

ABSTRACT

REAR SUSPENSION SYSTEM FOR SCOOTER-TYPE VEHICLE

The present subject matter discloses a swing arm assembly (100) for a scooter-type vehicle (100). The swing arm assembly (300) disclosed herein includes a swing arm (102) having a first arm (206), and a second arm (208) disposed substantially parallel to longitudinal axis of the vehicle (100). An extended arm (214) disposed substantially inclined to the longitudinal axis of the vehicle (100) is provided. At least one support bracket (306, 308) is disposed substantially perpendicular to the first arm (206) laterally separating the second arm (208) from the first arm (206). A plurality of mounting brackets (310-1, 310-2, 310-3, 310-4, 310-5, 310-6) are disposed on the at least one support bracket (306, 308) and the extended arm (214) for mounting an internal combustion engine (108).

<To be published with Fig. 3 (a)>

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I/ we claim:

1. A swing arm assembly (300) for a scooter type vehicle (100), said swing arm assembly (300) comprising:

a swing arm (102) having a first arm (206), and a second arm (208) disposed substantially parallel to longitudinal axis of said vehicle (100), and an extended arm (214) disposed substantially inclined to the longitudinal axis of said vehicle (100);

at least one support bracket (306, 308) disposed substantially perpendicular to said first arm (206) and laterally separating said second arm (208) from said first arm (206); and

a plurality of mounting brackets (310-1, 310-2, 310-3, 310-4, 310-5, 310-6) disposed on said at least one support bracket (306, 308) and said extended arm (214) for mounting an internal combustion engine (108).

2. The swing arm assembly (300) as claimed in claim 1, wherein the first arm (206) and the second arm (208) includes a plurality of mounting slots (216-1, 216-2) disposed for mounting a centre stand (110), the second arm (208) and the extended arm (214) includes a plurality of mounting brackets (312-1, 312-2) for mounting an exhaust device, and wherein the extended arm (214) includes a plurality of mounting brackets (316-1, 316-2) for mounting an air filter sub-assembly (302).

3. The swing arm assembly (300) as claimed in claim 1, wherein said at least one mounting bracket (310-1) of said plurality of mounting brackets (310-1, 310-2, 310-3, 310-4, 310-5, 310-6) for mounting the internal combustion engine (108) comprises a dual torsion spring.

4. The swing arm assembly (300) as claimed in claim 1, wherein said extended arm (214) is u-shaped having one end (330) joined to a first wheel mounting bracket (218) of said first arm (206), and another end (332) joined to a second wheel mounting bracket (220) of said second arm (208), wherein at least

one wheel mounting bracket (218, 220) includes a slot (314) for mounting a rear suspension (112).

5. A swing arm assembly (300) for a scooter type vehicle (100) having a brake panel assembly (322) disposed on a centre hub (334) of a rear wheel (106) of said scooter type vehicle (100), said swing arm assembly (300) comprising:

a swing arm (102) having a first arm (206), and a second arm (208) disposed substantially parallel to longitudinal axis of said vehicle (100), and an extended arm (214) disposed substantially inclined to the longitudinal axis of said vehicle (100);

at least one support bracket (306, 308) disposed substantially perpendicular to said first arm (206) and laterally separating said second arm (208) from said first arm (206);

a plurality of mounting brackets (310-1, 310-2, 310-3, 310-4, 310-5, 310-6) disposed on said at least one support bracket (306, 308) and said extended arm (214) for mounting an internal combustion engine (108); and

a torque link element (318) for transferring braking forces from a brake panel assembly (322) having a first end (336) and a second end (324), wherein said torque link element (318) is disposed substantially tangential to said brake panel assembly (322).

6. The swing arm assembly (300) as claimed in claim 5, wherein said torque link element (318) is coupled to said brake panel assembly (322) at a first end (336), and to at least one mounting bracket (310-4) of said plurality of mounting brackets (310-1, 310-2, 310-3, 310-4, 310-5, 310-6) for mounting the internal combustion engine (108) at a second end (324).

7. The swing arm assembly (300) as claimed in claim 5 or 6, wherein said second end (324) of said torque link element (318) is coupled to a first boss (320) casted on the internal combustion engine (108).

8. The swing arm assembly (300) as claimed in claim 5 or 6, wherein second end (324) of said torque link element (318) is coupled to at least one mounting slot (216-2) of said plurality of mounting slots (216-1, 216-2) for mounting the centre stand (110).

9. The swing arm assembly (300) as claimed in claim 1 or 5, wherein the first arm (206), the second arm (208), and the extended arm (214) has a tubular cross-section.

10. The swing arm assembly (300) as claimed in claim 5, wherein the first arm (206) and the second arm (208) are made from pressed sheet metal.

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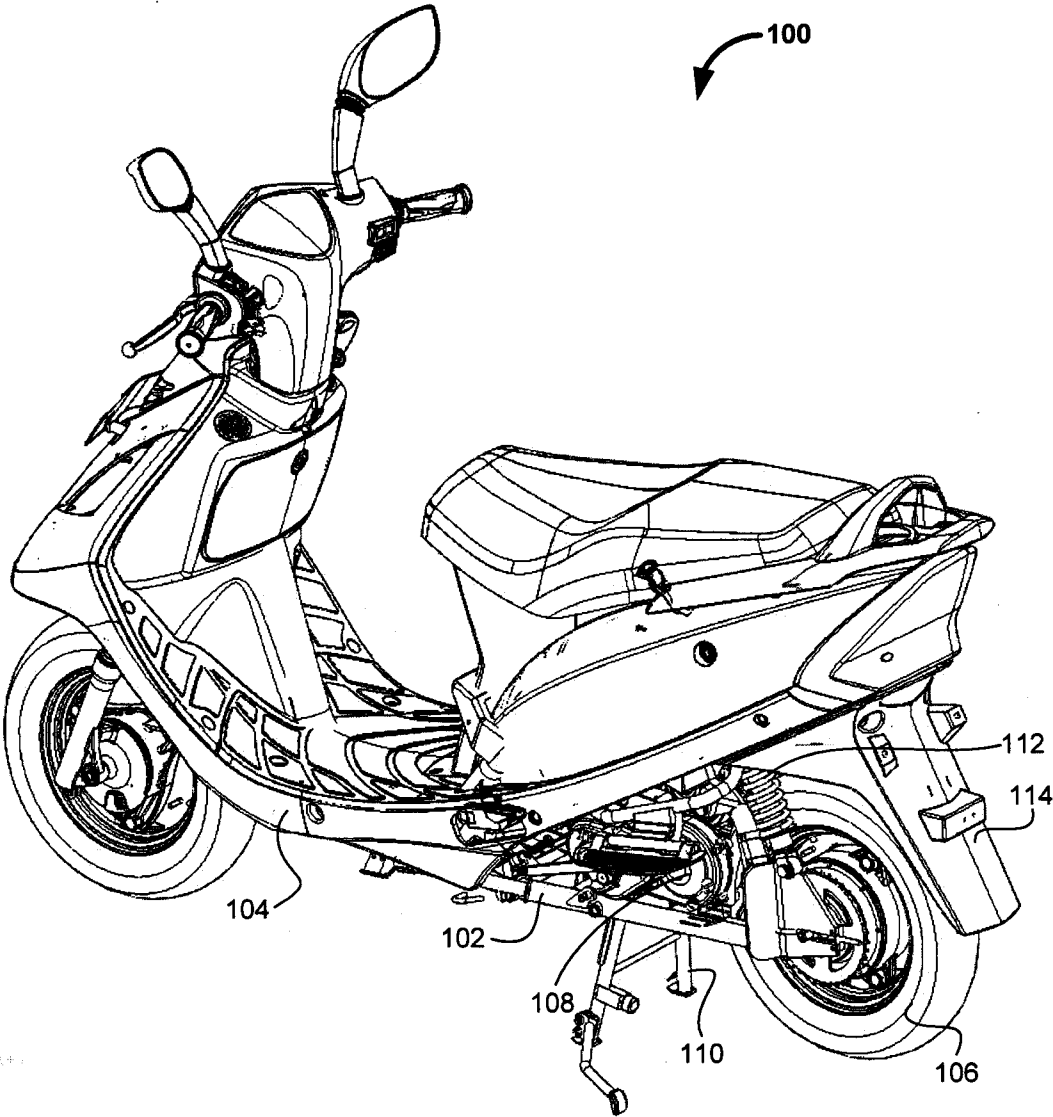


