiple components adds weight towards one lateral side of the vehicle, especially towards the side that accommodates the CVT. This further adds
5 to the imbalance that is caused during kick-start by the user in a seated condition on the vehicle.

[00017] Thus, there is need for an IC engine with a kick-start mechanism that is compact and easy operated. Further, the kick-start system should enable starting of the IC engine with minimal effort from the user irrespective of the disposition of
10 the engine in the vehicle. Further, the user should be capable of operating the kick-start mechanism even in a seated condition.

[00018] Hence, the present subject matter provides a vehicle with an IC engine having a kick-start system, which is easy to operate even in a seated condition by the user.

15 [00019] It is a feature of the present subject matter that the present subject matter provides a kick-start system that is supported on a first cover, which can crankcase cover, in accordance with one embodiment.

[00020] In one embodiment, the kick-start system includes a kick-shaft, a first rotating member, and a second rotating member that are supported on the first
20 cover. The first rotating member is functionally connected to the kick-shaft, wherein the first rotating member rotates along with the kick-shaft. In a preferred embodiment, the kick-shaft extends in a frontward direction from the pivot point thereof.

[00021] In one embodiment, the first rotating member is capable of rotating in a
25 first direction of rotation during an operation of the kick-shaft by the user, which is clock-wise direction when seen lateral side of the vehicle [the lateral side on which the kick-shaft is disposed]. It is a feature of the present subject matter, that the first rotating member causes the second rotating member to also rotate in the first direction of rotation. The second rotating member is adapted to selectively engage
30 with a crankshaft of the engine for performing cranking operation.

[00022] In the one embodiment, the first rotating member is an inner gear, and the second rotating member is an outer gear. The term 'inner gear' refers to a gear having plurality of teeth being provided radially inward on a peripheral portion thereof and the term 'outer gear' refers to a gear having plurality of teeth being provided on a radially outward direction of a peripheral portion thereof. The first rotating member can be a partial gear structure, which is arc shaped.

[00023] In one embodiment, the first rotating member includes an arm portion and a peripheral portion. The arm portion may be formed by two arms which are extending radially from a pivot axis and are being disposed at a predetermined angle with respect to each other. Further, the peripheral portion, which can be an arc shaped structure [in one embodiment], is connected between the arms of the arm portion. Further, the peripheral portion includes plurality of teeth disposed inward of the peripheral portion. In one embodiment, the plurality of teeth is disposed at an angle with respect to the axis, for example forming a helical gear. Correspondingly, the second rotating member is provided with plurality of teeth that are provided to engage with the plurality of teeth of the first rotating member.

[00024] It is a feature that, in one embodiment, the second rotating member is additionally having an axis [axis of rotation] within the periphery of the first rotating member. Thus, the two gears are compactly packaged within the axes [axes of rotation] disposed in proximity.

[00025] It is a feature that, in one embodiment, the first rotating member is a larger gear [having larger diameter] but having weight less than a larger gear used in a conventional kick-start system. Thus, the kick-start system in spite of being disposed on one lateral side of the power unit, it takes up less space and adds small weight towards the lateral side of the power unit. Further, in one embodiment, a ratio of diameter of first rotating member to a diameter of the second rotating member to be in the range of 3 to 5 so as to comfortably accommodate the second rotating member within the periphery of the first rotating member.

[00026] In one embodiment, in a non-actuated condition of the kick-shaft, the second rotating member is disposed at a first end portion of the peripheral portion. The first end portion of the peripheral portion is a leading portion thereof with

respect to first direction of rotation thereof. The peripheral portion rotating in the first direction of rotation causes the second rotating member to rotate in the first direction of rotation and subsequently axially engage with the crankshaft and cause the cranking of the power unit.

5 [00027] In one embodiment, the first rotating member is having the peripheral portion disposed at an axial off-set from the arm portion. A coil spring is wound about the axis of the first rotating member which can be accommodated at space formed due to the offset thereby retaining without any interference with sub-arms.

[00028] In one embodiment, the axial off-set of the peripheral portion of the first
10 rotating member reduces/eliminates any interference of the arm portion with the other ancillary components.

[00029] Further, the first rotating member with the off-set provided for the peripheral portion offers manufacturing feasibility as the offset provides relief for forming the teeth by cutting or honing. For example, a rotating machine or fixed
15 machine can access the radial inner periphery of the peripheral portion without getting blocked by the arm portion as the arm portion is disposed in different plane.

[00030] Further, the present subject matter enables the kick-shaft to be disposed in a forward direction to enable the user to kick-start the vehicle in a non-actuated condition of the main-stand. Thus, the user, in order perform kick-start operation in
20 one or more circumstances, can perform the kick-start operation without getting off the vehicle or even when got off vehicle, the need for putting the vehicle on main-stand is eliminated.

[00031] Thus, the present invention provides a unidirectional torque transfer mechanism comprising a force application member, which is like a kick-shaft. The
25 first rotating member is functionally connected to the force application member. The first rotating member is capable of rotating in a first direction of rotation during an operation of the force application member. The operation of the force application member can be done by manual or mechanical application of force. The first rotating member causes the second rotating member to rotate in the first direction
30 of rotation during the operation of the force application member, whereby torque transfer occurs in same direction.

[00032] These and other advantages of the present subject matter would be described in greater detail in conjunction with one or more embodiments and corresponding figures in the following description.

[00033] Fig. 1 depicts a left side view of an exemplary motor vehicle 100, in accordance with an embodiment of the present subject matter. The motor vehicle 100 includes a frame member 105 represented schematically by dotted lines comprising a head tube 106, a down tube 107 extending rearwardly downward from the head tube 106, and one or more rear tubes 110 extending inclinedly rearward from a rear portion of the down tube 107. In the depicted embodiment, the frame member 105 defines a step-through portion 151. In one embodiment, the down tube may be adapted to extend rearward and subsequently downward defining a space below the down tube supporting a front wheel 130 and a rear wheel 133. The front wheel 130 and the rear wheel 133 are rotatably supported by front suspension system 131 and the rear suspension system 134, respectively. In one embodiment, the rear wheel 133 may be additionally supported by a swingarm.

[00034] In the present embodiment, a power unit 200 is swingably connected to the frame member 105 and is disposed substantially below a seat assembly 155 and rearward to a step-through portion 151. The power unit 200 includes a transmission system (not shown) for transferring power to the rear wheel 133, wherein the transmission may include a continuously variable transmission.

