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(54) MOUNTING FOR AN EXHAUST EMISSION SYSTEM OF A MOTOR VEHICLE

(57) The present invention relates to a mounting arrangement for an exhaust emission system (17) of a two-wheeled vehicle (10). As per the present subject matter, said vehicle (10) comprises of an intermediate mounting assembly (230) through which said exhaust emission system (17) is attached to a footrest assembly (12) of said vehicle (10). Said intermediate mounting assembly (230) is provided to stably mount said exhaust emission system (17) and arrest the vibrations which it goes through. In addition to it, said flexible mounting assembly (230) arrests and controls the vibrations of said exhaust emission system (17) in all the directions, be it along the vehicle lengthwise, height wise and width wise.

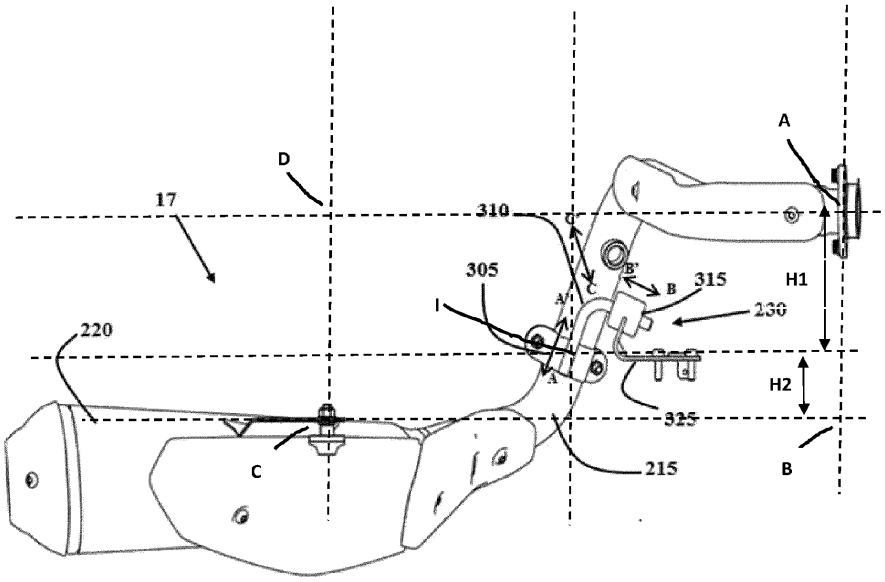

Figure 5

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Description

FIELD OF INVENTION

[0001] The present invention relates to a motor vehicle and more particularly to an exhaust emission system for the internal combustion engine of a motor vehicle.

BACKGROUND OF INVENTION

[0002] Generally, an internal combustion engine of a vehicle receives an air-fuel mixture which is burnt to generate power for transmission of the vehicle. However, after the burning of the gases a substantial amount of exhaust in the form of harmful HC, NOx and CO is generated. This harmful exhaust leaves the internal combustion engine from an exhaust port provided on the internal combustion engine. An exhaust pipe extends in a downward rearwardly fashion from the exhaust port through which the gases travel to reach the muffler unit. A set of catalysts are provided either in the exhaust pipe or in the muffler unit, to oxidize the harmful gases. Mostly, the combination of exhaust pipe and muffler unit constitute as an exhaust emission system used by the vehicle.

[0003] Conventionally, in motor vehicles, muffler units are also provided to dampen noise arising from the engine and prevent the harmful oxides from entering in the atmosphere. Generally, the muffler unit comprises of baffle pipes and chambers to increase the flow of the gas and dampen the sound coming from the engine, whereas it also comprises of catalytic converters to reduce and convert harmful NOx to N2 before it gets released into the atmosphere. Typically, the exhaust emission system also comprises of a tail pipe located at the end of the muffler unit. The tail pipe is disposed after the baffle pipe such that, after travelling through the baffle pipe, exhaust would flow out of tail pipe to enter the atmosphere.

[0004] Typically, the exhaust emission system is located at a rear portion of the vehicle & is disposed on either of its sides. Generally, the exhaust emission system is mounted on the frame assembly for a stable support. The exhaust emission system is one of the embodiments most prone to vibrations. Thus, mounting of the exhaust emission system is one of the most critical aspects. Due to the intense working operation and complex arrangement, the exhaust emission system needs a very stable support and mounting. Such a mounting is required to eliminate undesirable vibration of the exhaust emission system. Typically, exhaust leaves the muffler unit through the tail pipe at a great speed and pressure, because of which the exhaust emission system and the muffler unit in particular experiences vibrations. These gases will flow through the exhaust pipe which is supported mainly by clamps connected to an engine. Also, the exhaust pipe is subjected to several types of stress most of which arise due to vibration because of which fatigue life of the system is reduced. Hence, it becomes even more important to provide the exhaust emission system with a stable mounting to control such vibrations. Excessive & undesirable vibrations tend to exert excess loads on the mounting structure of the exhaust system as well as the vehicle system. Further, silencer has to reduce the noise as well as the vibrations. In doing so, it is subjected to various failures which can occur due to temperature range, vibration and fatigue as discussed above, this cases cracks. It can also potentially lead to undesirable irritation e.g. rattling noise & eventually lead to crack or structural breakage of the system resulting in poor durability & reliability. The problem of vibration is further compounded in two & three wheeled vehicles on account of their size, high payload to power ratio as well as factors like need of compact packaging, low weight, low cost, low part count, excess forces owing to usage on bad road conditions in developing economies, etc.

[0005] To achieve such an objective some of the known arts mount the exhaust emission system to the frame or chassis assembly of the vehicle. The frame assembly acts as a skeleton and support for the vehicle. However, even after mounting the exhaust emission system to the frame assembly it experiences vibrations which is a critical problem. It is the vibrations of the exhaust emission system and muffler unit in particular which needs to be controlled / minimized and arrested as far as possible to minimize cracks, improve life cycle and efficiency of the overall exhaust system.

[0006] Hence, it is desired to have an improved mounting assembly for the exhaust emission system which restricts the vibrations experienced by it and provides a stable mounting for the exhaust emission system onto the vehicle.

BRIEF DESCRIPTION OF DRAWINGS

[0007] The detailed description of the present subject matter is described with reference to the accompanying figures. Same numbers are used throughout the drawings to reference like features and components.

Figure **1** illustrates a side view of an exemplary two-wheeled vehicle, in accordance with an embodiment of the present subject matter.

Figure **2** illustrates a perspective view of an exhaust emission system being connected to an internal combustion

engine in accordance with an embodiment of the present subject matter.

Figure **3** illustrates an exploded view of a flexible mounting assembly with respect to a footrest assembly in accordance with an embodiment of the present subject matter.

Figure **4** illustrates an exploded view of a flexible mounting assembly attached to the footrest assembly in accordance with an embodiment of the present subject matter.