FIG. 1

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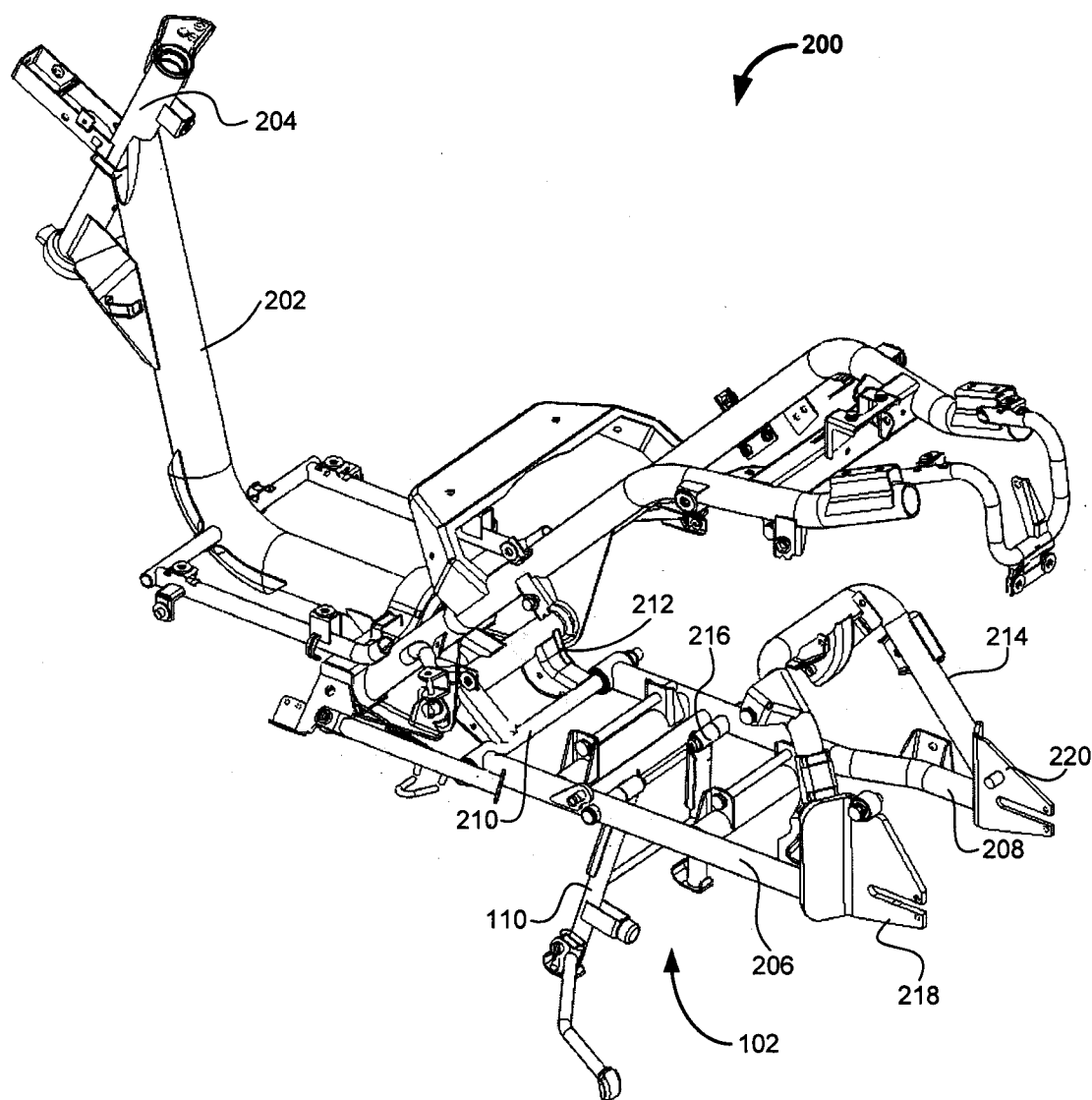


FIG. 2

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For TVS Motor Company Limited
Dated: 10/10/2018
Place: Chennai

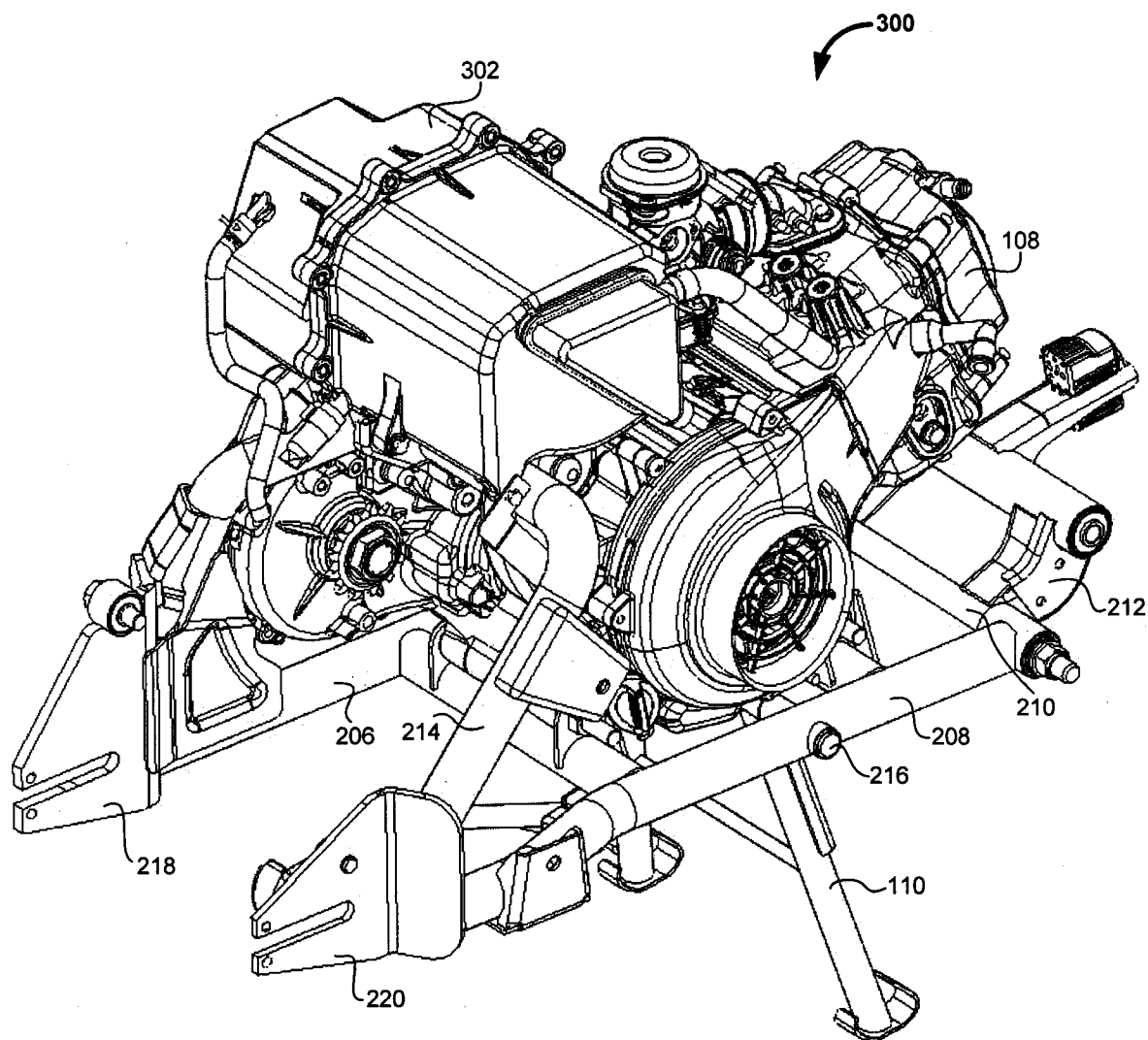


FIG. 3 (a)

