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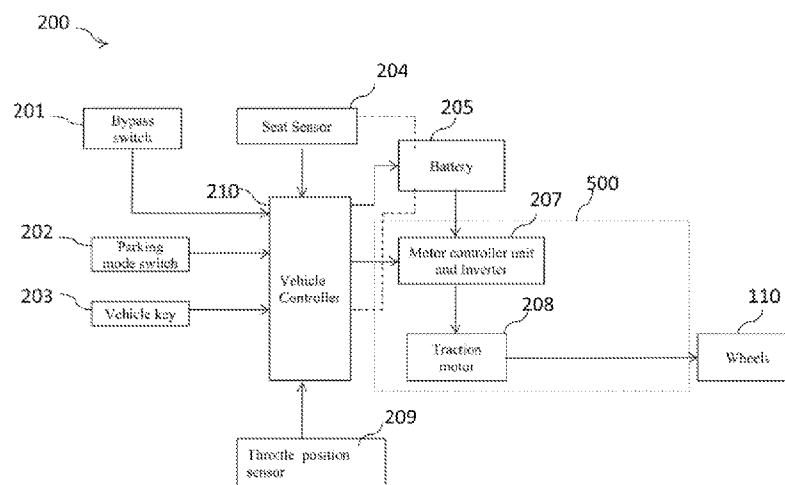


Fig.2

(57) Abstract: The present subject matter generally relates to a saddle type vehicle (100). The present subject matter specifically relates to a throttle interlock system (200) in a saddle type vehicle (100). The present subject matter provides a throttle interlock system (100) which prevents a sudden increase in the speed of the vehicle (100) due to accidental actuation of the throttle control on a handlebar of the vehicle (100) without the intention of the user. The throttle interlock system (200) provides one or more detecting means to detect the position of the user to enable a vehicle controller (210) to determine the intention and the readiness of the user to drive the vehicle. Depending on the position of the user the vehicle controller controls the throttle output to limit the speed of the vehicle thereby eliminating the chances of accidental increase in the throttle output which may lead to fatal conditions.

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A THROTTLE INTERLOCK SYSTEM FOR A VEHICLE

TECHNICAL FIELD

[0001] The present subject matter generally relates to a vehicle. The present subject matter specifically but not exclusively relates to a throttle interlock system in a saddle type vehicle.

5

BACKGROUND

[0002] Generally, in motorcycle the grip on the handlebar can be rotated to control a throttle system of the motorcycle to control the air intake flow and thereby power and the torque output of the engine. The throttle valves are linked to the accelerator hand grip by a throttle cable located on a handle bar of a two or
10 three wheeled vehicle.

[0003] Whereas an electronic throttle control system determines a target throttle valve position based on the accelerator position and various engine operating parameters and based on the control unit decision the position of the throttle valve is regulated electronically.

15

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The detailed description is described with reference to an embodiment of a saddle type scooter along with the accompanying figures. The same numbers are used throughout the drawings to reference like features and components.

[0005] **Fig. 1** illustrates a left side view of an exemplary two-wheeled vehicle, in
20 accordance with an embodiment of the present subject matter.

[0006] **Fig. 2** illustrates an embodiment of the present subject matter depicting the throttle interlock system in an electric vehicle, in accordance with an embodiment of the present subject matter.

[0007] **Fig. 3** illustrates an embodiment of the present subject matter depicting a
25 throttle interlock system in a combustion engine, in accordance with an embodiment of the present subject matter.

[0008] Fig. 4 illustrates a flow chart for the method to actuate the throttle interlock system in a vehicle, in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

5 [0009] Unlike a mechanical throttle system, where the throttle valve is controlled by a throttle cable, the electronic throttle control system controls the opening and closing of the throttle valve electronically. The rider's throttle position and input is determined by an ECU (Engine control unit) through a throttle opening sensor and based on the input received by the ECU from the throttle opening sensor, the
10 ECU makes a decision related to the throttle opening required for a throttle valve. An output signal from the ECU is sent to a DC motor to control the opening of the throttle valve. The DC motor is coupled to the throttle valve by a gear mechanism. Therefore, on the basis of the movement of the DC motor, the throttle valve opens and closes accordingly. The electronic control of the throttle system improves the
15 response time and drivability over the mechanical throttle system.

[00010] The throttle valves are controlled electronically through a DC (Direct current) motor and any rider input in the throttle grip will enable the DC motor to actuate the throttle valve. Unlike IC engine in the vehicle the electric power drive such as electric motor has no audible warning when throttle input is provided
20 especially for an electronic throttle valve. Also, the motor driven electric vehicles have relatively higher acceleration (instantaneous pick up torque) which can lead to unsafe operating condition such as user turning the throttle when not seated on the vehicle. In such a situation, the unintended vehicle movement can lead to an accident. Hence, enabling or disabling the vehicle power drive based on the
25 rider's intention to ride the vehicle attains prime importance in order to provide safety and prevent any accident to happen due to unintentional action. Similarly, when the user parks the vehicle on a side of the road to take a phone call or attend an emergency situation then the user may accidentally operate the throttle or any person may handle the throttle which may increase the throttle output and lead to

vehicle jump off. Therefore there is a need of an improved throttle valve control system which overcomes all above problems and other problems of known art.