[00035] Further, a control device like a carburetor or a throttle body with fuel injection system or the like (not shown) supplies air-fuel mixture to the power unit 200. Further, the front wheel 130 is pivotally supported by the frame member 105 and a handle bar assembly 150 is functionally connected to the front wheel 130 for maneuvering the vehicle 100. The handle bar assembly 150 supports an instrument cluster, vehicle controls including throttle, clutch, or electrical switches.

[00036] Further, the seat assembly 155 is mounted to the frame member and the rider can operate the vehicle 100 in a seated position on the seat assembly 155. Moreover, the vehicle 100 includes the step-through portion 151 formed between the handle bar assembly 150 and the seat assembly 155.

[00037] Further, the vehicle 100 includes a front fender 160 covering at least a portion of the front wheel 130 and a rear fender 165 covering at least a portion of the rear wheel 133. Also, the vehicle 100 is provided with plurality of panels 170A, 170B, 170C mounted to the frame member 105 and covering the frame member
5 105 and/or parts of the vehicle 100. The plurality of panels includes a front panel 170A and a leg-shield 170B covering a head tube 106 of the frame member 105 in forward and rearward direction respectively. Further, a rear panel assembly 170C is disposed substantially below the seat assembly 155 covering substantially a utility box (not shown) disposed below the seat assembly 155 and also, covering at
10 least a portion of the power unit 200. In one embodiment, the vehicle 100 includes a main-stand 145 that is supported by the power unit 200, wherein the main-stand in a non-engaged condition at least partially extends in a rearward direction.

[00038] The power unit 200 includes a kick-start system 205 for cranking the power unit 200 manually. Further, the vehicle may include an electric start system (not
15 shown) that is capable of cranking the power unit 200 by touch/press of a button.

[00039] Fig. 2 illustrates a left-side view of the power unit 200, in accordance with an embodiment of the present subject matter. The power unit 200 includes a crankcase cylinder head 206, and a cylinder block 207. The cylinder head 206 is mounted to the cylinder block 207 and the cylinder block 207 is supported by the
20 crankcase 208. The crankcase 208 may be formed by two or more parts. In one embodiment, the crankcase 208 includes a right-side member (not shown) and a left side member 209. In the depicted embodiment, the left side member 209 is elongated in longitudinal direction of the vehicle 100, when compared to the right-side member. An air control apparatus 210 is connected to the cylinder head 206,
25 at an intake port (not shown). Further, an exhaust system (not shown) would also be connected to the cylinder head 206 for scavenging exhaust gases from the power unit 200.

[00040] The cylinder block 207 and the cylinder head 206 define a cylinder portion and a piston 211 is slidable within the cylinder portion. Further, the piston 211 is
30 functionally connected to a connecting rod 212, wherein one end of the connecting rod 212 is connected to the piston 211 and other end of the connecting rod 212 is

connected to a crankshaft 213. The crankshaft 213 is rotatably supported by the crankcase 208. A first cover 201 (as shown in Fig. 1) is mounted to the crankcase 208 covering the transmission system 214.

[00041] In the present embodiment, on one lateral side of the crankcase 208, which is left side on the present embodiment, the transmission system 214 is accommodated. The transmission system 214, in the present embodiment, is a continuously variably transmission system having a drive pulley 215 and driven pulley 216 that are connected to a belt 217. One end 225 of the crankshaft 213 is connected to the drive pulley 215 of the transmission system 214. The power unit 200 includes electric starter 220 system, which engages with the drive pulley 215 through a Bendix gear system 221. The drive pulley 215 is provided with a gear 218 that engages with the Bendix gear system 221.

[00042] The kick-start system 205 is supported on the first cover 201 (as shown in Fig. 1). However, in Fig. 2, the first cover 201 is not shown for illustrating the engagement of the kick-start system 205 with the crankshaft 213. Fig. 3 depicts an inner lateral side view of the first cover 201 supporting the kick-start system 205.

[00043] The kick-start system 205 includes a kick-shaft 250 rotatably supported by the first cover 201 of the power unit. A first rotating member 255, and a second rotating member 260 are functionally connected to the crankshaft 213. Specifically, the first rotating member 255 is functionally connected to the kick-shaft 250. The first rotating member 255 is capable of rotating in a first direction of rotation FD during an operation of the kick-shaft 250 by the user. The first rotating member 255 causes the second rotating member 260 to rotate in the first direction of rotation during the operation of the kick-shaft 250.

[00044] In the present embodiment, the first direction of rotation FD is clockwise, when viewed from inner lateral side and the first direction of rotation FD is anti-clockwise when viewed from outer lateral side of the first cover 201. In one embodiment, the first rotating member 255 is an internal gear, and the second rotating member 260 is an outer gear. The term 'internal gear' refers to a gear having plurality of teeth being provided radially inward on a peripheral portion

thereof and the term 'outer gear' refers to a gear having plurality of teeth being provided on a radially outward of a peripheral portion thereof.

[00045] As shown in Fig. 3, the first rotating member 255 is supported by the first cover 201 and is rotatable about the first axis S-S', which is also the axis of rotation of the kick-shaft 250. The first cover 201 includes a side wall 202 and a peripheral wall 203, wherein the first rotating member 255 is supported on the side wall 202. The peripheral wall 203 abuts with the crankcase 208. Similarly, the second rotating member 260 is also supported by the side wall 202 of the first cover 201, wherein the second rotating member 260 is rotatable about an axis of rotation C-C', which is also the axis of rotation [also referred to as crankshaft axis] of the crankshaft 213. Fig. 4 depicts a sectional view of the first cover 201, taken along axis X-X' in accordance with an embodiment of the present subject matter. The first cover 201 defines a region 204 which is used for accommodating the first rotating member 255, the second rotating member 260 and other additional parts of the kick-start system. In one embodiment, a local cover (not shown) is provided to cover the kick-start system.

[00046] The present invention provides a unidirectional torque transfer mechanism comprising a force application member, which is like the kick-shaft 250. The first rotating member 255 is functionally connected to the force application member 250. The first rotating member 255 is capable of rotating in a first direction of rotation FD during an operation of the force application member. The operation of the force application member can be done by manual or mechanical application of force. The first rotating member 255 causes the second rotating member 260 to rotate in the first direction of rotation FD during the operation of the force application member 250, whereby torque transfer occurs in same direction.

