(19) ORGANISATION AFRICAINE DE LA PROPRIETE INTELLECTUELLE

(51) Inter. Cl.[8] B62K 19/00 (2018.01)
B62K 25/04 (2018.01)

(11) N° 19593

FASCICULE DE BREVET D'INVENTION

(21) Numéro de dépôt : 1202000089

(22) Date de dépôt : 21/02/2020

(30) Priorité(s) :

IN n° 201941010332 du 16/03/2019

(24) Délivré le : 03/11/2020

(45) Publié le : 23.12.2020

(73) Titulaire(s) :
TVS MOTOR COMPANY LIMITED,
Jayalakshmi Estates,
29 (Old No. 8) Haddows Road,
CHENNAI 600 006 (IN)

(72) Inventeur(s) :

CHINNIWAKKAM RAMESH ASWIN KUMAR (IN)
SUDARSHAN MOHAN (IN)
Manickam SUBASH (IN)

(74) Mandataire : DUGA TITANJI & PARTNERS IP,
B.P. 3331, YAOUNDE (CM).

(54) Titre : A frame assembly for a vehicle.

(57) Abrégé :

The present subject matter generally relates to a two or three-wheeled vehicle, and more particularly, to a frame assembly for a two-wheeled or a three-wheeled vehicle. The frame assembly (102) includes a pair of rear frames (202) extending rearwardly from a main frame (201), a pair of side frames (203) extending downwardly from at least a portion of the pair of rear frames (202), a reinforcing member (204) disposed adjoiningly in between at least a portion of said pair of rear frames (202), said reinforcing member (204) is configured to connect said pair of rear frames (202) and said pair of side frames (203), and a shock absorber mounting shaft (205) attached to at least a portion of said reinforcing member (204), said shock absorber mounting shaft (205) includes varying sections A, B, C.

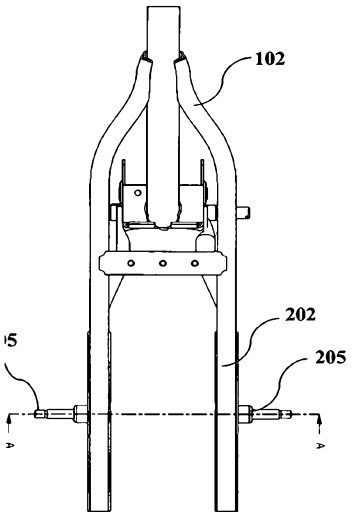


Figure 5(a)

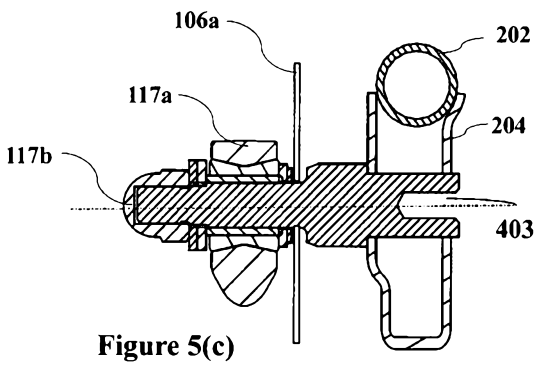


Figure 5(c)

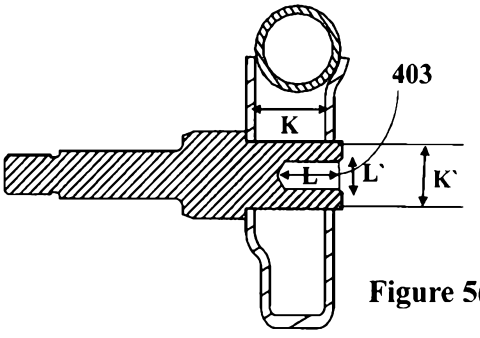


Figure 5(b)

Fig. 5(a) ; Fig. 5(b) ; Fig. 5(c)

A FRAME ASSEMBLY FOR A VEHICLE

TECHNICAL FIELD

[0001] The present subject matter generally relates to a two or three-wheeled vehicle, and more particularly, but not exclusively, to a frame assembly for a two-wheeled or a three-wheeled vehicle.