[00011] Hence, the present subject matter provides a throttle interlock system in a saddle type vehicle to overcome the problems as stated above. The present subject matter provides a throttle interlock system which prevents sudden increase in the speed of the vehicle due to accidental actuation of the throttle control on a handlebar of the vehicle without the intention of the user. The throttle interlock system provides one or more detecting means to detect the position of the user to enable a vehicle controller to determine the intention and the readiness of the user to drive the vehicle. Depending on the position of the user a vehicle controller controls the throttle output to limit the speed of the vehicle thereby eliminating the chances of accidental increase in the throttle output which may lead to fatal conditions.

[00012] Another embodiment of the present subject matter provides a throttle interlock system with one or more detecting means to detect the position. Detecting means can be a occupant seated condition sensing means provided under the seat of the vehicle, which senses a seating condition of the user. If the user is not in a seating condition (NULL condition) then the vehicle controller limits the vehicle speed up to a predetermined speed which enables the vehicle controller to keep a check on the speed of the vehicle. By reducing the speed of the vehicle based on the seating condition of the user, the probability of sudden increase of the throttle is avoided which helps in preventing any accident or damage to the vehicle. When the user is in the seating condition (not NULL condition) i.e , the user is sitting on a seat, then the occupant seated condition sensing means send a signal to the vehicle controller to indicate that the user is ready to drive the vehicle.

[00013] Similarly, other detecting means can be cameras mounted on the handlebar to determine the user's position and determining the readiness of the user to drive the vehicle. Another detecting means can be a smart phone wirelessly connected to the vehicle controller to indicate the vehicle controller

about the readiness of the user to drive the vehicle. The smart phone is provided with a button which can indicate the vehicle controller that the user is ready to drive the vehicle.

5 [00014] Another embodiment of the present subject matter provides a bypass switch which can bypass the operation of occupant seated condition sensing means detecting the seating condition of the user on the seat of the vehicle. The bypass sensor enables the user to operate the vehicle normally without controlling the throttle output which leads to controlling of the vehicle speed up to predetermined speed. The bypass switch can be enables or disabled by the user
10 manually. Bypass switch can be provided in an application of a smart phone connected wirelessly to the vehicle controller.

[00015] Yet another embodiment of the present subject matter is to provide a tow mode and a default drive mode. The tow mode gets enabled when the bypass switch is disabled and the occupant seated condition sensing means senses the
15 seating condition to be NULL or the when the rider is not seated on the seat of the vehicle. The tow mode restricts the vehicle speed up to a predetermined speed, which is achieved by controlling the throttle opening in a combustion engine vehicle and controlling the traction motor speed in an electric vehicle. The tow mode ensures that the vehicle do not cross a certain speed limit to prevent any
20 accident or damage to the vehicle.

[00016] Whereas the default drive mode gets enabled when the bypass switch is disabled or when the rider is seated on the seat, i.e. the seating condition is not NULL. The default drive mode allows the user to operate the vehicle at a speed proportional to the throttle input and does not sets any speed limit. The tow mode
25 and default drive mode is applicable for both reverse and forward speed of the vehicle.

[00017] Still another embodiment of the present subject matter provides a method to actuate throttle interlock system in a vehicle. The method to actuate the interlock system in the vehicle provides the systematic process of enabling the
30 tow mode and the default mode in the vehicle depending on the input received

from bypass switch condition and the occupant seated condition sensing means by the vehicle controller.

[00018] The exemplary embodiments detailing features regarding the aforesaid and other advantages of the present subject matter will be described hereunder with reference to an embodiment of a two wheeled saddle type motorcycle along with the accompanying drawings. Various aspects of different embodiments of the present invention will become discernible from the following description set out hereunder. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. It should be noted that the description and figures merely illustrate principles of the present subject matter. Various arrangements may be devised that, although not explicitly described or shown herein, encompass the principles of the present subject matter. Moreover, all statements herein reciting principles, aspects, and examples of the present subject matter, as well as specific examples thereof, are intended to encompass equivalents thereof. Further, it is to be noted that terms “upper”, “down”, “right”, “left”, “front”, “forward”, “rearward”, “downward”, “upward”, “top”, “bottom”, “exterior”, “interior” and like terms are used herein based on the illustrated state or in a standing state of the two wheeled vehicle with a driver riding thereon. Furthermore, arrows wherever provided in the top right corner of figure(s) in the drawings depicts direction with respect to the vehicle, wherein an arrow F denotes front direction, an arrow R indicates rear direction, an arrow T denotes upward direction, an arrow D denotes downward direction, an arrow R denotes right side, and an arrow L denotes left side. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[00019] **Fig. 1** illustrates a left side view of an exemplary two-wheeled vehicle (100), in accordance with an embodiment of the present subject matter. The vehicle (100) illustrated, has a schematically shown frame assembly (105) (shown in dotted line). In the present embodiment, the frame assembly (105) is step-through type includes a head tube (105A), and a main frame (105B) that extend

rearwardly downward from an anterior portion of the head tube (105A). The main frame (105B) extends inclinedly rearward to a rear portion of the vehicle (100).