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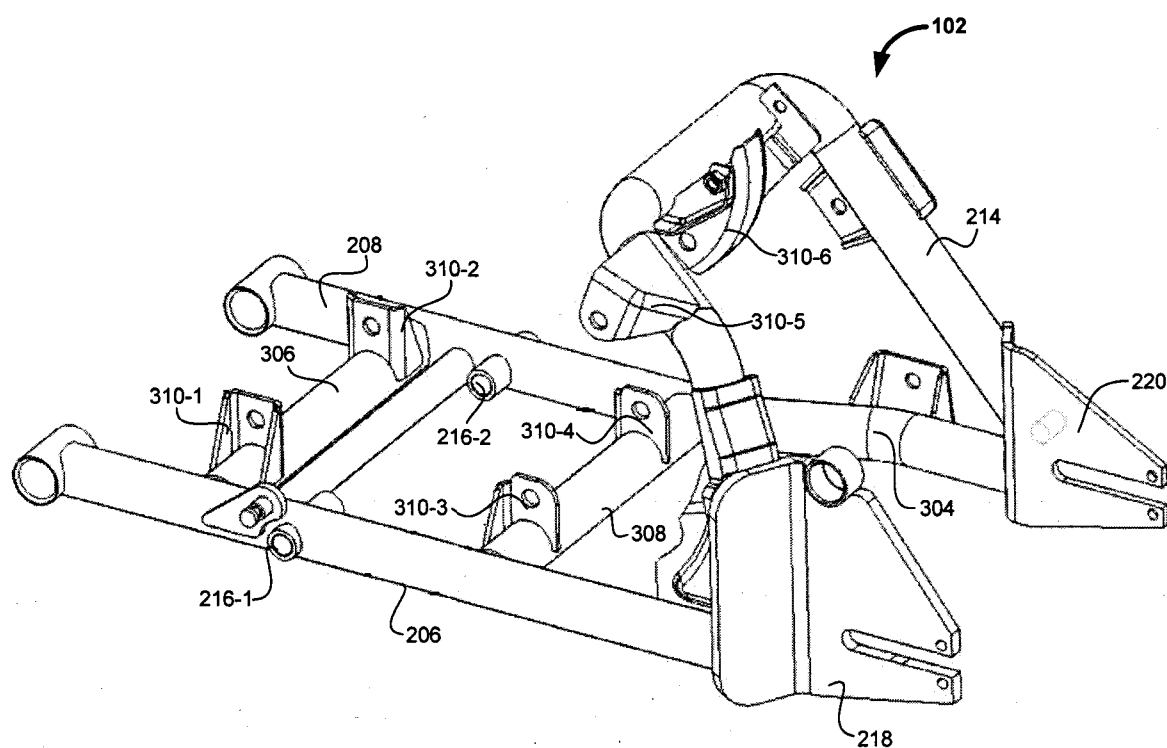


FIG. 3 (b)

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College Park, Maryland
2004

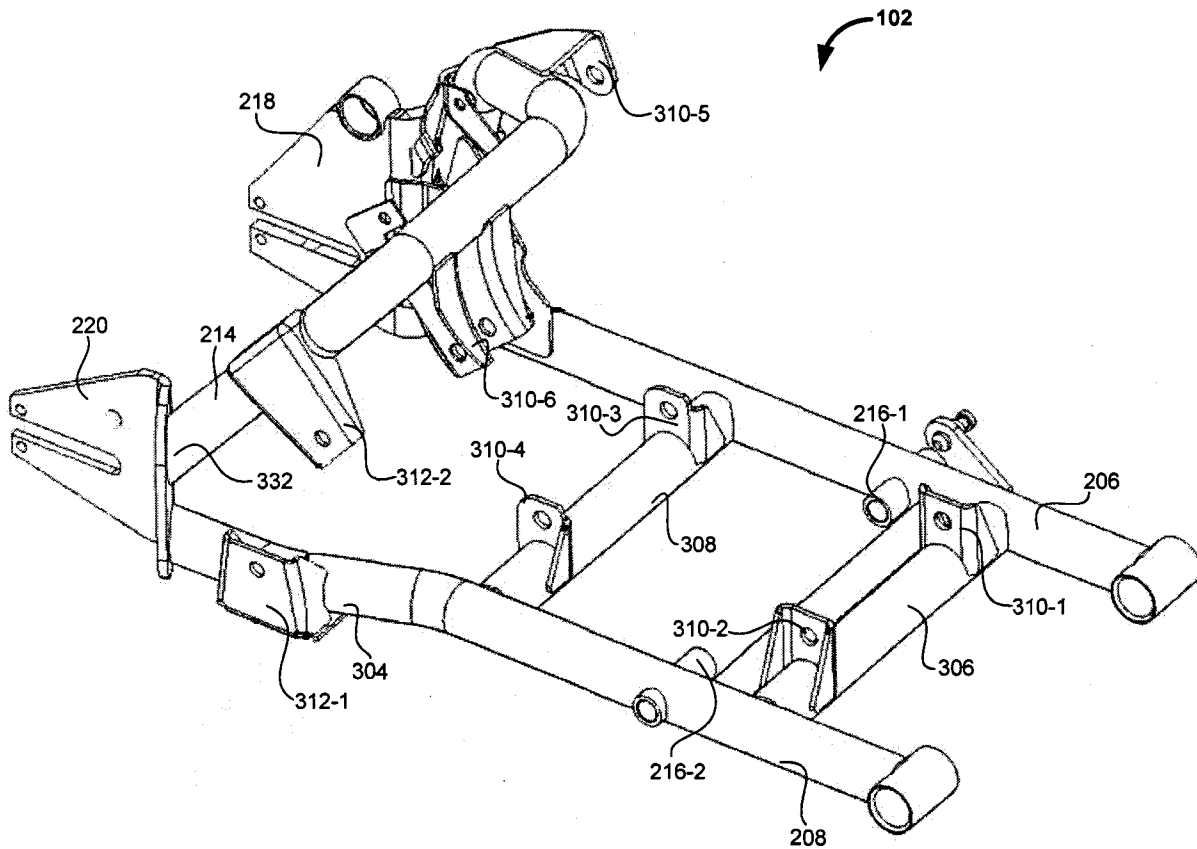


FIG. 3 (c)