[00047] As shown in Fig. 4, the first rotating member 255 is supported by a first shaft 270, which extends to either sides of the side wall 202. The outward end, which is outward side of the side wall 202, of the first shaft 270, the kick-shaft 250 is connected. An inward end of the first shaft 270, the first rotating member 255 is supported. Further, one end 251 of the kick-shaft 250 is connected to the first shaft 270 and another end 252 of the kick-shaft 250 is provided with an ancillary lever

that can be opened and retracted for kick-starting. The second rotating member 260 is mounted to a second shaft 275, which accommodates the second rotating member 260 inward of the first cover 201.

[00048] Referring to Fig. 3, and Fig. 4, the first rotating member 255 includes an arm portion 256 and a peripheral portion 257. The arm portion 256 may be formed by two arms which are extending radially and are being disposed at angle with respect to each other. Further, the peripheral portion 257 is connected to the arm portion 256, wherein the peripheral portion 257 is arc shaped. Further, the peripheral portion 257 includes plurality teeth 258 disposed inward of the peripheral portion 257. In one embodiment, the plurality of teeth 258 are disposed at predetermined angle. The second rotating member 260 is disposed to have the axis of rotation C-C' inward of the portion defined by the first rotating member 255, wherein the second rotating member 260 is provided with a plurality of teeth 261 that are provided radially outward. The second rotating member 260 is disposed to engage with the plurality of teeth 258 of the first rotating member 255. In one embodiment, the second rotating member 260 has the plurality of teeth 261 disposed at a predetermined angle such that plurality of teeth conforms and engage with the plurality of teeth 258 provided on the first rotating member 255. The second rotating member 260 includes a first engaging means 262, which is provided on the inward axial side thereof, wherein the first engaging means 262 is capable of engaging with a second engaging means 240 of the crankshaft 213.

[00049] In one embodiment as shown in Fig. 3, the kick-start system 205 includes a resisting means 280, which is provided to exert a resisting force (resisting the rotation) on the second rotating member 260. When the user exerts force on the kick-shaft 250 to cause the kick-shaft to rotate in a first direction of rotation FD, the second rotating member 260, initially is subject to resistance from rotation due to the resisting means 280, because of which the second rotating member 260 moves in an axially inward direction AI (shown in Fig. 4), due to the angularly provided teeth 258, 261. Thus, the second rotating member 260 moves in axial direction till a force exerted by the first rotating member is less than or equal to the resistance offered by the resisting means 280. Once the force exerted by the first

rotating member 255 exerted on the second rotating member 260 exceeds the
aforementioned resistance, the axial movement of the second rotating member 260
is restricted and the second rotating member 260 also rotates in the first direction
of rotation FD. Further, the axial rotary movement of the second rotating member
5 260 enables the second rotating member 260 to engage with the crankshaft 213
thereby causing the rotation of the crankshaft 213 for cranking the power unit 200.
An elastic member 285 is provided to cause first rotating member to return to
original position. In one embodiment, the coil spring 285 is wound about the first
axis S-S' of the first rotating member 255 with one end of the coil spring 285
10 secured to the side wall 202 of the first cover 201 and other end of the coil spring
285 secured to the first rotating member 255. The kick-start system 205 can be
compactly accommodated within the first cover 201 of the power unit 200 as the
axis of rotation C-C' of the second rotating member 260 is disposed within the outer
periphery defined by the peripheral portion 257 whereby the rotating member 255,
15 260 with the axes of rotation S-S' and C-C' thereof being kept closer without
compromising on the torque or the gear ratio. The present subject matter as per an
additional embodiment enables a ratio of diameter of first rotating member 255 to
a diameter of the second rotating member 260 to be in the range of 3 to 5.

[00050] Fig. 5 depicts a detailed perspective view of selected parts of the kick-start
20 system 205. Fig. 6 (a) depicts a top view of a first rotating member, in accordance
with an embodiment of the present subject matter. Fig. 6 (b) depicts a perspective
view of a first rotating member, in accordance with an embodiment of the present
subject matter. The first rotating member 255 comprises an arm portion 256 (as
shown in Fig. 3) and a peripheral portion 257. The arm portion 256 maybe formed
25 by a first sub-arm 256A and a second sub-arm 256B that are extending radially
outward from a mounting portion 259 and are disposed apart by a first angle being
at least an acute or an obtuse angle. The first rotating member 255 is rotatable about
the first axis S-S' through the mounting portion 259. The peripheral portion 257 is
an arc shaped portion that is connected to the first sub-arm 256A and the second
30 sub-arm 256B.

[00051] In a non-actuated condition of the kick-shaft 250, the second rotating member 260 is disposed at a first end portion 257A of the peripheral portion 257 with the plurality of teeth 261 of the second rotating member 260 engaging with the plurality of teeth 258 provided radially inward of the peripheral portion 257 of the first rotating member 255. In one embodiment, the plurality of teeth 258 are helical type. The first end portion 257A of the peripheral portion 257, aforementioned, is a leading portion thereof with respect to first direction of rotation FD. When user applies force on the kick-shaft 250, the kick-shaft 250 is rotated in first direction of rotation FD, wherein the first rotating member 255 is also rotated in the first direction of rotation FD about the first axis S-S'. This causes the first rotating member 255 to rotate the second rotating member 260 about the axis of rotation C-C'. The peripheral portion 257 rotating in the first direction of rotation causes the second rotating member 260 to axially engage with the crankshaft 213 and cause the cranking of the power unit 200. Once the power unit 200 gets started, the crankshaft 213 attains certain speed which is greater the speed of rotation of the second rotating member 260. The first engaging means 262 of the second rotating member 260 is provided with slip mechanism, which may be a ratchet type system or similar slip type system that controls transfer of torque to the crankshaft 213.

[00052] Further, the first rotating member 255 is having the peripheral portion 257 disposed at an axial off-set D1 from the first sub-arm 256A, and the second sub-arm 256B. The second rotating member 260 is accommodated within the peripheral portion 257 of the first rotating member 255 without any interference between the sub-arms 256A, 256B. Further, the coil spring 285 wound about the first axis S-S' of the first rotating member 255 can be accommodated at space defined by the offset D1 without any interference with the sub-arms 256A, 256B.

[00053] Further, the first rotating member 255 offers manufacturing feasibility as the offset D1 provides relief for forming the teeth 258 by cutting or honing. Thus, the kick-start system 205 of the present subject matter offers ease of manufacturing.