[00020] The vehicle (100) includes one or more prime movers that are connected to the frame assembly (105). In the present implementation, one of the prime
5 movers is an internal combustion (IC) engine (115) mounted to the frame assembly (105). In the depicted embodiment, the IC engine (115) is mounted to a structural member (135) that is pivoted to the frame assembly (105). In one embodiment, the structural member (135) is a rigid member made of metal. The vehicle (100) also includes another prime mover, which is an electric motor (120).
10 In a preferred embodiment, the electric motor (120) is hub mounted to one wheel of the vehicle (100). In another embodiment, more than one electric motor is mounted to wheels of the vehicle. In the depicted embodiment, the vehicle (100) includes at least two-wheels and the electric motor (120) is hub mounted to the rear wheel (125) of the vehicle. A front wheel (110) is rotatably supported by the
15 frame assembly (105) and is connected to a handle bar assembly (130) that enables manoeuvring of the vehicle (100).

[00021] Further, the vehicle (100) includes a high capacity on-board battery (not shown) that drives the electric motor (120). The high capacity battery may include one or more high capacity battery packs or one or more low capacity cells. The
20 high capacity battery can be disposed at a front portion, a rear portion, or at the centre of the vehicle (100). The high capacity battery is supported by the frame assembly (105) and the vehicle (100) includes plurality of body panels, mounted to the frame assembly (105) for covering various components of the vehicle (100). The plurality of panels includes a front panel (140A), a leg shield (140B), an
25 under-seat cover (140C), and a left and a right side panel (140D). A glove box may be mounted to a leg shield (140B).

[00022] A floorboard (145) is provided at the step-through portion defined by the main frame (105B). A seat assembly (150) is disposed rearward to the step-through portion and is mounted to the main frame (105B). The seat assembly
30 (150) that is elongated in a longitudinal direction F-R of the vehicle (100) enables

the user to operate the vehicle in a saddle ride-type posture. One or more suspension(s) connect the wheels (110), (125) to the vehicle (100) and provide comfortable ride. The vehicle (100) comprises of plurality of electrical and electronic components including a headlight (155A) movably supported on a head tube (105A), a taillight (155B), a starter motor (not shown), a horn etc. Also, the vehicle (100) includes a master control unit (not shown) that takes control of the overall operation of the vehicle (100) including the function of the IC engine (115), the electric motor (120), charging of the batteries from a magneto/integrated starter generator (ISG), driving of loads by the magneto/ISG, charging of the high capacity batteries by the electric motor operating in generator mode, and any other operations associated with the operation of the vehicle (100).the vehicle (100) can be a two-wheeled saddle type or a three wheeled vehicle.

[00023] Fig. 2 illustrates an embodiment of the present subject matter depicting the throttle interlock system (200) comprising a vehicle controller (210) (such as an ECU) connected to a traction motor (208) of an electric vehicle through a motor controller unit (207). The vehicle controller (210) is connected to a vehicle key (203), which provides access to the vehicle (100) and allows the user to start the vehicle (100). Further, the vehicle controller (210) is electrically connected to at least a detecting means such as occupant seated condition sensing means (204) for an embodiment. The occupant seated condition sensing means (204) senses the presence or the absence of the user and sends the signal to the vehicle controller (210). Input from the occupant seated condition sensing means (204) enables the vehicle controller (210) to determine a seating condition or seated presence of the user. Similarly, the detecting means can be one or more camera mounted on the vehicle (100) to detect the position of the user with respect to the vehicle (100). The vehicle key (203) can be a wireless key or a mechanical key.

[00024] The vehicle controller (210) is powered by a power source such as a battery (205) (power flow from the battery to the vehicle controller (210) is represented by a dotted line). The power from the battery (205) also drives the

traction motor (208) through motor controller unit (207) to drive the wheels (110) of the vehicle (100). The traction motor (208) is controlled by a motor controller unit (207) which also has an inverter circuit to convert the DC power from the battery (205) into an AC power to run the traction motor (208). The motor control
5 unit (207) along with the traction motor (208) forms an actuating means (500). and the vehicle controller (210) actuates the motor controller unit (207) depending on the input received from the occupant seated condition sensing means (204).