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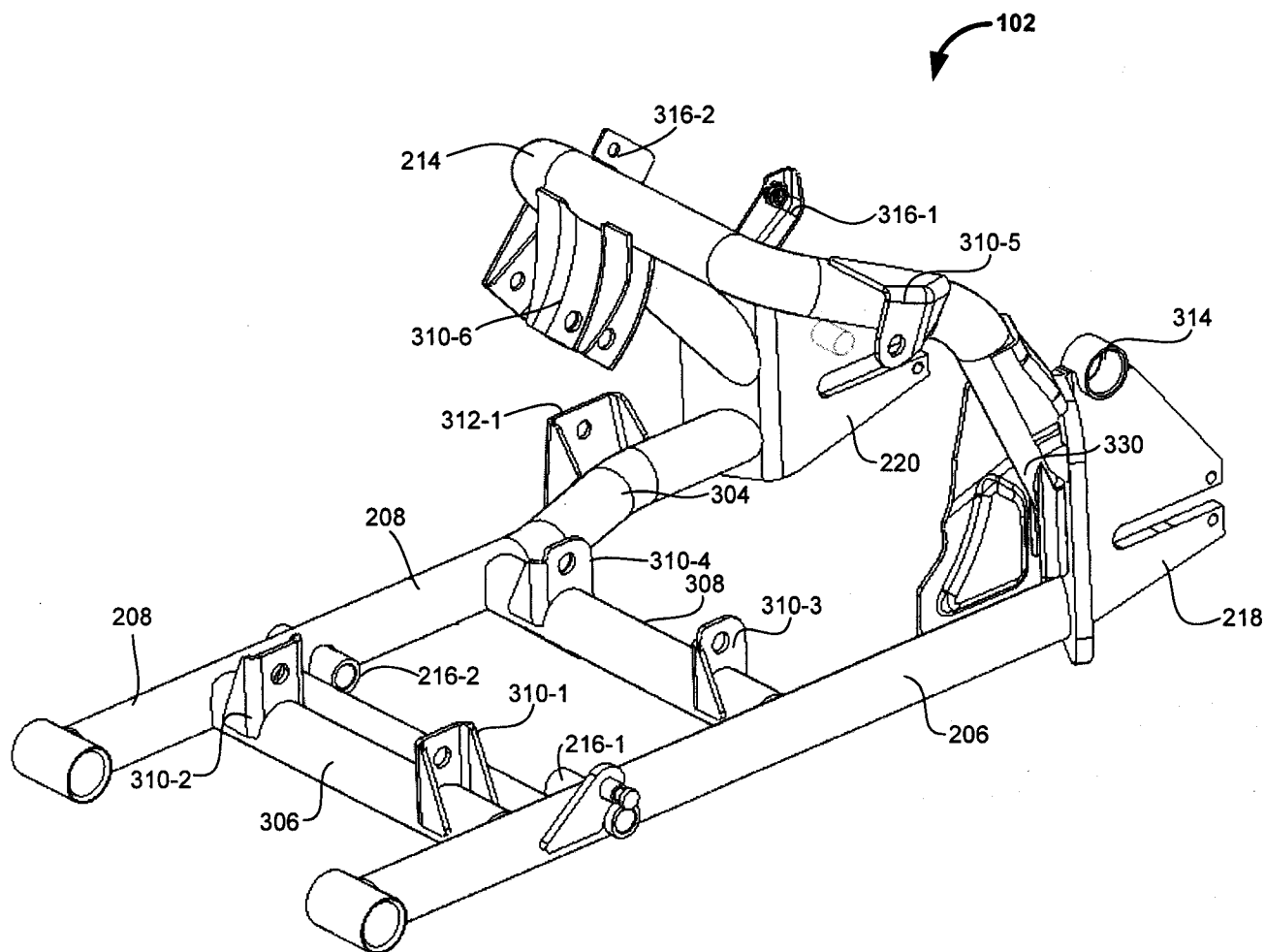
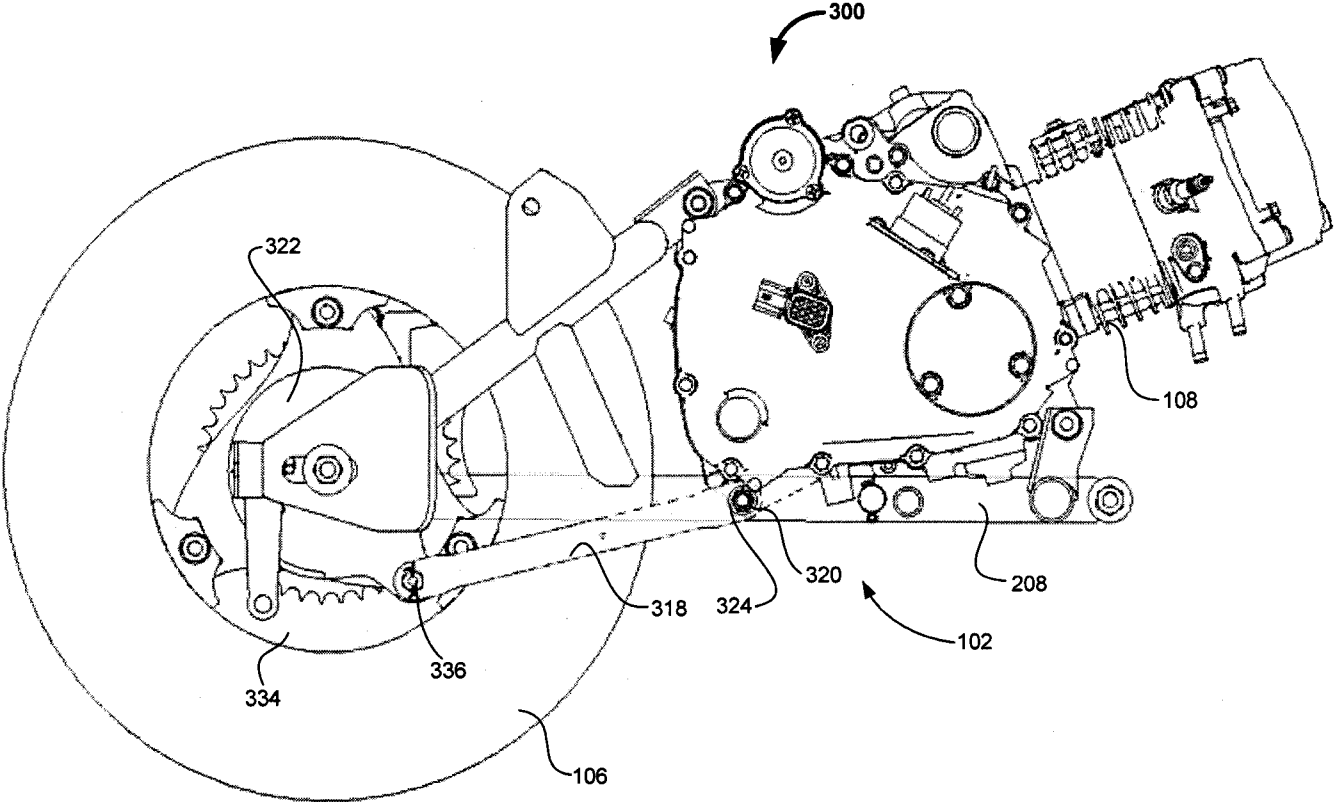


FIG. 3 (d)

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Naval
S. Raman
Chartered Engineer