[00054] Thus, the kick-shaft 250 of the present subject matter can be disposed to be extended in a first direction with respect to the vehicle. The first direction can be a forward direction and a rearward direction. For example, in the depicted

embodiment of Fig. 5, the kick-shaft 250 is extending in a forward direction from the first axis S-S', wherein the second rotating member 260 is at a front portion of the peripheral portion 257. This embodiment offers the advantage of enabling kick-start action without the need for putting the vehicle on main-stand 145 (shown in Fig. 1). Similarly, users can perform kick-start operation in a seated position on the vehicle 100.

[00055] In one embodiment, the kick-shaft may be disposed to be extending in a rearward direction from the first axis S-S', wherein such embodiment, the second rotating member 260 will be disposed in proximity to a rear portion of the peripheral portion 257, as the kick-start operation in this embodiment will cause the first rotating member to rotate a direction opposite to first direction of rotation FD thereby requiring an additional rotation reversal gear to result in rotation of the second rotating member 260 in first direction of rotation FD.

[00056] Considering Fig. 7 in conjunction with Fig. 1 to Fig. 5, the main-stand 145 of the vehicle 100, in one embodiment, is mounted to the power unit 200. The main-stand 145 comprises an operating-portion 146 and a load-portion 147. The operating-portion 146 is disposed either fixedly or pivotably with the load-portion 147. The load-portion 147 is the load bearing member which comes in contact with the ground surface. The operating-portion 146 extends in an upward direction and adjacent to at least a portion of power unit 200 in a disengaged condition of the main-stand. Whereas, the kick-shaft 250 extends in a forward direction thereof without any interference with the main-stand 145. The kick-shaft 250 extends in a forward direction thereof away from the operating-portion 146. The kick-shaft 250 comprises a region of rotation RR during actuation of kick-shaft 250 and said region of rotation RR is disposed away from the operating-portion 146. The region of rotation RR is the portion of plane (substantially vertical plane) along which the kick-shaft 250 moves during operation thereof.

[00057] In the depicted embodiment, the power unit 200 is swingably mounted to the vehicle 100 and the power unit 200 is disposed closer to at least one rear wheel 133 of the vehicle 100 (when compared to at least one front wheel 130 of the vehicle 100). The present subject matter enables kick-start of the vehicle by using the kick-

start system 205. The user, even in a seated condition on the seat assembly 155, would be able to access the kick-shaft 250 without the need for putting the vehicle 100 on main-stand 145 as the kick-shaft 250 is extending in a forward direction and the kick-shaft 250 rotates without interfering with the main-stand 145. Further, the
5 user can perform kick-start operation with minimum effort.

[00058] It is to be understood that the aspects of the embodiments are not necessarily limited to the features described herein. Many modifications and variations of the present subject matter are possible in the light of above disclosure. Therefore, within the scope of claims of the present subject matter, the present
10 disclosure may be practiced other than as specifically described.

List of reference signs:

100	motor vehicle	211	piston
105	frame member	212	connecting rod
106	head tube	213	crankshaft
5 107	down tube	35 214	transmission system
110	rear tubes	215	drive pulley
130	front wheel	216	driven pulley
131	front suspension system	217	belt
133	rear wheel	220	starter
10 134	rear suspension system	40 221	Bendix gear system
145	main-stand	225	one end (Crankshaft)
146	operating-portion	240	engaging means
147	load-portion		(crankshaft)
150	handlebar assembly	250	kick-shaft
15 151	step-through portion	45 251	one end
155	seat assembly	252	another end
160	front fender	255	first rotating member
165	rear fender	256A	first sub-arm
170A/170B/170C		256B	second sub-arm
20	panel(s)	50 256	arm portion
200	power unit	257	peripheral portion
201	first cover	257A	first end portion
202	side wall	258	plurality of teeth (first
203	peripheral wall		rotating member)
25 204	region	55 260	second rotating member
205	kick-start system	261	plurality of teeth (second
206	cylinder head		rotating member)
207	cylinder block	262	first engaging means
208	crankcase	270	first shaft
30 209	side member	60 275	second shaft
210	air control apparatus	280	resisting means

285	coil spring (elastic member)	S-S'	axis of rotation (first
259	mounting portion		rotating member)
FD	first direction of rotation	RR	region of rotation
C-C'	axis of rotation (second		
5	rotating member)		

We claim:

1. A vehicle (100) comprising:
 - a power unit (200), said power unit (200) comprising a crankshaft (213), said crankshaft (213) rotatably supported therein; and
 - 5 a kick-start system (205), said kick-start system (205) comprising a kick-shaft (250) rotatably supported by said power unit (200), a first rotating member (255), and a second rotating member (260) functionally connected to said crankshaft (213),
 - said first rotating member (255) functionally connected to said kick-shaft (250), said first rotating member (255) capable of rotating in a first direction of rotation (FD) during an operation of said kick-shaft (250), and
 - 10 said first rotating member (255) causes said second rotating member (260) to rotate in said first direction of rotation (FD) during said operation of said kick-shaft (250).
- 15 2. The vehicle (100) as claimed in claim 1, wherein said first rotating member (255) is an inner gear, and said second rotating member (260) is an outer gear, and said second rotating member (260) is in direct contact with said first rotating member (255) and said second rotating member (260) is having an axis of rotation (C-C') disposed within an outer periphery of said first rotating member (255), and
- 20 wherein said axis of rotating (C-C') coincides with a crankshaft axis (C-C').
3. The vehicle (100) as claimed in claim 1, wherein said first rotating member (255) comprises an arm portion (256) and a peripheral portion (257), said arm portion (256) comprises a first sub-arm (256A) and a second sub-arm (256B) extending in a radial direction from an axis of rotation (S-S') of said first rotating
- 25 member (255) and are disposed apart by a first angle, and said peripheral portion (257) is connected to the first sub-arm (256A) and the second sub-arm (256B).
4. The vehicle (100) as claimed in claim 1, wherein said second rotating member (260) is disposed at a first end portion (257A) of a peripheral portion (257) of said first rotating member (255) and said first end portion (257A) is a leading
- 30 portion of the peripheral portion (257) with respect to the first direction of rotation (FD).