[00025] The user uses a throttle control provided on a handlebar of the vehicle (100) and an electric throttle control has a throttle position sensor (209) which
10 senses the degree of rotation and the vehicle controller (210) receives the signal from the throttle position sensor (209) after which the vehicle controller (210) controls the traction motor (208) through motor controller unit (207). Therefore, the motor controller unit (207) controls the speed of the traction motor (208) based on the throttle input received from the throttle position sensor (209).
15 Depending on the throttle position/ throttle input, the amount of current to the traction motor (208) is controlled by the motor control unit (207).

[00026] The user switches ON the vehicle using a vehicle key (203), which can be a mechanical key or a wireless key. After switching ON the vehicle key (203), the user may operate the throttle control to run the vehicle (100) but sometimes the
20 user may give throttle input accidentally which may lead to sudden jerk or set the vehicle into motion without the intention of the user. This sudden change in the motion of the vehicle (100) may lead to an accident.

[00027] When the vehicle (100) runs on an internal combustion engine, the sound of the throttle operation may alert the user because of the sound that is typically
25 generated by the combustion of fuel. But in the case of electric motor driven vehicle (100), the absence of sound would not enable the user to know whether the throttle input is high or low, which increases the chances of wrongful operation of the throttle control without the intention. Hence, it becomes necessary to provide a mechanism which would prevent such sudden change in
30 the vehicle (100) speed due to uncontrolled throttle input. In order to solve the

above mentioned problem the throttle interlock system (200) is provided with one or more detecting means to detect the user's presence and alter the throttle output accordingly. A occupant seated condition sensing means (204) is mounted below the seat (150) of the vehicle (100). The seating condition detected by the occupant
5 seated condition sensing means (204), enables the vehicle controller (210) to control the throttle output and thereby controlling the traction motor (208). The occupant seated condition sensing means (204) can be a proximity sensor based on infrared.

[00028] If the user is in a seating condition then vehicle controller (210) enables
10 default drive mode which allows the user to provide throttle input as per requirement and the throttle output controlling the traction motor (208) changes according to the throttle input provided by the throttle control. But when the user is not in a seating condition then the vehicle controller (210) controls or alters the throttle output and the traction motor speed is limited up to a predetermined
15 speed.

[00029] The vehicle (100) enters in a tow mode when the seating condition of the user is NULL or when the user is not occupying the seat (150) in the vehicle (100). In tow mode, no matter how much throttle input is provided, the throttle output remains restricted and cannot go beyond a predetermined value and hence
20 the traction motor (208) speed does not increase beyond a predetermined safe speed. The predetermined speed can be 5kmph, which can ensure safety to the user. The tow mode can help the user to take the vehicle to a nearby repair shop when the vehicle (100) gets punctured without giving additional manual push. Through tow mode the user can give throttle input and the vehicle can be set in
25 motion but at a low speed and thereby putting less strain on the user during the process of dragging the vehicle (100) on the road with a punctured tyre.

[00030] The vehicle controller (210) controls the speed of the traction motor (208) both in a forward direction and in a reverse direction. When a parking mode switch (202) is enabled the reverse direction speed remains below predetermined
30 speed. This helps the user park the vehicle (100) in a cramped parking space

where sudden jerk or increase in the speed may cause damage to the nearby objects. The predetermined safe speed is in a forward direction when the vehicle is operated in a normal mode and in a reverse direction when the vehicle is operated in a parking mode by activating the parking mode switch.

5 [00031] Further, the vehicle controller (210) is electrically connected to a bypass switch (201) which bypasses the sensing operation of the detecting the presence of the user in a seated condition occupant seated condition sensing means. As per an embodiment, on switching ON of the bypass switch (201), the vehicle controller (210) stops receiving the input from the occupant seated condition sensing means
10 (204). The bypass switch (201) allows the user to eliminate the limitation or restriction put on the vehicle (100) speed. The bypass switch (201) can be provided on an instrument cluster of the vehicle (100) or a touch button in an application provided in a smart phone which can be wirelessly connected to the instrument cluster of the vehicle (100). The bypass switch (201) can be enabled or
15 disabled by the user manually. If the bypass switch (201) is disabled by the user then the vehicle (100) enters into the default drive mode and the vehicle controller (210) no longer senses the presence of the user's seating condition.

[00032] Fig. 3 illustrates an embodiment of the present subject matter depicting the throttle interlock system (200) comprising a vehicle controller (210) with a
20 throttle motor (206) to control the throttle valve (301) opening for controlling the combustion in an engine (302). The vehicle controller (210) receives a throttle input from the throttle position sensor (209). Depending on the input received from the occupant seated condition sensing means (204) to the vehicle controller (209), the throttle motor (206) is controlled.