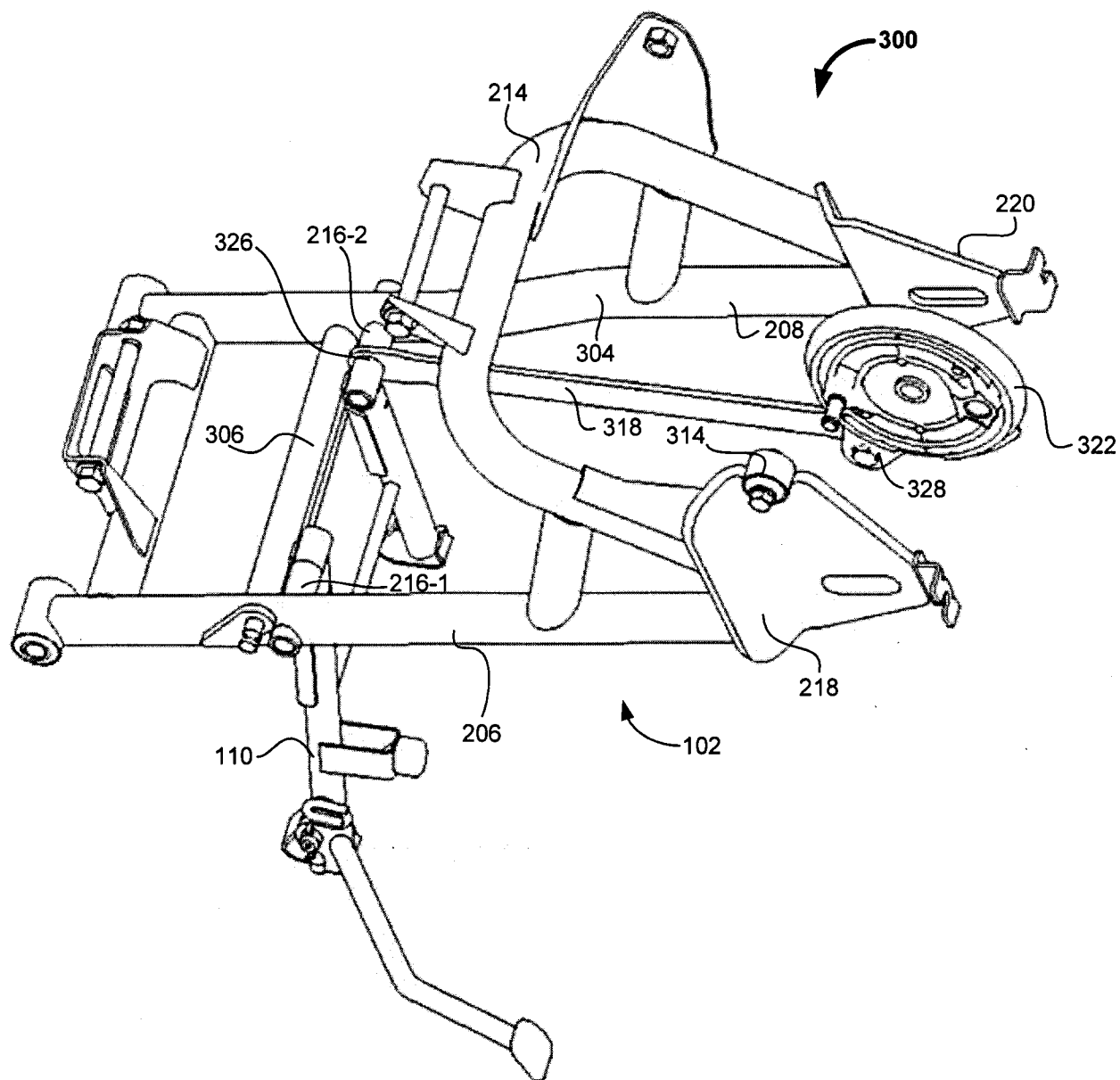


FIG. 3 (f)

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TECHNICAL FIELD

[0001] The present subject matter, in general, relates to rear suspension system for scooter-type vehicle, and in particular, relates to a swing arm assembly for the scooter-type vehicle.

BACKGROUND

[0002] A scooter is a motorcycle with step-through frame and a platform for the operator's feet. Such scooters are exceedingly useful and popular, although certain limitations inherent in their construction impede their broader use and greater success. A scooter type vehicle generally has a swinging engine attached to a rear wheel hub. Generally, in such scooter-type vehicles, the swinging engine crankcase is capable of acting as a load carrying member and provides rear suspension for the vehicle. Moreover, in such vehicles, rear suspension, muffler and centre stand are directly supported on the swinging engine, which in addition to driving the vehicle is required to act as a load carrying member.

[0003] Generally, in such scooter-type vehicles, the role of the engine as the load carrying member eliminates the need for a separate swing arm. However this construction may not be feasible in all scooter-type vehicles, for example, in case of a scooter-type hybrid vehicle. Generally, in such hybrid vehicles, the inclusion of both engine, battery, and traction motor demands a strong supporting body frame. Additionally, such vehicles demands optimal packaging of the engine and associated components as a bigger battery sufficient enough to power the traction motor has to be accommodated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the drawings to reference like features and components.

[0005] FIG. 1 illustrates a scooter-type vehicle, in accordance with an embodiment of the present subject matter.

[0006] FIG. 2 illustrates a vehicle chassis of the scooter-type vehicle, in accordance with an embodiment of the present subject matter.

[0007] FIG. 3 (a), 3 (e), and 3 (f) illustrates a swing arm assembly of the scooter-type vehicle, in accordance with an embodiment of the present subject matter.

[0008] FIG. 3 (b), 3 (c), and 3 (d) illustrates a swing arm of the scooter-type vehicle, in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

[0009] In general, conventional configuration of the electric scooters has limitation with respect to the range of travel capable of being achieved with one full charge and the range of operating speed and acceleration that is capable of being achieved. Further, the conventionally known scooters have limitations with providing an optimal construction that is capable of meeting all-terrain needs. Furthermore, the conventional scooters have limitations associated with isolation of engine vibrations from the vehicle frame structure, in particular, during high speed operation of the scooter-type vehicle.

[00010] Further, conventional torque links that transmits reverse torque out from the brake panel assembly is connected to the swing arm assembly. For example, the torque link is capable of being connected to the swing arm by mounting to a bracket provided on the swing arm. In such an arrangement, the torque link experiences a plurality of problems. For example, the torque link when directly mounted to the swing arm is generally shorter than a prescribed length, which causes additional load to be transmitted to the swing arm. Further, the torque link when mounted on a bracket provided on the swing arm, even though the length is substantially equal to the prescribed length, the torque link is disposed at an angle to connect to the bracket. In this position, the torque link is inclined to the brake panel assembly. Such an arrangement i.e., disposition of the torque link inclined with respect to the brake panel assembly makes the torque link ineffective as the reverse torque generated in the brake panel assembly is not fully transmitted to the swing arm and some part of the reverse torque is

transmitted back to the brake panel assembly leading to failure of the brake panel assembly.

[00011] The present subject matter provides a rear suspension system including a swing arm assembly for scooter-type vehicles, and in particular, tubular swing arm assembly for hybrid scooter-type vehicles that ensures vibrations from IC engine is not transmitted to vehicle chassis. In an embodiment, the swing arm assembly of the present subject matter augment the rear suspension system of the vehicle.

[00012] In an embodiment, the present subject matter relates to scooters and, more particularly, to the construction of a hybrid dual powered scooter in which the rear wheel is operationally connected to an IC engine at a fixed distance to maintain adequate tension in the chain during operation over rough terrain. In an embodiment, the swing arm assembly of the present subject matter provides mounting of IC engine of scooter –type vehicle.

[00013] In an implementation, the present subject matter provides a swing arm assembly for a hybrid vehicle capable of accommodating an IC engine and electric traction motor. For example, in an embodiment, the swing arm assembly of the present subject matter enables incorporating a simple motorcycle engine with single reduction transmission to an electric scooter type vehicle without having to make any changes to the engine. For example, the present subject matter relates to suspended hybrid two-wheeler scooter using an under-bone chassis frame, a toggle link, a tubular swing arm structure, a 3-Valve IC-Engine and an electric motor. In an embodiment, the scooter type vehicle of the present subject matter uses two different power sources to drive the vehicle forward, a 3-Valve IC Engine as a main power source and an electric motor installed at the driven rear wheel as an auxiliary power source. The tubular swing arm assembly of the present subject matter is provided with a toggle link that is attached to the vehicle chassis for preventing the transfer of load from the swing arm assembly to the vehicle chassis.

[00014] In an embodiment, the swing arm assembly of the present subject matter is provided with a plurality of mounting locations for mounting an air filter sub-assembly, exhaust system, centre stand, and rear suspension in addition to

mounting the IC engine. The tubular swing arm assembly is also capable of mounting rear disc brake, and chain cover. In each of the engine mounting locations, a two-way dual torsion spring is provided that acts as an additional shock absorber preventing transfer of engine vibration to the chassis.

[00015] In an embodiment, the swing arm assembly of the present subject matter enables positioning of the 3Valve IC engine and the electric motor firmly and helps in maintaining a fixed relationship between the engine and the rear wheel. In an embodiment, the swing arm assembly of the present subject matter enables isolation of rough terrain shocks and IC engine vibrations such as initial crank vibration and high rpm vibration from the vehicle frame structure. In an embodiment, the swing arm assembly of the present subject matter ensures that the vehicle is dynamically stable.