Figure **5** illustrates a perspective view of the flexible mounting assembly attached to the exhaust emission system in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

[0008] Generally, a two-wheeled or a three-wheeled vehicle comprises of a frame assembly extending rearwardly from a head tube. The frame assembly acts as a skeleton and a structural member for the vehicle that supports the vehicle loads. The frame structure also comprises of a down tube extending in a downward and rearward direction from the head tube, and a main tube extending in a straight and forward direction from the head tube. At least one front wheel is connected to a front portion of the frame assembly through one or more front suspension(s). The frame assembly extends towards a rear portion of the vehicle. At least one rear wheel is connected to a frame assembly through one or more rear suspension(s). The frame assembly comprises of a head tube disposed in a front portion of the vehicle, wherein a down tube extends from the head tube in a downward and rearward manner. In one of the embodiments, at least one main tube is typically provided which extends in a substantial straight and rearward fashion from the head tube. In one of the embodiments, in addition to it, a pair of cross tubes may be provided at a rearmost portion of the vehicle to accommodate a seat assembly.

[0009] Moreover, the frame assembly also comprises of an engine assembly mounted to it. The engine assembly is functionally connected to the rear wheel, which provides forward motion to the vehicle. A muffler unit is provided at a rear portion of the vehicle which is also mounted to the frame assembly or to the vehicle through a mounting means e. g. a bracket. Typically, plurality of panels is mounted to the frame assembly that covers various vehicle parts mounted thereon.

[0010] Mostly, it is the internal combustion engine which generates power for the vehicle. An air-fuel mixture is supplied to the internal combustion engine by means of a carburetor. Thereafter combustion of the air fuel mixture takes place so that at least one piston disposed in the internal combustion engine is set into motion. The piston is operated in a linear motion, after which said linear motion is converted to a rotational motion of a crankshaft, which is finally transferred to the rear axle.

[0011] Moreover, the two-wheeled or three wheeled vehicle comprises of an exhaust emission system extending in a downward manner from the internal combustion engine towards a rear portion of the vehicle. The unburnt air-fuel mixture in form of exhaust gases being emitted from the internal combustion engine is emitted in the atmosphere after the oxidation reaction in the exhaust emission system. Typically, a catalytic converter is provided in an exhaust pipe or a muffler unit, to enable oxidation of the unburnt gases such that the toxic gases are converted to less harmful gases. The muffler unit is also meant for achieving overall noise reduction. After all the reaction and process, the exhaust leaves the exhaust emission system at a great speed and pressure. As an automobile exhaust system comprises of various components or parts of an automobile engine, which are used for discharging burned gases or steam, it is to be noted that engine vibrations can easily shake the exhaust pipe enough to cause component rattling on impact. Damping of such mentioned vibrations should be done to such an extent so that each component can perform intended function to their maximum extent with good life & durability. The exhaust emission system helps in filtering and releasing the exhaust being generated by internal combustion engine of the vehicle. Generally, vehicles suffer from the negative effects of vibration during movement. Vibration is a mechanical phenomenon whereby oscillations occur about an equilibrium point. More often this vibration is undesirable and results in wastage of energy and creation of unwanted sound, i.e. noise. The vibrations which are observed during the vehicle movement results in making the exhaust components to perform at a level which is very lower than their actual performance level over a period of time. Due to its nature of work the exhaust emission system is highly prone to vibrations. When the vibrations created in a vehicle engine are transferred to the exhaust system frequently, they can potentially cause the breakage in the exhaust manifold. Also, there are generally two types of vibrations that can affect the exhaust system, they are firstly, the sonic pressure waves coming from the exhaust ports and secondly, the vibration of the engine itself because of torqueing. When combined together, these vibrations can play a critical role in affecting the performance of the overall system as well as the health of the rider in a negative way. Thus, it is highly critical to keep a check on the above discussed variables in accounting for vibration levels and also to control such vibrations to improve the durability of the necessary components.

[0012] Further, since the exhaust emission system experiences a lot of vibrations because of the above described

process, there is a need for a stable mounting to be provided for the exhaust emission system to hold it and control the vibrations. Mostly, the exhaust emission system is mounted on two locations, first being the frame assembly and the other being internal combustion engine of the vehicle. Generally, a set of mounting flanges is provided on the exhaust emission system, one being disposed on the muffler unit through which it is mounted on the frame assembly, and the other one provided on the exhaust pipe through which it is mounted on a cylinder head of the internal combustion engine. However, such an assembly is not able to fully restrict the vibrations experienced by the exhaust emission system and muffler unit. Additionally, vibrations tend to increase with the increase in the power output of the engine / power train, vehicle speed, engine rpm as well as how well is the engine balanced. Unbalanced forces of the IC engine give rise to excitation energy leading to adverse vibrations of the exhaust system. In a typical two & three wheeled saddle type vehicle, the mounting & structural rigidity of the exhaust system can have potential impact on the dynamic performance behavior of the vehicle especially during out of plane maneuvers. For good handling & dynamic performance the rigidity of the structure is desirable to be high which can de detrimental to adequately damping the vibrations of the exhaust system. Typically exhaust system are mounted with an upstream & a downstream mounting to support the system. Any increase in the rigidity of the system or its mountings to control the vibrations as well as enhance structural rigidity can be detrimental to the life, durability & dampening of the exhaust mounting system as well as the vehicle parts which is undesirable. However, the need for enhanced structural & mounting rigidity contradicts the need for vibration isolation. Additionally, layout constraint in the vehicle & packaging constraint the disposition of the exhaust system the exhaust pipe routing as well as peripheral parts like footrest etc. making it difficult to adequately mount the exhaust system while still maintaining low vehicle height & good ground clearance. Thus, there exists a need of having an improved solution for the mounting of an exhaust system for a two & three wheeled saddle type vehicle overcoming all of the above stated problems.

[0013] In one of the known arts especially in a two wheeled vehicle, a third mounting arrangement is provided on the exhaust pipe through which it is mounted on a footrest assembly of the vehicle. A circular slot is provided as the third mounting bracket in which a mounting arm is inserted. The slot perfectly accommodates the mounting arm but is not able to restrict the vibrations in all directions. The slot and mounting bracket are able to control the vibrations generated in a horizontal plane along the vehicle length, but is not able to control the vibrations and movement of the exhaust emission system occurring in any other direction or plane, be it an upward and downward direction in a vertical plane along the vehicle height, or vibrations and movements occurring in a left-right direction along the vehicle width. In furtherance to it, the mounting assembly described is very rigid and is not able to restrict the vibrations effectively without hampering durability. Furthermore, in such a mounting assembly the vibration of the exhaust emission system is transferred to the footrest assembly which needs to be avoided, keeping in mind the vehicle stability and the rider's comfort. Lastly, the current mounting assembly is not easy to assemble nor is easy to access, hence hinders its serviceability as well.

[0014] Hence, an objective of the present subject matter is to provide a mounting assembly for the exhaust emission system which efficiently restricts as well as dampens its vibrations & overcomes all the above cited problems & other problems known in thee art. In furtherance to it, the present subject matter also provides an improved mounting assembly with an enhanced ease of assembly, accessibility which does not allows the vibrations to get transferred to the footrest assembly.