25 [00033] When the seating condition of the user is NULL (user not seated on the seat) and the bypass switch (201) is disabled, the vehicle (100) enters in a tow mode. The vehicle controller (210) limits the throttle motor (206) operation so that the throttle valve (301) opening is limited to a predetermined throttle opening which limits the speed of the vehicle (100) up to a predetermined speed. The
30 controlled throttle valve (301) opening controls the combustion of fuel in the

engine (302) and therefore, the power transferred to the drive wheels (110) also reduces. The throttle motor (206) along with throttle valve (301) and engine (302) form an actuating means (500) and the vehicle controller (210) actuates the throttle motor (206) depending on the input received from the occupant seated
5 condition sensing means (204)

[00034] When the seating condition is not NULL (user is seating on the seat) then the vehicle (100) enters into the default drive mode. The vehicle controller (210) does not limit the throttle motor (206) function to operate the opening of the throttle valve (301) and the user can open the throttle valve (301) as per the
10 requirement.

[00035] Fig. 4 illustrates a flow chart for the method to actuate the throttle interlock system (200) in a vehicle (100). In step 401, the vehicle (100) is switched ON through a vehicle key (203) which can be a mechanical key or a wireless key with an immobilizing device in the vehicle (100). In step 402, the
15 vehicle controller (210) checks whether the bypass switch (201) is enabled or not. If the bypass switch (201) is disabled then in step 403, the rider's seating condition is checked otherwise if the bypass switch (201) is enabled then in step 407, the vehicle controller (210) enables the default drive mode which allows the user to provide a throttle input as per the requirement and in step 408, the output
20 speed of the vehicle (100) is proportional to the throttle input.

[00036] Whereas if the rider is in a seating condition in step 403, then in step (404), the vehicle (100) enters in a tow mode where the output speed of the vehicle (100) is not proportional to the throttle input and the vehicle (100) speed is controlled or restricted up to a predetermined safe speed by controlling the throttle
25 valve (301) opening in a vehicle (100) with a internal combustion engine. If the vehicle (100) is electric then the traction motor (208) speed is controlled in step 405 which leads to restriction in the speed of the vehicle (100) and remains below or equal to the predetermined safe speed. In step 406, the speed in both forward and reverse direction is limited up to the predetermined speed.

30

LIST OF REFERENCE NUMERALS

	taillight (155B)
vehicle (100)	20 throttle interlock system (200)
frame member (105)	vehicle controller (210)
5 head tube (105A)	traction motor (208)
main frame (105B)	vehicle key (203)
engine (115)	occupant seated condition sensing
structural member (135)	25 means (204)
electric motor (120)	battery (205)
10 rear wheel (125)	throttle position sensor (209)
handle bar assembly (130)	motor controller unit (207)
front panel (140A)	parking mode switch (202)
leg shield (140B)	30 bypass switch (201)
under-seat cover (140C)	throttle motor (206)
15 right side panel (140D)	throttle valve (301)
seat assembly (150)	engine (302)
wheels (110), (125)	
headlight (155A)	35 actuating means (500)

We claim:

1. A throttle interlock system (200) for a vehicle(100) comprising:
a vehicle controller (210) powered by a power source (205) after a vehicle
key (203) is switched ON,
5 said vehicle controller (210) electrically connected to a throttle position
sensor (209) to receive a position of a throttle actuator of said vehicle
(100);
at least one detecting means to detect a seating condition of a user to
enable at least a mode of said vehicle (100); and
10 said vehicle controller (210) actuates at least an actuating means (500) to
restrict the speed of said vehicle (100) up to a predetermined safe speed
based on said seating condition through a prime mover.
2. The throttle interlock system (200) for a vehicle (100) as claimed in
claim1, wherein said at least an actuating means are one or more of a
15 throttle motor (206) and a motor control unit (207).
3. The throttle interlock system (200) for a vehicle (100) as claimed in
claim1, wherein said at least a detecting means is a occupant seated
condition sensing means (204) to detect the presence of the user mounted
below a seat (150) of the vehicle (100).
- 20 4. The throttle interlock system (200) for a vehicle (100) as claimed in
claim3, wherein said occupant seated condition sensing means (204) is a
proximity sensor.
5. The throttle interlock system (200) for a vehicle (100) as claimed in
claim1, wherein said at least a detecting means is a camera mounted on the
25 vehicle (100).
6. The throttle interlock system (200) for a vehicle (100) as claimed in
claim1, wherein said mode is one or more of a tow mode and a default
drive mode.

7. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein a bypass switch (201) is electrically connected to said vehicle controller (210) to enable or disable said occupant seated condition sensing means sensing of presence of user seated condition on the vehicle 100.
8. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said at least a prime mover is an internal combustion engine (302).
9. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said at least a prime mover is a traction motor (208).
10. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said vehicle controller (210) is electrically connected to a parking mode switch (202).
11. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said predetermined safe speed is in a forward direction in a normal mode.
12. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said predetermined safe speed is in a reverse direction when a parking mode switch (202) activated.
13. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said vehicle controller (210) controls said at least a prime mover in a tow mode,
wherein, said tow mode gets enabled when said seating condition is NULL.
14. The throttle interlock system (200) for a vehicle (100) as claimed in claim1, wherein said vehicle controller (210) controls said at least a prime mover in a default drive mode.

wherein, said default drive mode gets enabled when said seating condition is NOT NULL.