[00016] In an embodiment, the swing arm assembly of the present subject matter provides mounting for air filter sub-assembly and prevents the air filter sub-assembly from being mounted on the engine casing. In an embodiment, the swing arm assembly of the present subject matter enhances flexibility of the vehicle frame structure by accommodating plurality of peripheral accessories such as exhaust system, final driver cover, mono-shock, dual shock, rear disc brake, parking solutions like centre stand, prop stand & prop stand warning system, chain/belt covers, simply supported type low cost & lighter rear axle.

[00017] In an embodiment, the swing arm assembly of the present subject matter includes one or more two-way dual torsion springs mounted on one or more engine mounting locations for enhancing the isolation of engine vibrations from the vehicle chassis. For example, the dual torsion springs also called as silent bloc bushes enables isolation of higher operating speed engine from the chassis structure. In an embodiment, the swing arm assembly of the present subject matter enables isolation of vibrations from rear suspension from the IC engine by providing a separate mounting for the rear shock absorber and eventually helping in reducing the engine structure complexity.

[00018] Further, the present subject matter helps in reducing material cost & time required for IC engines by eliminating one or more stresses acting on the engine and enabling usage of material with substantially lesser stress and strength

requirement for manufacturing the IC engine. Furthermore, in an embodiment, the swing arm assembly of the present subject matter ensures that a plurality of modifications to the engine structure, for example, multiple variants of the IC engine can be accommodated in the vehicle frame without making constructional modifications to the vehicle frame. In an embodiment, the swing arm assembly of the present subject matter enhances manoeuvrability and dynamic stability of the vehicle.

[00019] The present subject matter provides a swing arm assembly that eliminates wear and in turn helps in preventing damage to other vehicle components, for example, a brake panel assembly. Further, in an embodiment, the present subject matter eliminates transmission of load to the swing arm assembly from the brake panel assembly mounted on rear wheel of the vehicle.

[00020] Further, in an embodiment, when the vehicle brake is operated, a reverse torque is created as the rotating rear wheel continues to decelerate. The reverse torque so created is often transmitted to a torque link by the brake panel assembly. For example, the torque link of the present subject matter transmits the reverse torque from the brake panel assembly to other stable parts of the vehicle and ensures that the brake panel assembly is not affected due to the generation of the reverse torque.

[00021] In an embodiment, the present subject matter provides a torque link assembly that overcomes the problems associated with the conventional torque link mounting. Furthermore, in an embodiment, the present subject matter provides a torque link assembly that is capable of transmitting load from the brake panel assembly to the swing arm without producing reverse loads acting on the brake panel assembly.

[00022] In one embodiment, the torque link assembly of the present invention is disposed substantially tangential to the brake panel assembly. In one embodiment, the torque link is provided with a length of substantially greater than 186 mm.

[00023] In one embodiment, one end of the torque link is mounted on the brake panel assembly while the other end is mounted on a boss casted on the engine. In one embodiment, the other end of the torque link is mounted on a bracket mounted on the swing arm for mounting the rear end of the engine. In another

embodiment, the other end of the torque link is mounted on a bracket mounted on the swing arm for mounting a centre stand.

[00024] In an embodiment, the mounting of the other end of the torque link on either the boss casted on the engine, the engine mounting bracket on the swing arm, or the centre stand mounting bracket on the swing arm is associated with a plurality of advantages. For example, since the torque link is not mounted on to the bend portion of the swing arm, and in turn not inclined to the brake panel assembly, any transfer of load back to the brake panel assembly is eliminated. Further, since the torque link is not lesser than, for example, 186 mm, additional load is not transferred to the swing arm. Furthermore, since the torque link is mounted to the engine, or the swing arm mounting location for the engine and the centre stand, the reverse torque carried by the torque link is completely transmitted without affecting the brake panel assembly. In addition, the torque link of the present subject matter enables effective transfer of reverse torque from the brake panel assembly to the swing arm, irrespective of the type of swing arm.

[00025] The present subject matter and its equivalent thereof offer many advantages, including those, which have been described henceforth. The swing arm assembly of the present subject matter provides a mounting arrangement for the internal combustion engine ensuring that the stresses from the vehicle chassis and the suspension device are not transmitted on to the engine. Further, the swing arm assembly of the present subject matter also ensures that the engine vibrations are not transmitted directly to the vehicle chassis and the presence of a toggle link between the swing arm assembly and the vehicle chassis ensures that such vibrations are not transmitted to the vehicle chassis. The swing arm assembly of the present subject matter also bolsters the rear suspension system of the vehicle. More further, the swing arm assembly is capable of accommodating one or more type of engines ranging from a forced air cooled engine, horizontal engine, vertical engine etc. without having to undergo any constructional modification. Furthermore, the swing arm assembly of the present subject matter provides mounting for air filter sub-assembly and ensures that the engine is not acting as a stressed member. Further, the swing arm assembly of the present subject matter provides a plurality of mounting locations, each such location provided with a

dual torsion spring that ensures the engine vibrations are optimally absorbed, especially during high rpm conditions thereby providing a smoother vibration free ride for the rider even when the vehicle is operated at higher rpm.

[00026] Furthermore, the torque link element of the present subject matter ensures that the load from the brake panel assembly is optimally routed to the vehicle chassis without causing reverse torque that could potentially damage the brake panel assembly. Mounting the torque link element substantially tangential to the brake panel assembly and extending up till the engine mounting or the centre stand mounting on the swing arm assembly ensures that no reverse torque is generated and the loads transferred by the torque link element does not affect the swing arm assembly.

[00027] These and other advantages of the present subject matter would be described in greater detail in conjunction with the figures in the following description.

[00028] FIG. 1 illustrates a scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In an embodiment, the scooter-type vehicle 100 is a hybrid scooter-type vehicle. The vehicle 100 has a body frame 104 made up of several tubes welded together which usually supports the body of the vehicle 100. The vehicle 100 has a steerable front wheel and a driven rear wheel 106. The body frame 104 of the vehicle 100 is an elongated structure, which typically extends from a forward end to a rearward end of the vehicle 100. It is generally convex in shape, as viewed from a side elevational view. The body frame 104 includes a head tube 204 (shown in Fig. 2), a main frame 202 (shown in Fig. 2) and a sub-frame. In one embodiment, the sub-frame is attached to the main frame 202 using appropriate joining mechanism. In an embodiment, the body frame 104 is covered by a plurality of vehicle body covers, for example, a front panel, a leg shield, an under seat cover and a side panel. Generally, the body frame 104 can also be referred to as a vehicle frame 104.

[00029] In one embodiment, the vehicle frame 104 includes a swing arm 102 to provide strength and support to the vehicle 100. In particular, the swing arm 102 of the present subject matter enable mounting of an internal combustion (IC) engine 108. In one embodiment, the swing arm 102 enables mounting of one or

more peripheral devices such as a rear suspension device 112, an exhaust device, for example, a muffler (not shown), an air filter sub-assembly 302 (shown in Fig. 3 (a)), and a centre stand 110. In another embodiment, the vehicle frame 104 also includes, for example, a handlebar assembly and a seat assembly supported at opposing ends of the vehicle frame 104, defining a floorboard, which is an open area there between functioning as a step through space. The seat for a driver and a pillion is placed forward to a fuel tank and rearwardly of the floorboard. In one embodiment, the swing arm 102 of the vehicle frame 104 includes the centre stand 110 for supporting the vehicle 100. Further, in one embodiment, a rear fender including a mud flap 114 is placed between the fuel tank and the rear wheel 106. For example, the mud flap 114 inhibits rain water or the like from being thrown up by the rear wheel 106 on the IC engine 108 that is placed forwardly of the rear wheel 106.