[0015] In an embodiment, a two-wheeled vehicle comprises of a frame assembly extending rearwardly from a head tube. The frame assembly comprises of a head tube formed in a front portion of the vehicle, and a mainframe assembly extending in a rearward downward fashion from the head tube along the length of the vehicle. In addition to it, the frame assembly comprises of a pair of side tubes extending in a rearward upwardly fashion from the end of the mainframe assembly. The vehicle comprises of a rear wheel connected to the frame assembly through one or more rear suspension(s) and front wheel connected to a front portion of the frame assembly through one or more front suspension(s). In an embodiment, the vehicle comprises of an internal combustion engine functionally connected to the rear wheel, and mounted through the frame assembly. The internal combustion engine comprises of a cylinder block over which a cylinder head is disposed. The combustion of the air-fuel mixture occurs in the cylinder head, wherein the cylinder head also accommodates the reciprocatory motion of a piston disposed in the cylinder block. In an embodiment, the vehicle comprises of an exhaust emission system located on its rear portion.

[0016] In an embodiment, the two-wheeled or three wheeled vehicle comprises of an exhaust emission system to oxidize the exhaust emissions being generated by the internal combustion engine. The exhaust emission system comprises of an exhaust pipe connected to the internal combustion engine and extending in a rearward downwardly fashion from it. The exhaust being generated from the internal combustion engine travels through the exhaust pipe to enter a muffler unit connected to it at its other end. The muffler unit comprises of one or more catalytic converter(s) which help in oxidation and reduction of the exhaust entering the muffler unit. The muffler unit comprises of a baffle assembly including chambers and baffle pipes through which the exhaust flows before leaving the muffler unit. In an embodiment, the muffler unit comprises of a tail pipe located at its end, being disposed after the baffler pipe. After flowing through the baffler pipe(s) the exhaust enters the tail pipe through which it flows out of the muffler unit into the atmosphere.

[0017] In an embodiment, the exhaust emission system is supported through mounting it on a frame assembly and a cylinder head of an internal combustion engine. A pair of mounting flanges is provided on the exhaust emission system, namely a first mounting flange formed on the exhaust pipe also referred as upstream mounting through which it is mounted on the cylinder head, and a second mounting flange formed on the muffler unit also referred as downstream mounting through which it is mounted on the frame assembly. As per the present subject matter, additional third mounting means i.e. an intermediate mounting assembly is provided through which the exhaust emission system is also mounted on the footrest assembly of the vehicle. As per an embodiment of the present invention, the intermediate mounting assembly is configured to be disposed substantially equidistant from the upstream & the downstream mounting in the longitudinal direction of the vehicle when seen from the top of the vehicle. As per an embodiment of the present invention, the intermediate mounting assembly is configured to be disposed at substantially 1/3rd the total distance between the upstream & downstream mountings in the vehicle width direction when seen from the top of the vehicle. Such a configuration enables adequately balancing the loads, minimizing the vibrations as well as provides good structural rigidity & durability while overcoming problems from the known art. As per an embodiment of the present invention, the 3rd flexible mounting is configured to be disposed within a rectangle formed by planes formed by lateral & longitudinal lines from the upstream & downstream mounting centres of the exhaust system. As per an embodiment of the present invention, the footrest is configured to be disposed substantially ahead of the intermediate mounting of the exhaust system when seen from the side view of the vehicle. The balance, distribution & disposition of the parts / masses & vehicle layout so configured enables achieving good rigidity, good load distribution as well as elimination of undesirable vibrations of the exhaust system thereby overcoming all the problems from the known art.

[0018] In an embodiment, the intermediate mounting assembly comprises of a mounting clamp disposed on the exhaust pipe, wherein substantially L-shaped support rod is attached upon it through suitable attaching means like welding. The first end of the support rod is attached upon the mounting clamp, wherein circular hollow ring (e.g. metal ring) is accommodated on its other end. A dampener made of elastomeric material e.g. rubber is adjusted in the circular hollow ring through which it is inserted in the other end of the support rod. A mounting bracket is attached upon the ring, wherein the mounting bracket is detachably attached to the footrest assembly of the vehicle. The mounting bracket comprises of openings on its topmost portion through which detachable attaching means e.g. bolts or screws are inserted to detachably attach the whole mounting assembly to the footrest of the vehicle. In an embodiment, the above described intermediate mounting assembly is the third mounting added to the exhaust emission system in addition to the mounting flanges (first mounting flange and second mounting flange) disclosed above.

[0019] In an embodiment, the intermediate mounting assembly is added to provide further stability to the exhaust emission system and prevent it from vibrating even at high speed conditions. The present subject matter restricts and arrests the vibrations of the exhaust emission system in all directions, be it vibrations generated in a horizontal plane along the vehicle length, or the vibrations and movement of the exhaust emission system in an upward and downward direction in a vertical plane along the vehicle height or be it in vibrations and movement generated along the vehicle width direction. Thus, it is the mounting clamp disposed upon the exhaust pipe which is able to restrict the vibrations of the horizontal plane occurring along the vehicle length. Whereas, it is the circular hollow ring and support rod which restrict the vibrations of the vertical plane occurring along the vehicle height and vehicle width. Therefore, the present intermediate mounting assembly is versatile, intermediate & multi-dimensional to be able to restrict all type of vibrations which the exhaust emission system might experience from multiple directions. In addition to it, the present subject matter does not let the vibrations to be transferred to the footrest assembly since an elastomeric dampener is inserted in the circular hollow ring which absorbs the vibrations and has a tendency to shift the frequency of vibration towards lower ranges e.g. from higher values to lower values in Hertz (Hz). Furthermore, the present intermediate mounting assembly is easy to assemble and access when due servicing is required.

[0020] Thus, the present subject matter provides a flexible, intermediate mounting assembly for the exhaust emission system to restrict and arrest the vibrations which it goes through from multiple directions, especially at a high running speed of the vehicle. In addition to it, the flexible, intermediate mounting assembly does not allow the vibrations to be transferred to the footrest assembly. Furthermore, the present subject matter is much easier to assemble and access.

[0021] The aforesaid and other advantages of the present subject matter would be described in greater detail in conjunction with the figures in the following description.

[0022] Arrows provided in the top right corner of each figure depicts direction with respect to the vehicle, wherein an arrow F denotes front direction, an arrow R indicated R direction, an arrow Up denotes upward direction, an arrow Dw denoted downward direction, an arrow Rh denotes right side, an arrow Lh denoted left side, as and where applicable.