5. The vehicle (100) as claimed in claim 1, wherein said first rotating member (255) is having a plurality of teeth (258) being helical and said second rotating member (260) is having a plurality of teeth (260) being helical.
6. The vehicle (100) as claimed in claim 3, wherein said arm portion (256) is
5 disposed at an axial off-set (D1) from said peripheral portion (257), and said peripheral portion (257) is at least radially partially overlapped in line with said second rotating member (260).
7. The vehicle (100) as claimed in claim 1, wherein said kick-shaft (250) is
10 extending in a first direction with respect to said vehicle (100), wherein said first direction comprises at least one of a forward direction (F) and a rearward direction (R).
8. The vehicle (100) as claimed in claim 1, wherein said vehicle (100) comprises a main-stand (145) mounted to one of said vehicle (100) and said power unit (200), and said main-stand (145) comprises an operating-portion (146), said
15 operating-portion (146) extends in an upward direction adjacent to at least a portion of said power unit (200), and said kick-shaft (250) extends in a forward direction thereof away from the operating-portion (146).
9. The vehicle (100) as claimed in claim 8, wherein said kick-shaft (250) comprises a region of rotation (RR) during actuation of kick-shaft (250) and said
20 region of rotation (RR) is disposed away from the operating-portion (146).
10. The vehicle (100) as claimed in claim 1, wherein said kick-start system (205) is mounted to a first cover (201) of said power unit (200) and said first cover (201) is mounted to one lateral side of a crankcase (208) of said power unit (200).
11. A first rotating member (255) for a kick-start system (205), said first rotating
25 member (255) comprising:
- a mounting portion (259);
 - an arm portion (256); and
 - a peripheral portion (257),
- said arm portion comprises a first sub-arm (256A) and a second sub-arm
30 (256B) that are extending radially outward from said mounting portion first axis (S-S') of said first rotating member (255), and

said peripheral portion (257) is an arc shaped portion extending between the first sub-arm (256A) and the second sub-arm (256B), said peripheral portion (257) provided with a plurality of teeth (258) provided radially inward thereof, and said peripheral portion (257) is disposed at an axial off-set (D1) from the arm portion (256).

5

12. A unidirectional torque transfer mechanism comprising:

a force application member (250);

a first rotating member (255), and

a second rotating member (260),

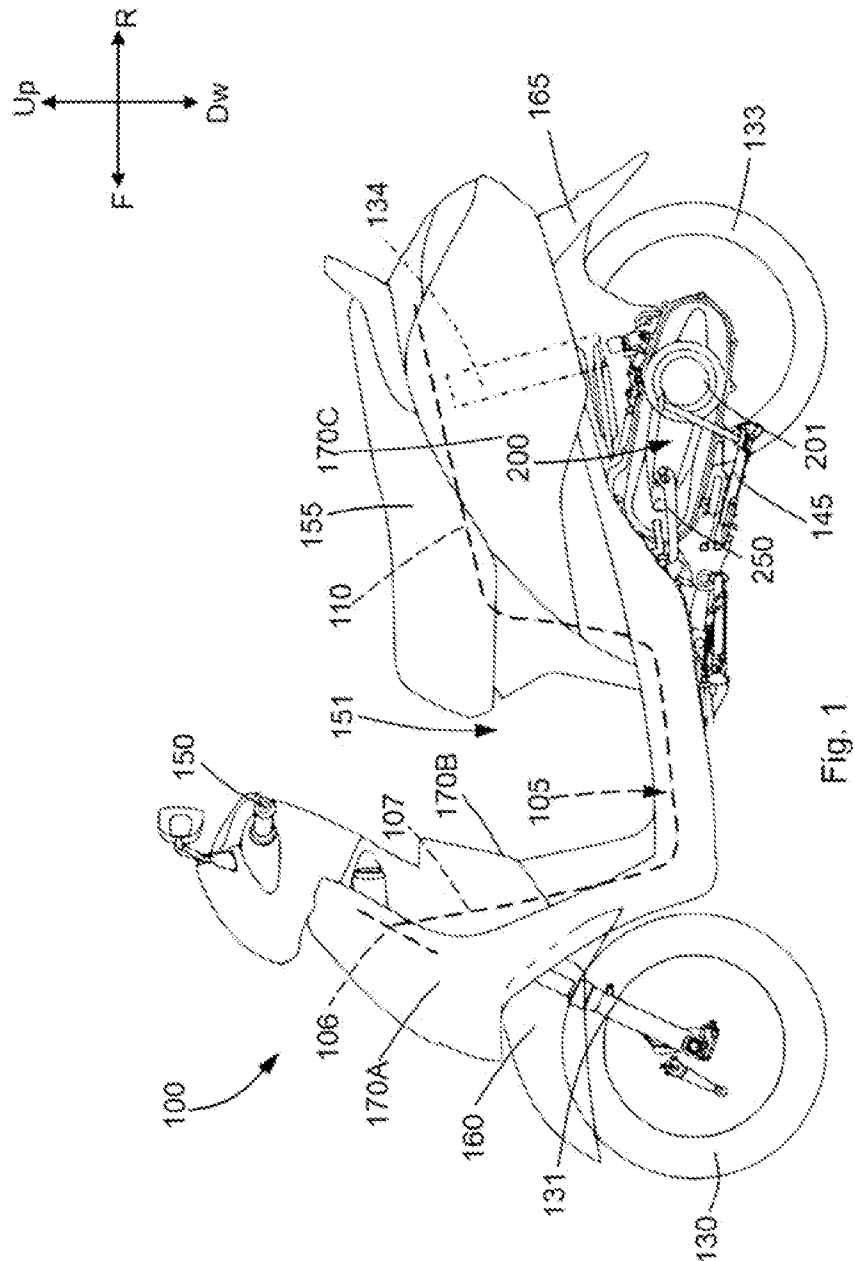
10

said first rotating member (255) functionally connected to said force application member (250), said first rotating member (255) capable of rotating in a first direction of rotation (FD) during an operation of said force application member, and

said first rotating member (255) causes said second rotating member (260)

15

to rotate in said first direction of rotation (FD) during said operation of said force application member (250).