15. A method to actuate throttle interlock system (200) in a vehicle (100) comprising the steps of:

5 switching ON the vehicle (100) through a vehicle key (203);

 checking a seating condition of a user through a occupant seated condition sensing means (204);

 controlling at least a prime mover by actuating at least an actuating means;
 and
10 limiting a forward speed and a reverse speed up to a predetermined speed when the user is sensed to be in a seated condition on the vehicle 100.

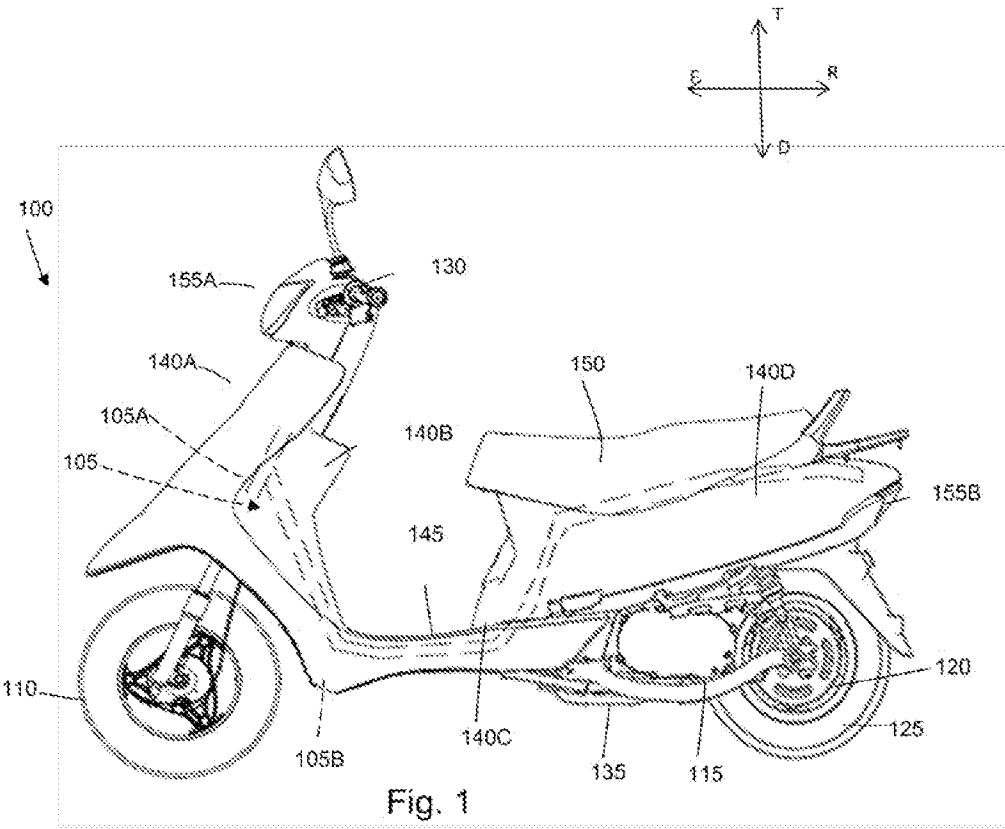
16. The method to actuate throttle interlock system (200) in a vehicle (100) as claimed in claim 15, wherein checking a seating condition of a user through an occupant seated condition sensing means (204) is carried out
15 only when a bypass switch (201) is disabled.