[0023] **Figure 1** illustrates a side view of an exemplary two-wheeled vehicle **(10)**, in accordance with an embodiment of the present subject matter. Said vehicle **(10)** includes a frame assembly **(105)** that extends from a head tube (not shown), which is disposed in the front portion of said vehicle **(10)**, towards a rear portion of said vehicle **(10).** Said frame assembly **(105)** includes a mainframe (not shown) comprising a main tube extending rearward from a rear portion of the head tube (not shown) and a down tube (not shown) that extends rearwardly downward from said head tube (not shown). Said frame assembly **(105)** may further comprise a sub-frame formed by a pair of rear tubes (not shown) that extend

obliquely rearward from the main frame. An internal combustion engine **(1)** is supported by said main frame of said frame assembly **(105).** Said internal combustion engine **(1)** acts as the power unit of said vehicle **(10)**, wherein the power unit may also include a traction/electrical motor (not shown). A front portion of a swing arm assembly **(2)** is swingably connected to said main frame of said frame assembly **(105)** and rear portion of said swing arm assembly **(2)** rotatably supports a rear wheel **(3).** Said rear wheel **(3)** is functionally coupled to said internal combustion engine **(1)** through a transmission system. A rear fender (not shown) disposed upwardly of said rear wheel **(3)** covering at least a portion of said rear wheel **(3).** In the present embodiment, a single mono-shock rear suspension **(4)** connects said swing arm assembly **(2)** to said frame assembly. A pair of front forks **(5)** supports a front wheel **(6)** and is steerably supported by said head pipe. A handlebar assembly **(7)** is connected to an upper portion of said pair of front fork **(5).** Further, a front fender assembly **(8)** covers at least a portion of said front wheel **(6)** and said front fender assembly **(8)** is mounted to said front forks **(5).**

[0024] A fuel tank **(9)** is mounted to said main tube of said frame assembly **(105)** and disposed rearwardly of said handlebar assembly **(7).** A seat assembly **(11)** is disposed rearwardly of said fuel tank assembly **(9)** and supported by the pair of rear tubes. A foot rest sub-assembly **(12)** mounted to both sides of said frame assembly **(105)** of said vehicle **(10)** enables in supporting the rider foot and a side stand unit **(13)** is also mounted on said frame assembly **(105)** used to support said vehicle **(10)** during a parked condition. Further, said vehicle **(10)** comprises a fairing assembly **(14)** that is disposed forwardly of said head tube and extending sidewardly covering at least a portion of said fuel tank **(9)** and at least a portion of said internal combustion engine **(1).** An exhaust emission system **(17)** is also connected to said internal combustion engine **(1)** allowing the exhaust gases to leave the system. Also, said vehicle **(10)** may include a bottom cowl assembly **(15)** that covers at least a portion of said internal combustion engine **(1)** whereby said internal combustion engine **(1)** is protected from dust, dirt, and water splashing. Said vehicle **(10)** comprises of a tail cover assembly **(16)** that are disposed rearwardly of a side panel assembly and extend along the pair of rear tubes thereby covering at least a portion of the pair of rear tubes. For the purposes of this invention said two-wheeled vehicle **(10)** as illustrated in **Figure 1** is interchangeably used as vehicle **(10)** for the rest of the application, wherein both the terms convey the same meaning

[0025] **Figure 2** illustrates a perspective side view of said exhaust emission system **(17)** connected to said internal combustion engine **(1)** in accordance with an embodiment of the present subject matter. Said exhaust emission system **(17)** comprises of an exhaust pipe **(215)** connected to said internal combustion engine **(1),** wherein said exhaust pipe **(215)** extends in a rearward direction along the vehicle length and carries the exhaust being generated to a muffler unit **(220).** In an embodiment, said exhaust emission system **(17)** comprises of two mounting assemblies **(205, 210)**, wherein the first mounting assembly comprises of a first mounting flange **(205)** disposed on the extreme front portion of said exhaust pipe **(215)** near said internal combustion engine **(1)** and the second mounting assembly comprises of a second mounting flange **(210)** being disposed on said muffler unit **(220).** Through said first mounting flange **(205),** said exhaust emission system **(17)** is mounted on a cylinder head **(225)** of said internal combustion engine **(1).** Whereas, through said second mounting flange **(210),** said exhaust emission system **(17)** is mounted on said frame assembly **(105)** of said vehicle (10). In an embodiment, said vehicle **(10)** comprises of a third mounting assembly for said exhaust emission system **(17).** As per the present subject matter, said third mounting assembly also termed as flexible, intermediate mounting assembly **(230)** enhances the mounting arrangement of said exhaust emission system **(17)** to said vehicle **(10)**, such that said exhaust emission system **(17)** does not vibrates or wobbles even at a high running speed of said vehicle **(10).**

[0026] **Figure 3** illustrates an exploded view of said flexible, intermediate mounting assembly **(230)** with respect to said footrest assembly **(12)** in accordance with an embodiment of the present subject matter. For the purpose of invention, flexible, intermediate, multi-dimensional & flexible are used interchangeably. In an embodiment, said intermediate mounting assembly **(230)** provided for said exhaust emission system (17) is configured to be detachably attached to said footrest assembly **(12)** of said vehicle **(10).** As per an embodiment of the present invention, said footrest assembly **(12)** is configured to be disposed substantially ahead of said intermediate mounting assembly **(230)** of the exhaust system when seen from the side view of the vehicle. In an embodiment, said flexible mounting assembly **(230)** comprises of a mounting clamp **(305)** which is clamped upon said exhaust pipe **(215)** of said exhaust emission system **(17).** Said mounting clamp **(305)** acts as a ring wrapped around said exhaust pipe **(215),** wherein a support rod **(310)** is attached/ welded onto said mounting clamp **(305).** Said support rod **(310)** comprises of a first end **(310F)** and a second end **(310S)**, wherein said first end **(310F)** is welded upon said mounting clamp **(305)**, and said second end **(310S)** is accommodated in a ring **(315).** Said ring **(315)** being a hollow shaped structure comprises of a rubber made dampener **(320)** disposed within it. Said ring **(315)** is fixed on said second end **(310S)** of said support rod **(310)** by inserting it in said rubber made dampener **(320)** which holds it. In an embodiment, said rubber made dampener **(320)** is also used to absorb the vibrations of said exhaust emission system **(17),** not allowing it to get transferred to said footrest assembly **(12).** Furthermore, said flexible mounting assembly **(230)** comprises of a mounting means **(325)** e.g. a bracket through which said flexible mounting assembly **(230)** is detachably attached to said footrest assembly **(12)** of said vehicle **(10).** Said mounting means **(325)** is attached/ welded on said ring **(315),** wherein said mounting means **(325)** comprises of at least two openings **(330)** provided in its top portion through which bolts **(335)** are inserted to detachably attach said mounting

means **(325)** and said flexible mounting assembly **(230)** to said footrest assembly **(12)** of said vehicle **(10).** Thus, through such a configuration said exhaust emission system **(17)** is also mounted upon said footrest assembly **(12)** of said two-wheeled vehicle **(10)** using said flexible mounting assembly **(230).**