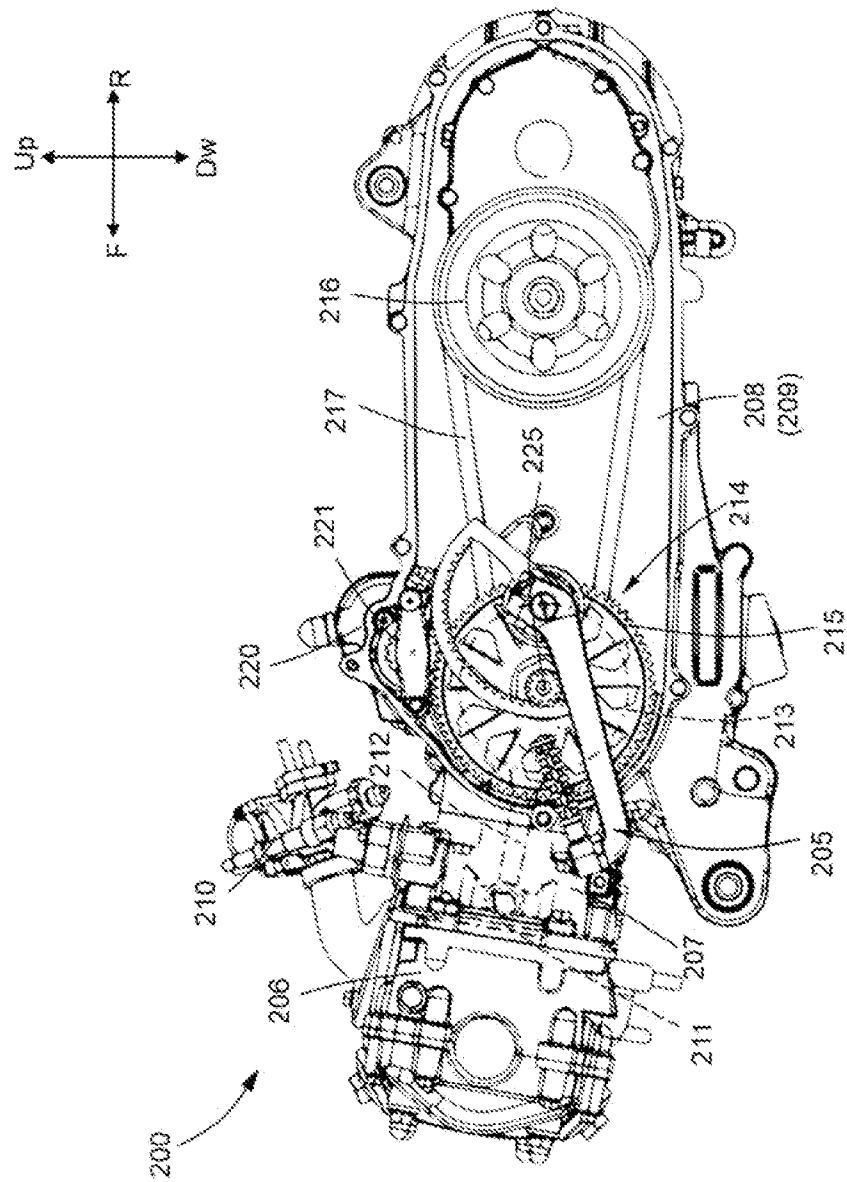


Fig. 2

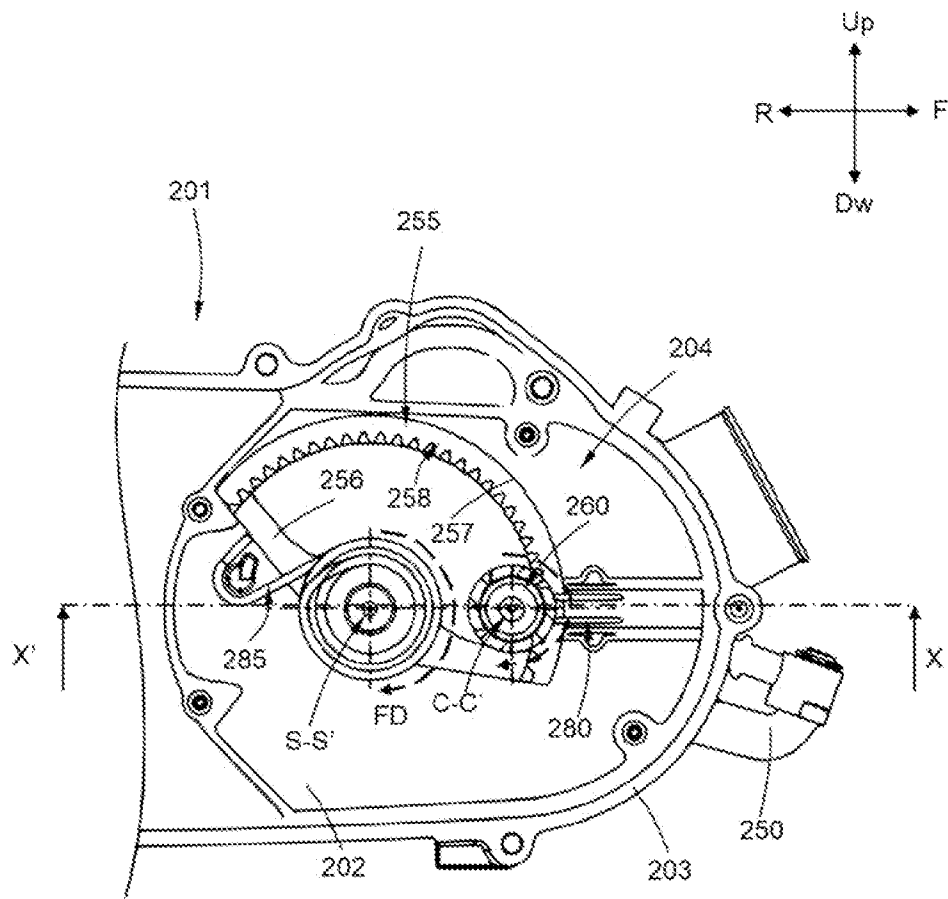


Fig. 3

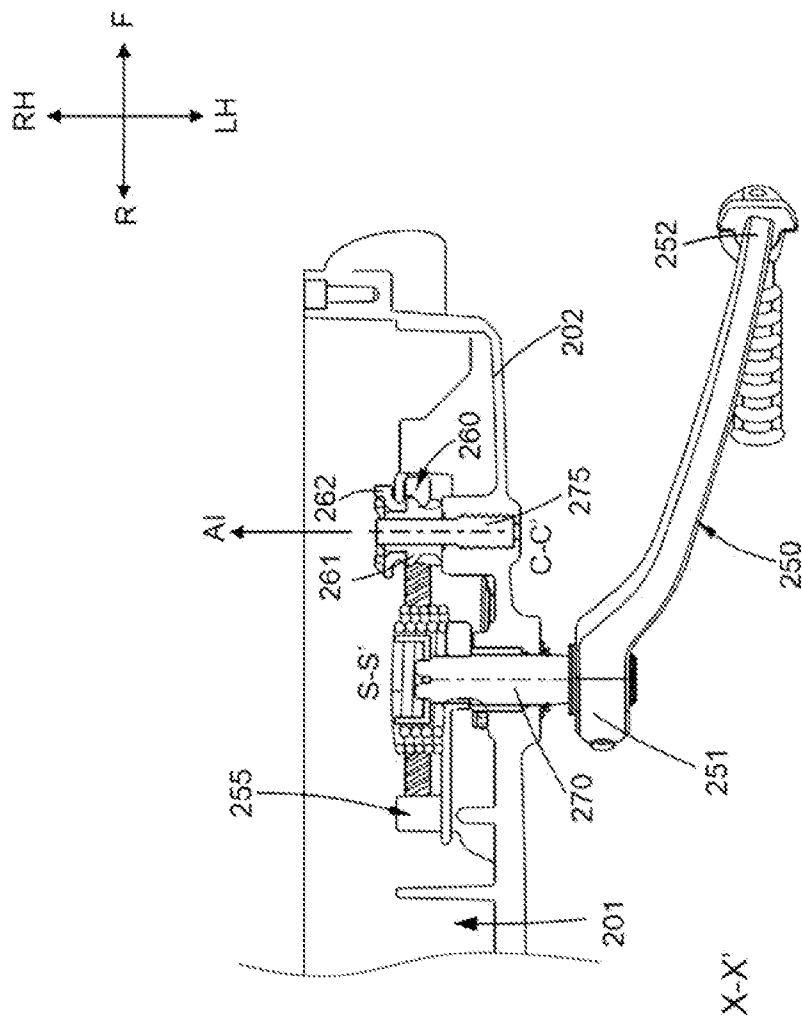