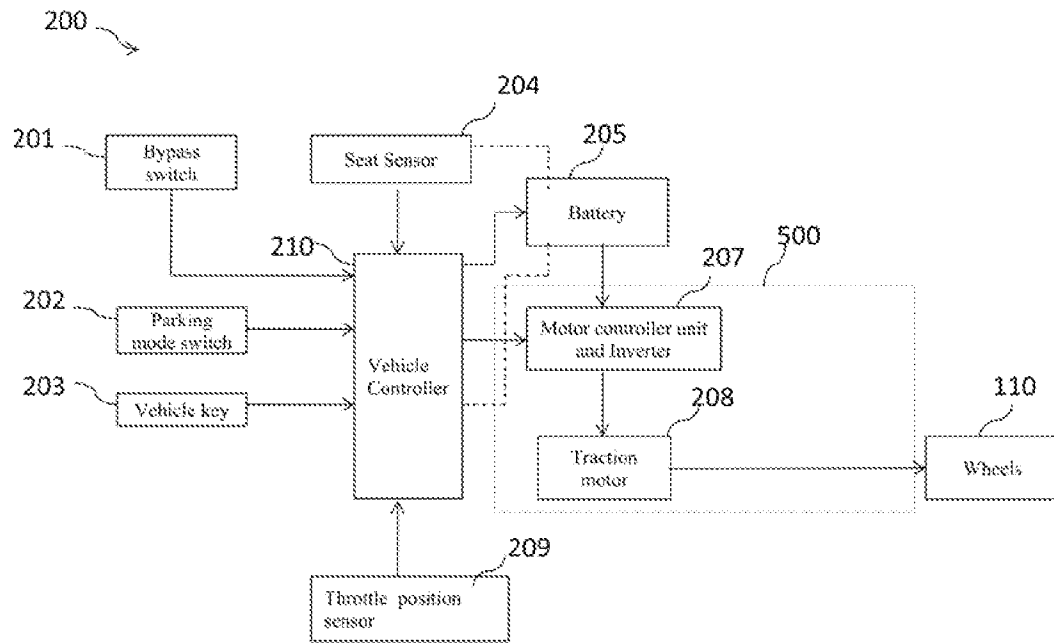
17. The method to actuate throttle interlock system (200) in a vehicle (100) as claimed in claim 16, wherein enabling a tow mode if said bypass switch (201) is disabled,

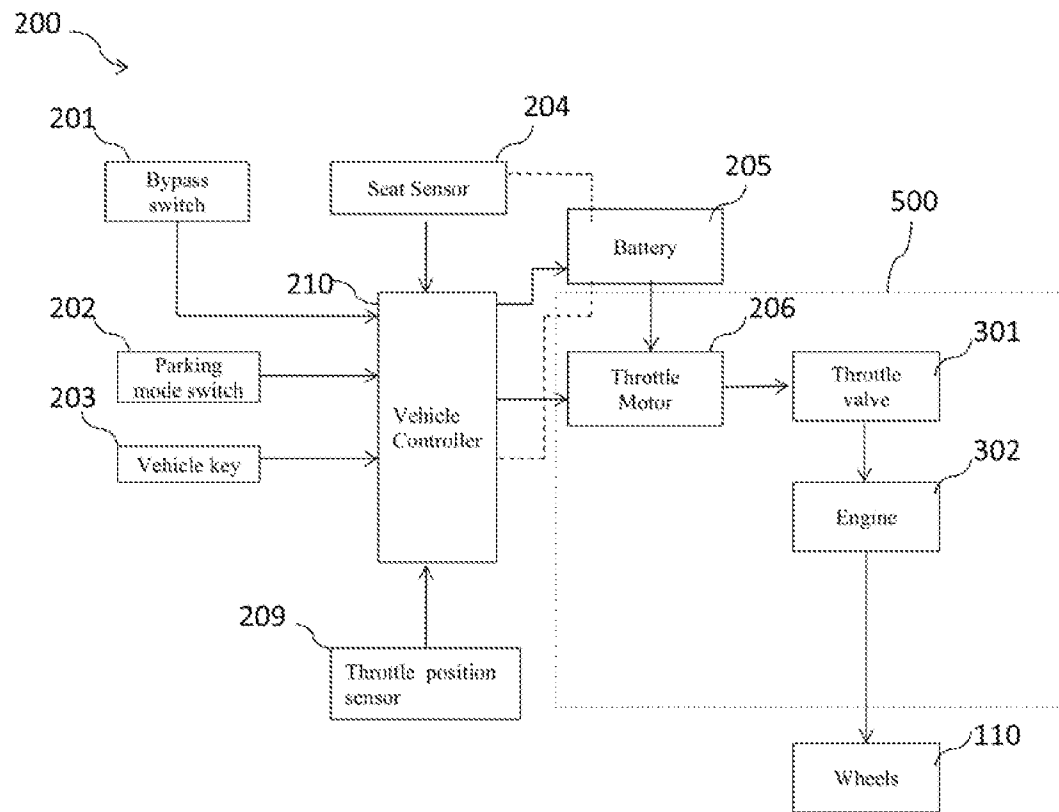
 wherein an output speed of said vehicle (100) is limited to a
20 predetermined safe speed.