[0027] **Figure 4** illustrates an exploded view of said flexible mounting assembly **(230)** attached to said footrest assembly **(12)** in accordance with an embodiment of the present subject matter when seen from the top view of the vehicle. As explained above, said flexible mounting assembly **(230)** is detachably attached to said exhaust pipe **(215)** of said exhaust emission system **(17)** and said footrest assembly **(12).** Such a configuration is provided to effectively control the vibration and movement of said exhaust emission system **(17).** To be precise, the present subject matter controls and arrests the vibrations in all the directions, be it in a front-back direction (in a horizontal plane alone the vehicle length direction), up-down direction (in a vertical plane along the vehicle height) or in a sideward direction along the vehicle width. In an embodiment, said mounting clamp **(305)** is detachably attached to said exhaust pipe **(215)** which arrests the vibrations caused in the horizontal plane along the vehicle length. In addition to it, said support rod **(310)** is welded on said mounting clamp **(305)** with its other end detachably attached to said ring **(315).** Thus, said support rod **(310)** attached to said ring **(315)** controls the vibrations caused along said vehicle **(10)** width direction. In addition to it, said mounting clamp **(305)** combined with said support rod **(310)** attached to said footrest assembly **(12)** through said mounting means **(325)** arrest any kind of vibrations occurring along the vertical plane in a vehicle height direction. Therefore, said intermediate mounting assembly **(230)** with its current assembly restricts any kind of vibrations bound to occur across complete 360 degrees round the system. As per an embodiment, said intermediate mounting assembly **(230)** is configured to be disposed within the rectangle ABCD formed by planes consisting of the lines passing in longitudinal & lateral direction of the vehicle from the upstream mounting centre A & the downstream mounting centre C as seen in this top view of the vehicle condition. As per an embodiment, the Centre I of said intermediate mounting assembly **(230)** is configured to be disposed at a distance L1 from A & at a distance L2 from C in the longitudinal direction such that the distance L1 is substantially equal to distance L2 i.e. L1 : L2 $\approx$ 1. As per an embodiment, the Centre I of said intermediate mounting assembly **(230)** is configured to be disposed at a distance W1 from A & at a distance W2 from C in the lateral direction such that the distance W2 is substantially half of the distance W1 i.e. W2: (W1 + W2) $\approx$ 1:3.

[0028] **Figure 5** illustrates a perspective view of said intermediate mounting assembly **(230)** attached to said exhaust emission system **(17),** in accordance with an embodiment of the present subject matter. In an embodiment, said intermediate mounting assembly **(230)** detachably attached to said exhaust pipe **(215)** of said exhaust emission system **(17)** enables it's mounting onto said footrest assembly **(12)** of said vehicle **(10).** Said intermediate mounting assembly **(230)** has been provided & configured so as to withstand and restrict the vibrations of said exhaust emission system **(17),** be it in any direction or plane. The present figure illustrates the various planes across which the vibrations are restricted. In an embodiment, said mounting clamp **(305)** is disposed on said exhaust pipe **(215)** of said exhaust emission system **(17)** to arrest the vibrations occurring horizontally along a first plane **B-B'** extending in a vehicle length direction. Whereas, said ring **(315)** and said mounting rod **(310)** restrict the vibrations occurring in across said vehicle **(10)** width along a second plane **A-A'.** In an embodiment, said mounting clamp **(305)** and said support rod **(310)** attached to it help in arresting the vibrations occurring vertically along a third plane **C-C'** extending along said vehicle **(10)** height direction. Hence, said intermediate mounting assembly **(230)** arrests the vibrations across all the planes formed around said exhaust emission system **(17)** to keep it in an intact and stably attached condition, eliminating any scope of vibration or wobbling that it might go through. As per an embodiment of the present subject matter, the Centre I of said intermediate mounting assembly **(230)** is so configured to be disposed at a height H1 from A & height H2 from C in the vertical direction such that the distance H2 is substantially half of distance H1 i.e. H2: (H1 + H2) $\approx$ 1:3. As per an embodiment of the present subject matter said intermediate mounting assembly **(230)** is disposed such that L1: (L1+ L2) ratio is 1:2. As per an embodiment of the present subject matter said intermediate mounting assembly **(230)** is disposed such that W2: (W1 + W2) $\approx$ 1:3.

[0029] Thus, the present subject matter provides said flexible mounting assembly **(230)** which holds said exhaust emission system **(17)** and helps in its mounting to said footrest assembly **(12).** In furtherance to it, said flexible mounting assembly **(230)** securely holds said exhaust emission system **(17)** to arrest all kind of vibrations in any plane. Therefore, said flexible mounting assembly **(230)** also eliminates the wobbling which said exhaust emission system **(17)** used to go through, and the unwanted noise produced due to the vibration. Furthermore, the present subject matter also enhances the ease in mounting of the whole system and brings out an easy accessibility and serviceability.

[0030] 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 disclosure may be practiced other than as specifically described.

List of Reference Signs

1	Internal combustion engine	230	Intermediate mounting assembly

(continued)

2	Swing arm assembly	305	Mounting clamp
3	Rear wheel	310	Support rod
4	Rear suspension	310F	First end
5	Front forks	310S	Second end
6	Front wheel	315	Ring
7	Handlebar assembly	320	Dampener
8	Front fender assembly	325	Mounting bracket
9	Fuel tank	330	Openings
10	Two-wheeled Vehicle	335	Bolts
11	Seat assembly	A-A'	First plane
12	Rear sub-assembly	B-B'	Second plane
13	Side stand unit	C-C'	Third plane
14	Fairing assembly		
15	Bottom cowl assembly		
16	Tail cover assembly		
17	Exhaust emission system		
105	Frame assembly		
205	First mounting flange		
210	Second mounting flange		
215	Exhaust pipe		
220	Muffler unit		
225	Cylinder head		

Claims

1. A motor vehicle **(10)** comprising:

a frame assembly **(105)** comprising a head tube disposed in a front portion of said vehicle **(10),** a down tube extending in a downward and rearward fashion from said head tube, and a main tube extending in a substantial straight and rearward fashion form said head tube;
a footrest assembly **(12)** attached to at least one of left hand side and right hand side of said vehicle **(10)**;
an internal combustion engine **(1)** mounted on said frame assembly **(105)** of said vehicle **(10)**;
an exhaust emission system **(17)** extending in a rearward direction of said vehicle **(10)** and being attached to said internal combustion engine **(1)** through a first mounting flange **(205)** at an upstream mounting and to said frame assembly **(105)** through a second mounting flange **(210)** at a downstream mounting; and
an intermediate mounting assembly **(230)** provided to mount said exhaust emission system **(17)** to said footrest assembly **(12)**;
said intermediate mounting assembly **(230)** comprises a mounting clamp **(305)** attached to said exhaust emission system **(17),** a support rod **(310)** with one end attached onto said mounting clamp **(305)** and other end accommodated in a ring **(315)** attached to said footrest assembly **(12).**

2. The motor vehicle **(10)** as claimed in claim 1, wherein said exhaust emission system **(17)** comprises an exhaust pipe **(215)** extending from said internal combustion engine **(1)** in a downward rearward fashion, wherein said mounting clamp **(305)** is disposed around said exhaust pipe **(215).**

3. The motor vehicle **(10)** as claimed in claim 1, wherein said support rod **(310)** configured to be L-shaped comprises a first arm **(310F)** and a second arm **(310S)** formed perpendicular to each other.