Fig. 4

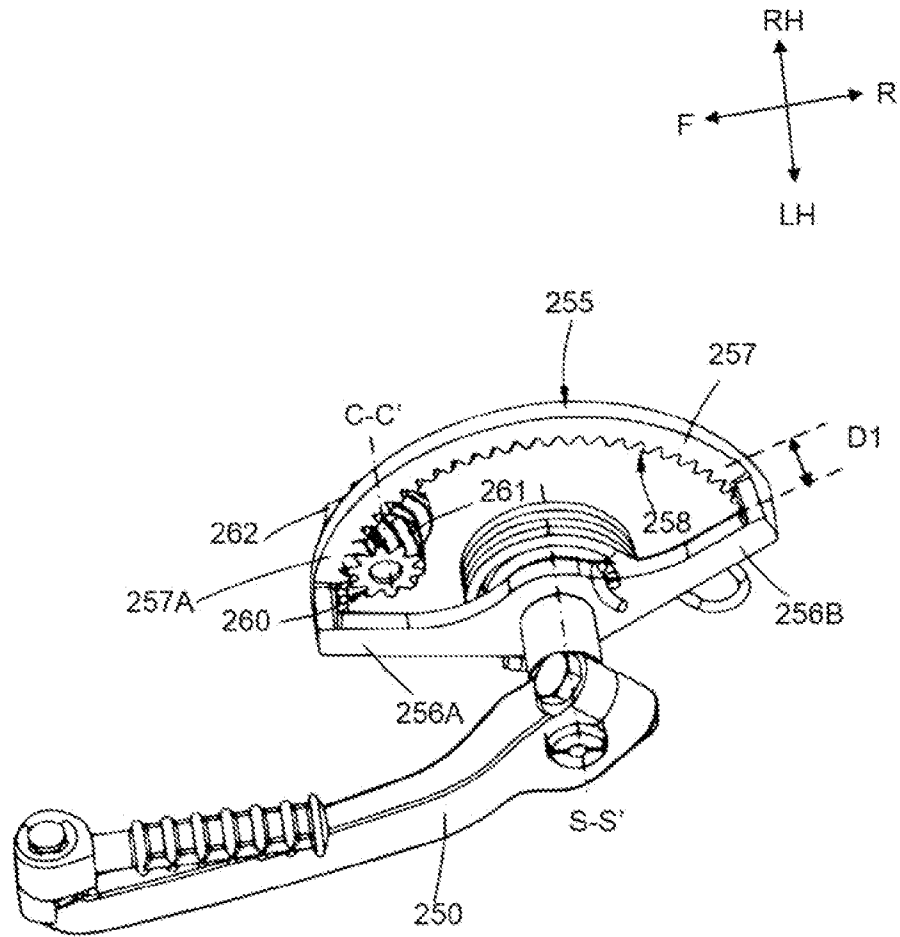


Fig. 5

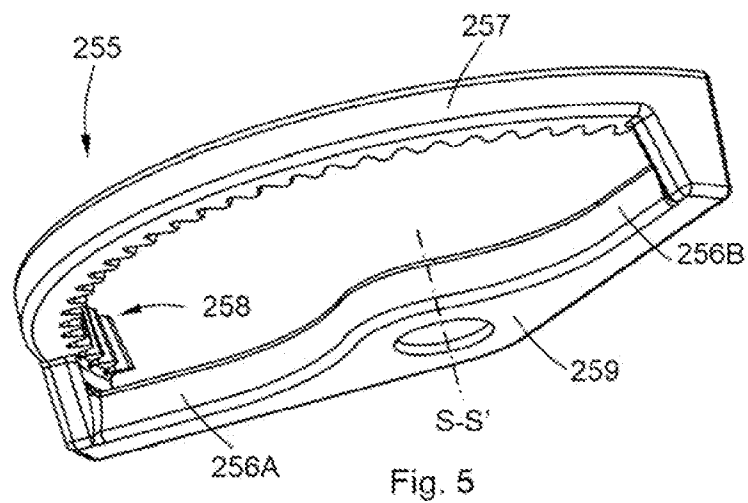
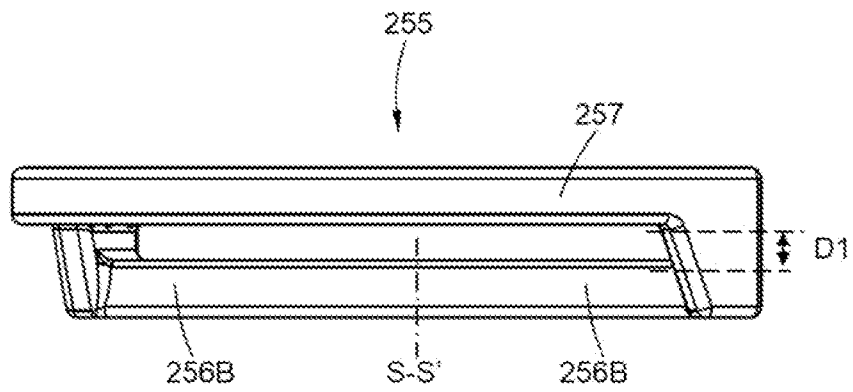