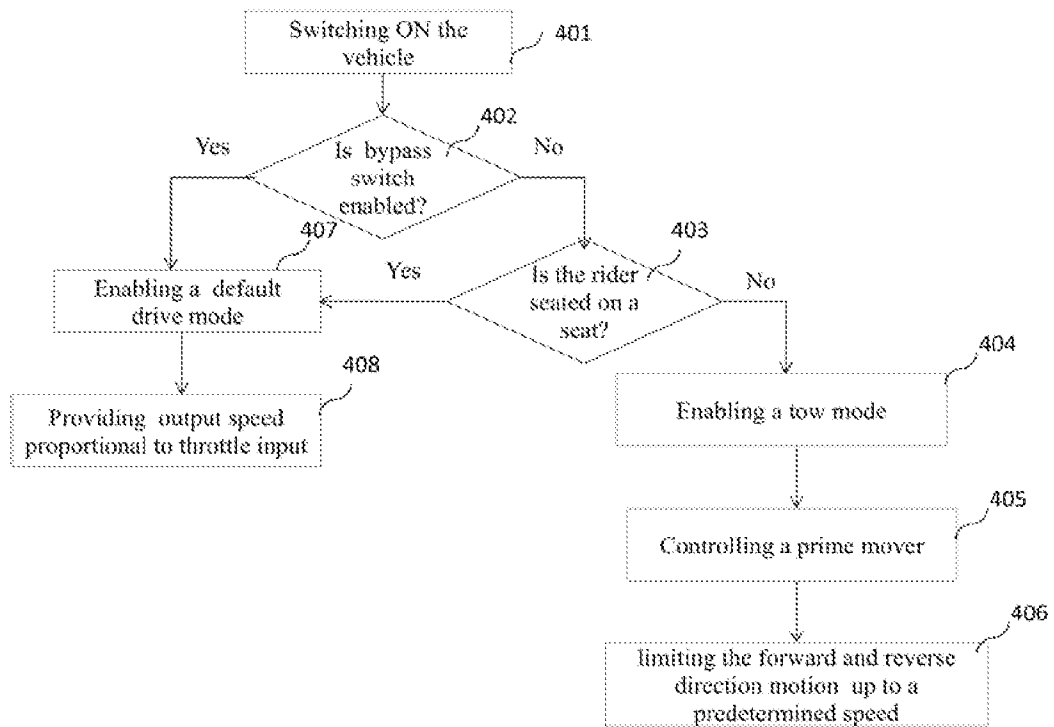
18. The method to actuate throttle interlock system (200) in a vehicle (100) as claimed in claim 16, wherein a default drive mode is enabled when said bypass switch (201) is switched ON,

 wherein, an output speed of said vehicle (100) is proportional to a
25 throttle input.



**Fig.2**

**Fig.3**

**Fig.4**

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2020/050873

A. CLASSIFICATION OF SUBJECT MATTER INV. B62J27/00 B62K23/02 B62M23/02 B60K28/04 F02D11/10 B60L15/10 B60L15/20 B60L3/00 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) B62K B62M B62J B60K F02D B60L B60W 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" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">X</td> <td>FR 2 735 080 A1 (PEUGEOT MOTOCYCLES SA [FR]) 13 December 1996 (1996-12-13)</td> <td style="text-align: center;">1-7,9-18</td> </tr> <tr> <td style="text-align: center;">A</td> <td>the whole document</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US 9 758 040 B1 (REID SHANE CHRISTOPHER [US] ET AL) 12 September 2017 (2017-09-12)</td> <td style="text-align: center;">1-6,8-15</td> </tr> <tr> <td style="text-align: center;">A</td> <td>the whole document</td> <td style="text-align: center;">7,16-18</td> </tr> <tr> <td style="text-align: center;">X</td> <td>JP 2006 051853 A (HONDA MOTOR CO LTD) 23 February 2006 (2006-02-23)</td> <td style="text-align: center;">1-6,9-15</td> </tr> <tr> <td style="text-align: center;">A</td> <td>figures 2,5,6</td> <td style="text-align: center;">7,8,16-18</td> </tr> <tr> <td style="text-align: center;">X</td> <td>CN 104 139 711 A (BOSCH AUTOMOTIVE PROD SUZHOU) 12 November 2014 (2014-11-12)</td> <td style="text-align: center;">1-6,8-15</td> </tr> <tr> <td style="text-align: center;">A</td> <td>figures 1-3</td> <td style="text-align: center;">7,16-18</td> </tr> <tr> <td></td> <td style="text-align: center;">-/--</td> <td></td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	FR 2 735 080 A1 (PEUGEOT MOTOCYCLES SA [FR]) 13 December 1996 (1996-12-13)	1-7,9-18	A	the whole document	8	X	US 9 758 040 B1 (REID SHANE CHRISTOPHER [US] ET AL) 12 September 2017 (2017-09-12)	1-6,8-15	A	the whole document	7,16-18	X	JP 2006 051853 A (HONDA MOTOR CO LTD) 23 February 2006 (2006-02-23)	1-6,9-15	A	figures 2,5,6	7,8,16-18	X	CN 104 139 711 A (BOSCH AUTOMOTIVE PROD SUZHOU) 12 November 2014 (2014-11-12)	1-6,8-15	A	figures 1-3	7,16-18		-/--	
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Date of the actual completion of the international search 9 March 2021		Date of mailing of the international search report 17/03/2021																														
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Truchot, Alexandre																														

INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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