4. The motor vehicle **(10)** as claimed in claim 3, wherein said first arm **(310F)** is attached to said mounting clamp **(305)** and said second arm **(310S)** is inserted in said ring **(315).**

5. The motor vehicle **(10)** as claimed in claim 1, wherein said ring **(315)** being a hollow structure comprises of a dampener **(320)** inserted in said ring **(315).**

6. The motor vehicle **(10)** as claimed in claim 5, wherein said dampener **(320)** provided in said ring **(315)** accommodates said second arm **(310S)** of said support rod **(310).**

7. The motor vehicle **(10)** as claimed in claim 1, wherein said intermediate mounting assembly **(230)** is detachably attached to said footrest assembly **(12)** through a mounting bracket **(325).**

8. The motor vehicle **(10)** as claimed in claim 1, wherein said intermediate mounting assembly **(230)** is disposed downstream of first mounting assembly & upstream second mounting assembly.

9. The motor vehicle **(10)** as claimed in claim 1, wherein said footrest assembly **(12)** is disposed substantially ahead of said intermediate mounting assembly **(230).**

10. The motor vehicle **(10)** as claimed in claim 7, wherein said mounting bracket **(325)** is configured to be attached to said ring **(315)** to support said intermediate mounting assembly **(230).**

11. The motor vehicle **(10)** as claimed in claim 7, wherein said mounting bracket **(325)** comprises of a set of openings **(330)** to accommodate a set of screws **(335)** to support said intermediate mounting assembly **(230).**

12. The motor vehicle **(10)** as claimed in claim 1, wherein a Centre I of said intermediate mounting assembly **(230)** is configured to be disposed at a distance L1 from A and at a distance L2 from C in the longitudinal direction such that said distance L1 is substantially equal to distance L2 i.e. L1: (L1 + L2) $\approx$ 1.

13. The motor vehicle **(10)** as claimed in claim 1, wherein a Centre I of said intermediate mounting assembly **(230)** is configured to be disposed at a distance W1 from A and at a distance W2 from C in the lateral direction such that said distance W2 is substantially half of said distance W1 i.e. W2: (W1 + W2) $\approx$ 1:3.

14. The motor vehicle **(10)** as claimed in claim 1, wherein a Centre I of said intermediate mounting assembly **(230)** is configured to be disposed at a height H1 from A and at a height H2 from C in the vertical direction such that said distance H2 is substantially half of said distance H1 i.e. H2: (H1 + H2) $\approx$ 1:3.

15. A motor vehicle **(10)** comprising:

a frame assembly **(105)** comprising a head tube disposed in a front portion of said vehicle **(10)**, a down tube extending in a downward and rearward fashion from said head tube, and a main tube extending in a substantial straight and rearward fashion form said head tube;
a footrest assembly **(12)** attached to at least one of left hand side and right hand side of said vehicle **(10),** wherein said footrest assembly **(12)** is disposed substantially ahead of said intermediate mounting assembly **(230).**