[00030] In an embodiment, the vehicle 100 includes an electromechanical powertrain including the IC engine 108 mounted on the swing arm 102, and a battery (not shown) powering an electrical traction motor. A transmission mechanism, a power coupling mechanism, starter motor and a controller are also provided in the vehicle 100. In an embodiment, the engine 108 is a four stroke single cylinder engine. The rear wheel 106 is driven by driving force generated by either the engine 108 or the traction motor or both. In one embodiment, the engine 108 is arranged horizontally, that is, its crankshaft is placed at right angles to the longitudinal direction of the vehicle 100. In an embodiment, the muffler (now shown) mounted on the swing arm 102 is disposed on right side of the vehicle 100, and connects to the engine 108. The exhaust gases entering the muffler from the engine 108 are further oxidized by the secondary air injected through the secondary air intake system to reduce harmful pollutants.

[00031] In an embodiment, the traction motor derives power from the battery. In another embodiment, the traction motor is coupled to a centre hub 334 (shown in Fig. 3 (e)) of the rear wheel 106. In one embodiment, the hub 334 moves around a rear axle (not shown). The direct coupling of the traction motor to the centre hub 334 outside the crankcase of the engine 108 saves space and prevents transmission losses due to gear reduction. The hub 334 also supports the rear wheel braking

system, for example, a brake panel assembly 322 (shown in Fig. 3 (e)). Further, the engine crankcase is small and is connected to the hub of the rear wheel through a transmission system. The transmission system transfers the load from the crankshaft to the drive shaft and enables the vehicle for locomotion. The transmission system has a primary wet type reduction and a secondary dry type sprocket and chain reduction. The sprocket mounted on the rear axle and the chain mechanism reduces rotational force of drive shaft and transmits reduced rotational force to rear wheel 106.

[00032] In one embodiment, the rear suspension device 112 mounted on the swing arm 102 enables comfortable steering of the vehicle 100 on the road. For example, the rear suspension device 112 is a hydraulic damped arrangement and is connected to the vehicle frame 104. In an embodiment, the rear suspension device 112 is provided on both left and right side of the vehicle 100. For the safety of the user and in conformance with the traffic rules, a headlight in the front portion of the vehicle 100 and a taillight in the rear portion of the vehicle 100 is also provided.

[00033] FIG. 2 illustrates a vehicle chassis 200 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In one embodiment, the vehicle chassis 200 provides strength and support for the vehicle frame 104 of the vehicle 100. In one embodiment, the vehicle chassis 200 has a front side formed of the main tube 202 and the head tube 204. For example, the handle bar assembly and the headlamp assembly of the vehicle 100 is mounted on the head tube 204, while the front cover including the footboard are mounted on the main tube 202 of the vehicle chassis 200. In an embodiment, the IC engine 108 of the vehicle 100 is not directly mounted on the vehicle chassis 200, rather is mounted through the swing arm 102. In one embodiment, the swing arm 102 is coupled to the main tube 204 of the vehicle chassis 200 through a toggle link 212. In an embodiment, the toggle link 212 helps in preventing transmission of load generated from the swing arm 102 to the vehicle chassis 200. In one embodiment, the toggle link 212 includes one or more toggle arms having a curved profile extending upwardly towards vehicle front side and connecting the swing arm 102 with the vehicle chassis 200.

[00034] In one embodiment, the swing arm 102 includes a first arm 206, a second arm 208, and an extended arm 214. In one embodiment, the first arm 206 and the second arm 208 are parallel to each other and are disposed parallel to a longitudinal axis of the vehicle 100. For example, the first arm 206 and the second arm 208 are disposed substantially parallel to the ground. In one embodiment, the extended arm 214 is u-shaped and disposed substantially inclined to the first arm 206 and the second arm 208. For example, the extended arm 214 is inclined with respect to the longitudinal axis of the vehicle 100. In one embodiment, the extended arm 214 is disposed from rearward ends of the first arm 206 and the second arm 208 and extending substantially upwardly towards frontside of the vehicle 100.

[00035] In one embodiment, the first arm 206 includes a first wheel mounting bracket 218 disposed at the rearward end of the first arm 206. Similarly, in one embodiment, the second arm 208 includes a second wheel mounting bracket 220 disposed at the rearward end of the second arm 208. The first and the second wheel mounting brackets 218, 220 are disposed substantially parallel to each other capable of receiving both ends of the rear axle that mounts the rear wheel 106 of the vehicle 100. In one embodiment, the u-shaped extended arm 214 is coupled to the first and the second wheel mounting brackets 218, 220 and extends upwardly forward of the vehicle 100.

[00036] In one embodiment, the first arm 206 and the second arm 208 are separated by a distance. The first arm 206 and the second arm 208 are joined at their forward ends by means of a connecting arm 210. In one embodiment, the toggle link 212 is mounted on the connecting arm 210 of the swing arm 102. In one embodiment, the centre stand 110 is mounted on the swing arm 102 through a centre stand mounting slot 216 disposed laterally on both the first and the second arms 206, 208.

[00037] In one embodiment, the Fig. 3 (a) illustrates a swing arm assembly 300 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. For example, the swing arm assembly 300 provides mounting of the IC engine 108 and the air filter sub-assembly 302 on the swing arm 102. In an embodiment, the swing arm assembly 300 includes the IC engine 108 mounted on

the swing arm 102. Similarly, the swing arm assembly 300 also includes the air filter sub-assembly 302 mounted on the swing arm 102.

[00038] In one embodiment, the IC engine 108 is mounted on the swing arm 102 by means of a plurality of engine mounting brackets (shown in Fig. 3 (b)) disposed on the first arm 206, the second arm 208, and the extended arm 214 of the swing arm 102. In one embodiment, the air filter sub-assembly 302 is mounted on the swing arm 102 by means of a plurality of air filter mounting brackets (shown in Fig. 3 (d)) disposed on the extended arm 214 of the swing arm 102. In an embodiment, the IC engine 108 mounted on the swing arm 102 is a four stroke single cylinder engine. For example, mounting the air filter sub-assembly 302 on the swing arm 102 instead of mounting directly on the IC engine 108 ensures that the IC engine 108 is not stressed. In one embodiment, mounting the engine 108 and the air filter sub-assembly 302 on the swing arm 102 ensures that the vibrations generated by the running of the IC engine 108 are not transferred to the vehicle chassis 200. For example, the swing arm 102 absorbing the engine vibrations and shocks and preventing transmission of such vibration and shock to the vehicle chassis 200 ensures that the vehicle 100 can reach high rpm without causing unpleasant riding experience to the rider.

[00039] In an embodiment, Fig. 3 (b) illustrates the swing arm 102 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In an embodiment, the first arm 206 and the second arm 208 of the swing arm 102 are separated by a distance equivalent to the length of at least one intermediate support bracket. For example, the first arm 206 and the second arm 208 are spaced apart by a first support bracket 306 and a second support bracket 308. In one embodiment, the first support bracket 306 is disposed nearer to the connecting arm 210 of the swing arm 102 and farther from the rear axle that mounts the rear wheel 106. For example, the first support bracket 306 is disposed substantially parallel to the connecting arm 210 and substantially perpendicular to the first and the second arms 206, 208.

[00040] In one embodiment, the first arm 206 and the second arm 208 are spaced apart by the second support bracket 308 disposed substantially perpendicular to the first and the second arms 206, 208. In one embodiment, the

second support bracket 308 is disposed substantially nearer to the rear axle that mounts the rear wheel 106 and substantially farther from the connecting arm 210. In an embodiment, one end of the second support bracket 308 is disposed adjoining a bended portion 304 of the second arm 208. In an embodiment, the bended portion 304 of the second arm 208 enables optimal accommodation of the exhaust device, for example, the muffler on the swing arm 102.