Fig. 6 (b)

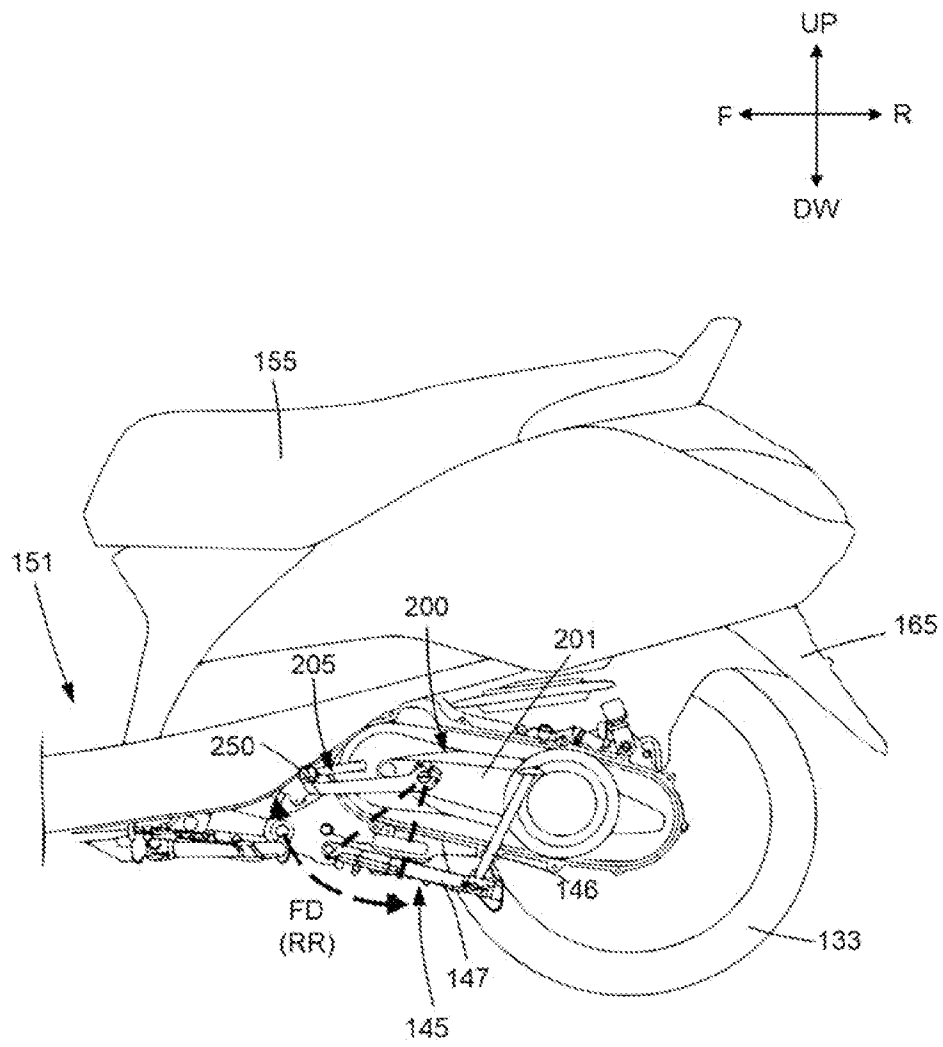


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2021/050123

A. CLASSIFICATION OF SUBJECT MATTER INV. B62K23/08 F02N3/04 B62H1/04 B62M7/04 ADD.																																			
According to International Patent Classification (IPC) or to both national classification and IPC																																			
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B62H F02P B62K B62M F02N F02B Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data																																			
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2 596 512 A (THOMAS JR FRANK S) 13 May 1952 (1952-05-13) the whole document</td> <td>1-4,6,7, 11,12</td> </tr> <tr> <td>Y</td> <td>-----</td> <td>8,9</td> </tr> <tr> <td>A</td> <td></td> <td>5,10</td> </tr> <tr> <td>Y</td> <td>JP S59 111961 U (-) 28 July 1984 (1984-07-28) figures 1,2</td> <td>8,9</td> </tr> <tr> <td>X</td> <td>-----</td> <td></td> </tr> <tr> <td>A</td> <td>GB 244 559 A (DOUGLAS MOTORS LTD; STEPHEN LESLIE BAILEY) 24 December 1925 (1925-12-24) the whole document</td> <td>1,3,4,6, 7,10-12</td> </tr> <tr> <td>X</td> <td>-----</td> <td></td> </tr> <tr> <td>A</td> <td>JP S59 29770 A (HONDA MOTOR CO LTD) 17 February 1984 (1984-02-17) figures 1,2</td> <td>1,4,7, 10,12</td> </tr> <tr> <td></td> <td>-----</td> <td>2,3,5,6, 8,9,11</td> </tr> <tr> <td></td> <td>-/-</td> <td></td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2 596 512 A (THOMAS JR FRANK S) 13 May 1952 (1952-05-13) the whole document	1-4,6,7, 11,12	Y	-----	8,9	A		5,10	Y	JP S59 111961 U (-) 28 July 1984 (1984-07-28) figures 1,2	8,9	X	-----		A	GB 244 559 A (DOUGLAS MOTORS LTD; STEPHEN LESLIE BAILEY) 24 December 1925 (1925-12-24) the whole document	1,3,4,6, 7,10-12	X	-----		A	JP S59 29770 A (HONDA MOTOR CO LTD) 17 February 1984 (1984-02-17) figures 1,2	1,4,7, 10,12		-----	2,3,5,6, 8,9,11		-/-	
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INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2021/050123

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IN2021/050123

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