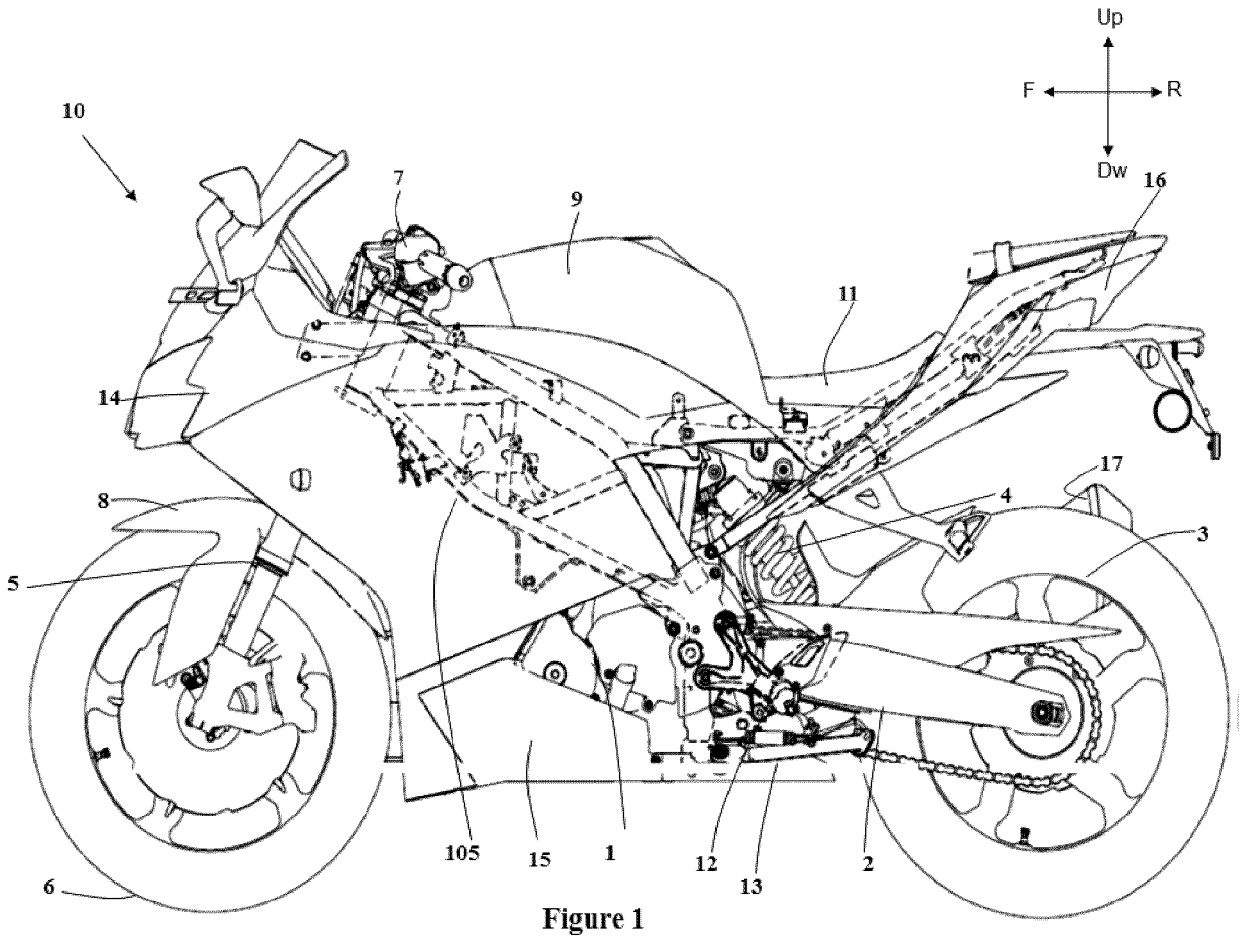

Figure 1

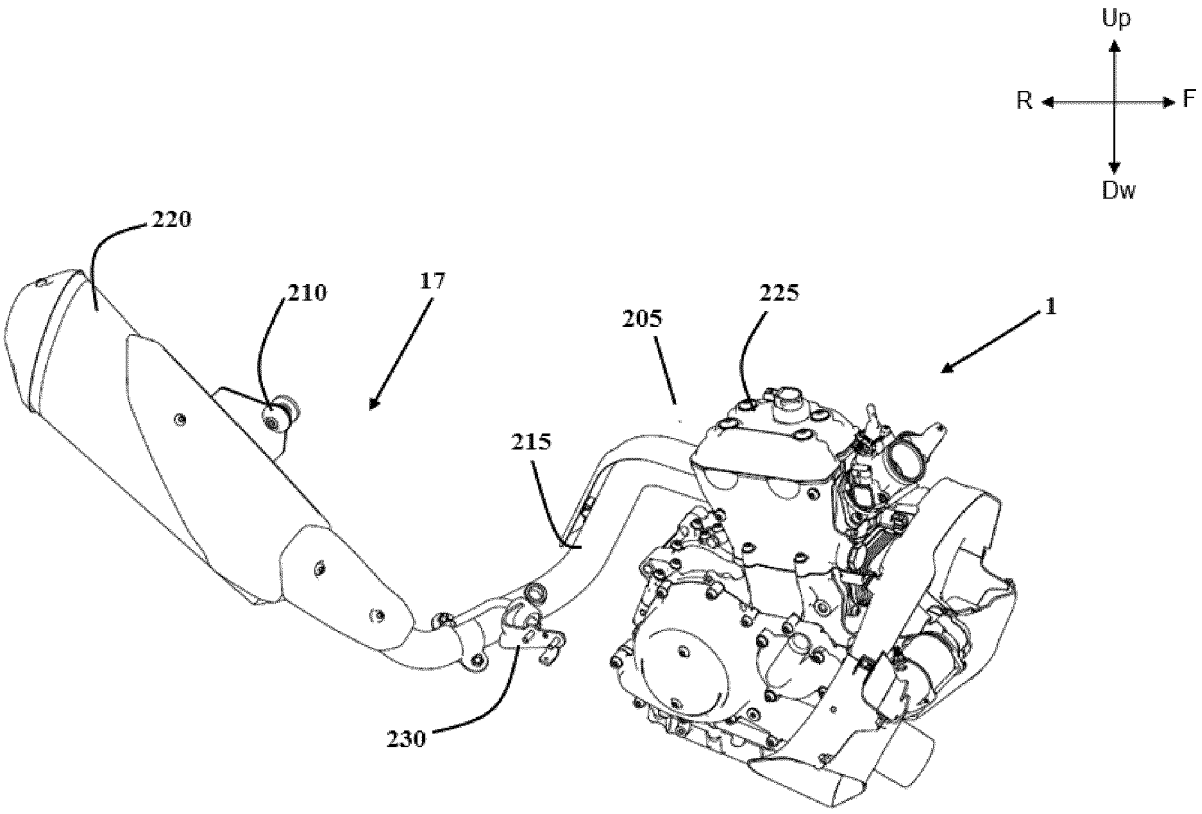

Figure 2

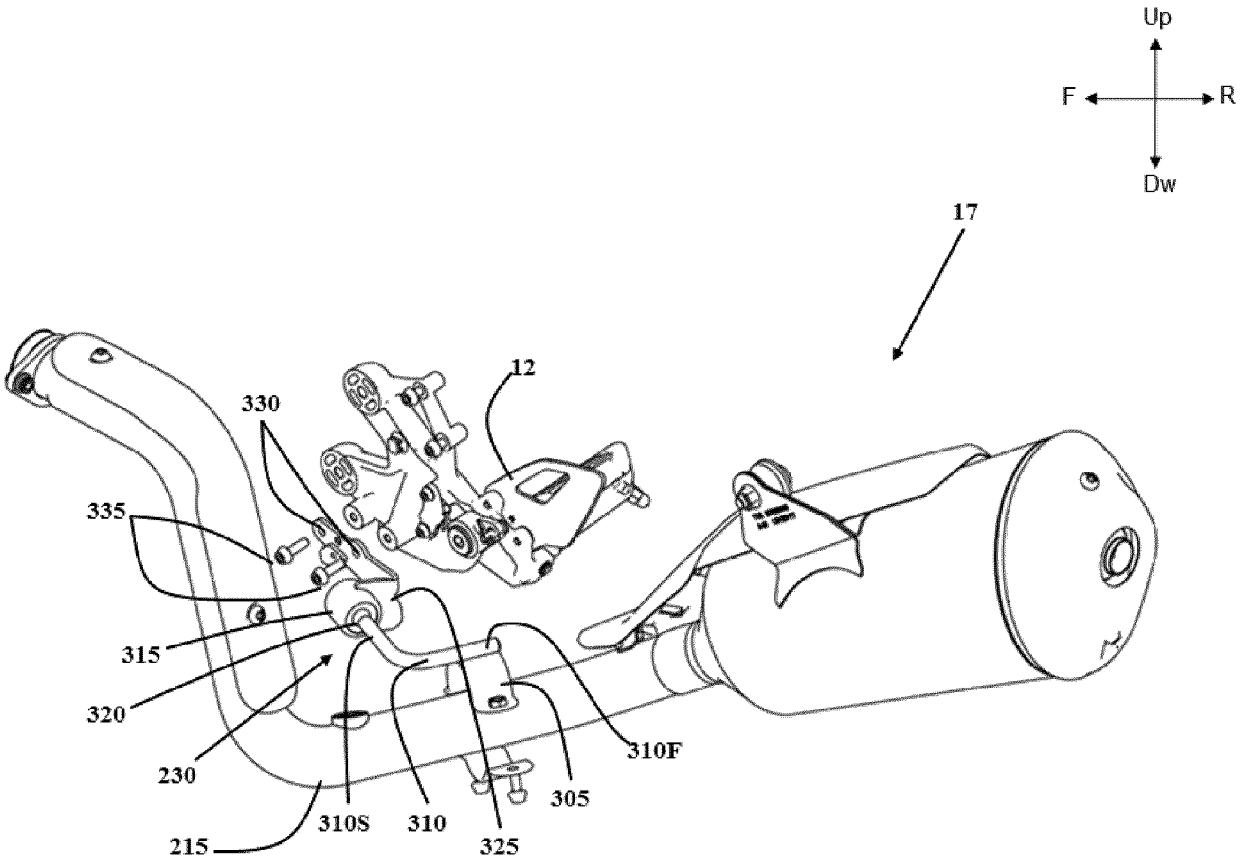

Figure 3

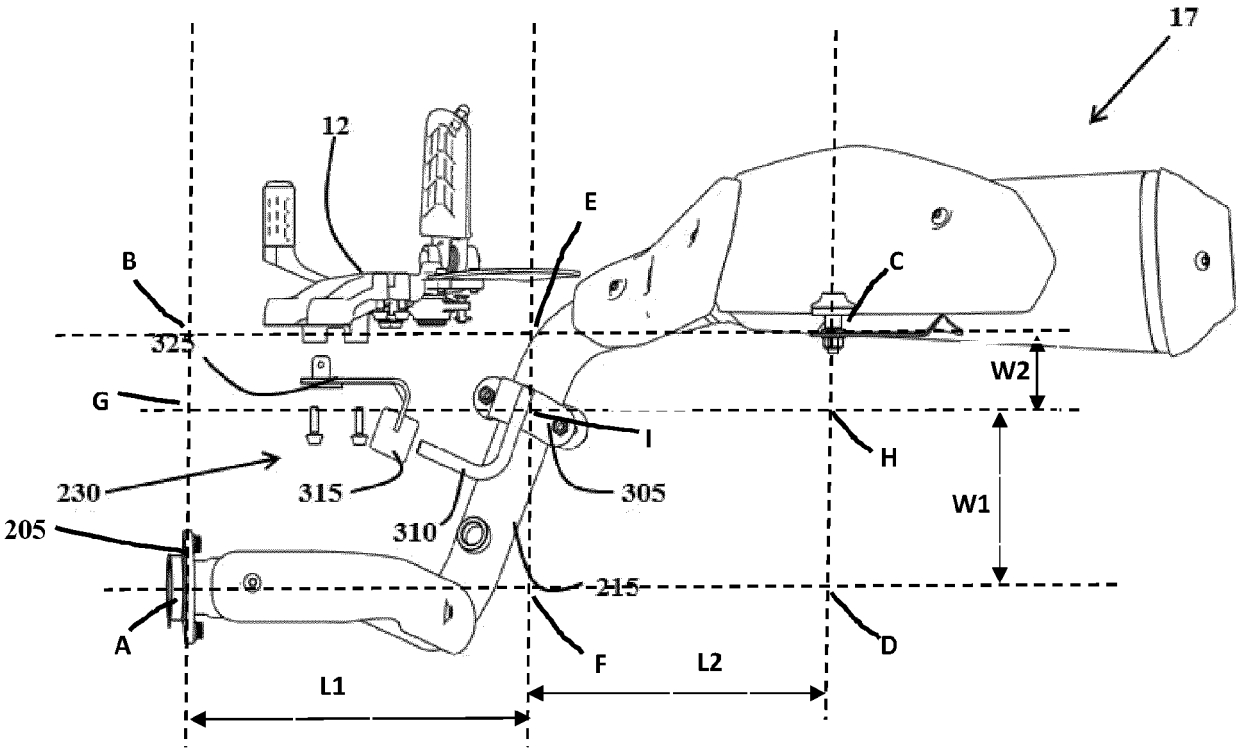

Figure 4

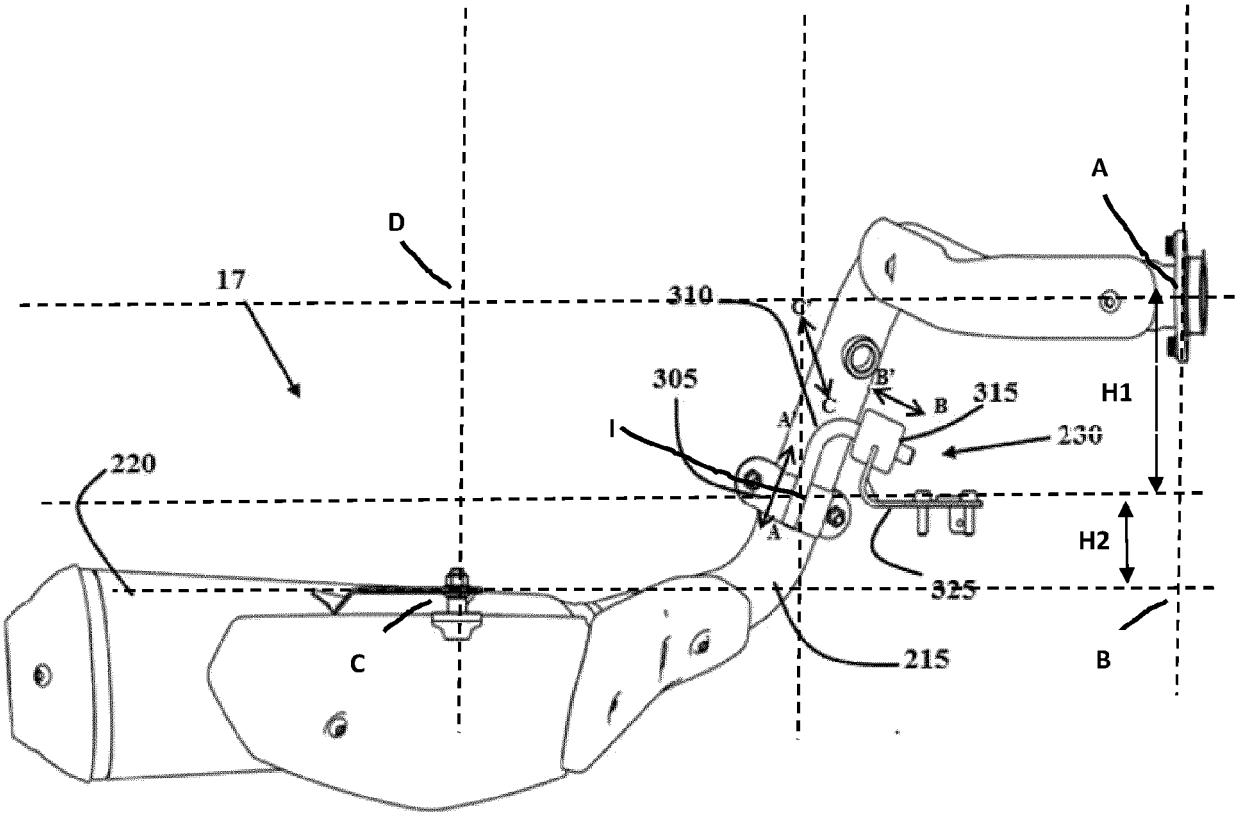

Figure 5

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 8272

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 489 847 A2 (HONDA MOTOR CO LTD [JP]) 22 August 2012 (2012-08-22)	15	INV. F01N13/18
Y	* paragraph [0031] *	1-11	
A	* paragraph [0040]; figures 2,4,7 *	12-14	
X	JP 2014 129065 A (HONDA MOTOR CO LTD) 10 July 2014 (2014-07-10)	15	
Y	* paragraph [0026] - paragraph [0036];	1-11	
A	figures 1-7 *	12-14	
A	WO 2012/008394 A1 (HONDA MOTOR CO LTD [JP]; INOKAWA HIROSHI [JP] ET AL.) 19 January 2012 (2012-01-19) * claims 1-6; figures 1-6 *	1-15	
A	WO 2011/001444 A2 (TVS MOTOR CO LTD [IN]; KRISHNA B VAMSI [IN] ET AL.) 6 January 2011 (2011-01-06) * page 3, line 13 - page 4, line 13; figures 1-5,8 *	1-15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 April 2020	Zebst, Marc

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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