[00041] In one embodiment, the swing arm 102 is provided with a plurality of engine mounting brackets 310-1 to 310-6. For example, the first support bracket 306 includes a first engine mounting bracket 310-1 and a second engine mounting bracket 310-2 spaced apart from each other for mounting the front portion of the IC engine 108 to the swing arm 102. Similarly, the second support bracket 308 includes a third engine mounting bracket 310-3 and a fourth engine mounting bracket 310-4 spaced apart from each other for mounting the rear portion of the IC engine 108 to the swing arm 102. Further, in one embodiment, the U-shaped extended arm 214 has one engine mounting bracket 310-5 disposed on a vertical member projecting upwardly forward from the first wheel mounting bracket 218. The U-shaped extended arm 214 is also provided with another engine mounting bracket 310-6 disposed on a horizontal member connecting the vertical members projecting upwardly forward from the first and the second wheel mounting brackets 218, 220. In one embodiment, the engine supporting brackets 310-5 and 310-6 are disposed substantially perpendicular to each other for providing an optimal additional support to the top portion of the IC engine 108. In an embodiment, the plurality of engine mounting brackets 310-1 to 310-6 ensures that the IC engine 108 is optimally mounted ensuring the vibrations and shock generated during the running condition of the IC engine 108 are absorbed and not transferred to other members of the vehicle chassis 200. In an embodiment, a plurality of dual torsion springs (not shown) also called as silent bloc bushes are disposed on each of the engine mounting bracket 310-1 to 310-6 for absorbing engine vibrations and eliminating transfer of vibrations to other members of the vehicle chassis 200.

[00042] In one embodiment, Fig. 3 (c) illustrates the swing arm 102 of the scooter-type vehicle 100, in accordance with an embodiment of the present

subject matter. In an embodiment, the swing arm 102 is provided one or more exhaust mounting brackets that enable mounting of the exhaust device such as the muffler on the swing arm 102. In an embodiment, the second arm 208 is provided with a first exhaust mounting bracket 312-1 disposed adjoining the bended portion 304 of the second arm 208. For example, the first exhaust mounting bracket 312-1 is disposed adjoining one end of the bended portion 304 that is nearer to the second wheel mounting bracket 220.

[00043] In one embodiment, the extended arm 214 is provided with a second exhaust mounting bracket 312-2 disposed substantially closer to a first end 332 of the extended arm 214 that is coupled to the second wheel mounting bracket 220. In an embodiment, the mounting of the muffler (not shown) on the plurality of exhaust mounting brackets 312-1, 312-2 disposed on the swing arm 102 helps in achieving prevention of loads from acting of the IC engine 108. In an embodiment, the first exhaust mounting bracket 312-1 is disposed substantially inclined to the second exhaust mounting bracket 312-2.

[00044] In one embodiment, Fig. 3 (d) illustrates the swing arm 102 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In an embodiment, the first wheel mounting bracket 218 is provided with a slot 314 for mounting the rear suspension device, for example, a rear shock absorber 112. In an embodiment, the suspension mounting slot 314 is disposed adjoining a second end 330 of the extended arm 214. Further, in one embodiment, the base portion of the extended arm 214 is provided with one or more air filter mounting brackets 316-1, 316-2. In an embodiment, the plurality of air filter mounting brackets 316-1, 316-2 are spaced apart from each other for optimally mounting the air filter sub-assembly 302 on the extended arm 214 of the swing arm 102.

[00045] In an embodiment, the first arm 206 of the swing arm 102 is provided with a laterally extending mounting slot 216-1 for mounting the centre stand 110. In an embodiment, the first centre stand mounting slot 216-1 is disposed substantially nearer to one end of the first support bracket 306 disposed substantially perpendicularly between the first arm 206 and the second arm 208. Similarly, a second centre stand mounting slot 216-2 is disposed laterally on the

second arm 208 substantially nearer to the other end of the first support bracket 306. In an embodiment, the centre stand 110 is mounted on the first and the second centre stand mounting slots 216-1, 216-2.

[00046] In one embodiment, Fig. 3 (e) illustrates the swing arm assembly 300 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In an embodiment, the IC engine 108 is mounted on the swing arm 102 such that the vibration load generated during the running of the IC engine 108 are transferred on to the swing arm 102. In an embodiment, when the IC engine 108 is in running condition, the braking system of the vehicle 100 is actuated to decelerate the moving vehicle 100. For example, in order to decelerate the vehicle 100, the rear and front brakes disposed on the rear and front wheel respectively are actuated by the rider of the vehicle 100. In an embodiment, the rear wheel 106 is mounted on to the rear axle through the centre hub 334. In an embodiment, the centre hub 334 of the rear wheel 106 is provided with the brake panel assembly 322 that effects braking of the rear wheel. For example, the brake panel assembly 322 is provided with a plurality of brake shoes (not shown) that are actuated to engage with the centre hub 334 by means of a cam lever, which is actuated by the actuation of rear brake pedal (not shown) by the rider. In an embodiment, the actuation of the plurality of brake shoes generates enormous torque on the brake panel assembly 322, which are transmitted out from the brake panel assembly 322 with the help of a torque link element 318. In an embodiment, the torque link element 318 is disposed substantially tangential to the brake panel assembly 322 so that the torque generated on the brake panel assembly 322 are optimally transmitted out from the brake panel assembly 322. In an embodiment, the tangentially disposed torque link element 318 ensures that reverse torque is not transmitted back to the brake panel assembly 322, which has the potential to cause sufficient damage to the brake panel assembly 322. In one embodiment, a first end 336 of the torque link element 318 is circumferentially connected to the brake panel assembly 322. In an embodiment, the first end 336 of the torque link element 318 and the farther end of the cam lever are laterally spaced apart from each other such that the torque link element 318 do not interfere with the actuation of a rear brake rod (not shown).

[00047] In one embodiment, the torque link element 318 is provided with sufficient length, for example, substantially greater than 186 mm in length. This ensures that the torque link element 318 optimally transmits the torque to a member to which a second end 324 of the torque link element 318 is connected. For example, in one embodiment, the second end 324 of the torque link element 318 is coupled to a boss 320 casted rearwardly on a bottom portion of the IC engine 108. Coupling the second end 324 of the torque link element 318 to the casted boss 320 ensures that no reverse torque is generated back on the brake panel assembly 322. Further, mounting the torque link element 318 on the casted boss 320 of the IC engine 108 ensures that the torque link element 318 is substantially tangential to the brake panel assembly 322 and extends at least for a length of approximately 186 mm.

[00048] In an embodiment, the Fig. 3 (f) illustrates the swing arm assembly 300 of the scooter-type vehicle 100, in accordance with an embodiment of the present subject matter. In an embodiment, the second end 324 of the torque link element 318 is coupled to the second centre stand mounting slot 216-2 and forms a torque link joint 326 on the centre stand mounting slot 216-2. In an embodiment, the torque link joint 326 ensures that the torque link element 318 remains tangential to the brake panel assembly 322 and the torque link element 318 extends at least for a length of approximately 186 mm. In one embodiment, the second end 324 of the torque link element is capable of being mounted on the fourth engine mounting bracket 310-4 disposed on the second support bracket 308 of the swing arm 102. In an embodiment, mounting the second end 324 of the torque link element 318 in any one of the above three locations, i.e., the second support bracket 308, the casted boss 320 on the IC engine 108, and the torque link joint 326 on the second centre stand mounting slot 216-2 ensures that the torque link element 318 optimally extends beyond the bended portion 304 on the second arm 208 and the torque link element 318 remains substantially tangential to the brake panel assembly 322. In an embodiment, the first end 336 of the torque link element 318 is mounted on the brake panel assembly 322 by means of an anti-rotation bolt 328.

[00049] In one embodiment, the swing arm 102 including the first arm 206, the second arm 208, the extended arm 214, the connecting arm 210 comprises a tubular cross-section. Further, in one embodiment, when the swing arm 102 is a plate-type swing arm, for example, a swing arm made of stamped sheet metal, the torque link element 318 can be advantageously disposed in a similar manner, i.e., substantially tangential to the brake panel assembly 322.

[00050] Although the subject matter has been described in considerable detail with reference to certain embodiments thereof, other embodiments are possible. It is to be understood that the appended claims are not necessarily limited to the features described herein. Rather, the features are disclosed as embodiments of the swing arm 102 and the swing arm assembly 300.