BACKGROUND

[0002] Generally, in a two-wheeled or three-wheeled vehicle with a frame assembly, the frame assembly extends in longitudinal direction of the vehicle. The frame assembly acts as a structural member and load-bearing member of the vehicle. Also, the drive wheel and the driven wheel are supported by the frame assembly. In a saddle-ride type vehicle, the power unit either is mounted or is low-slung to the frame assembly. Generally, the wheels are connected to the frame through damping members. Moreover, in a vehicle with a step-through type portion, the power unit is swingably mounted to the frame assembly through the damping members, which are typically suspensions. Therefore, the forces acting on the frame assembly is high due to added weight of the power unit on the rear portion. The suspension plays an essential role in damping the forces acting on the wheels and forces from the power unit from reaching the frame assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] 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.

[0004] Figure 1 illustrates a saddle ride type vehicle.

[0005] Figure 2 illustrates an exemplary vehicle frame assembly for a two-wheeled vehicle.

[0006] Figure 3 illustrates a shock absorber mounting on to the vehicle frame assembly for a two-wheeled vehicle.

[0007] Figure 4(a) illustrates an embodiment of at least one reinforcing member.

[0008] Figure 4(b) illustrates a side view of the shock absorber mounting shaft.

[0009] Figure 4(c) illustrates a side view of the sectional view of the shock absorber mounting shaft as illustrated in **Figure 4(b)**.

[00010] Figure 5(a) illustrates a top view of the vehicle frame assembly according to an embodiment of the present invention.

[00011] Figure 5(b) and **Figure 5(c)** illustrates a sectional view of the shock absorber mounting shaft mounted to the at least a portion of the reinforcing member.

[00012] Figure 6(a) and Figure 6(b) illustrates a comparative study of the flow of stress lines along the shock absorber mounting shaft without and with proposed non-anchoring collar addition respectively.

DETAILED DESCRIPTION OF THE DRAWINGS

[00013] Typically, in vehicles the frame assembly includes a front zone and a rear zone. The front zone supports the steering assembly along with the front suspension of the vehicle. The front zone includes a main tube that provides stiffness and strength for withstanding the forces acting thereon. The rear zone supports the vehicle parts including power unit along with the power train, the rear wheel, and the rear suspension connected thereof. Therefore, the rear zone is subject to various forces from the rear wheel through the suspension and from the power unit. For example, impacts from the road like bumps and vibration from the power unit are also acting on the frame assembly. Also, the vehicle is provided with utility and style parts that are mounted to the frame assembly for providing utility space and aesthetic appeal, which are to be mounted with minimal variations.

[00014] To this end, the various vehicle parts like rear suspension, utility box being mounted to the frame assembly requires multiple reinforcement members that are welded to the frame assembly. Moreover, provision of multiple reinforcement members requires multiple welding, which increases stress concentration and also reducing the strength at that particular point at that local region. Also, multiple welding in close vicinity results in dimensional variations of the frame assembly affecting the assembly/mounting of components thereat. For example, any dimensional variation of the frame assembly affects the

mounting position of the suspension or utility box. As the parts like utility box or suspension are rigid parts having fixed mounting points, the aforementioned variations will lead to interference or gaps between the parts. As such, the hard points are subject to various forces and any dimensional variations at the hard points, which are the essential load bearing points, will further affect the strength at the particular point. Also, riding characters of the vehicle area is compromised as the variation may affect the orientation of mounting of the vehicle parts. For example, the dimensional variation may affect the mounting of the rear suspension, which is mounted to the hard point of the vehicle. This affects the riding characteristics of the vehicle as functional characteristics of the suspension are changed due to improper orientation and alignment. Moreover, the suspension is mounted to a single member of the frame assembly. Therefore, such variations affect the life of the frame assembly as the hard points are subject to forces resulting in failure due to the forces acting on the single member. The shock absorber mounting on frame is a very important part that is designed to take loads and provide adequate ride comfort during the action of shock absorber in vehicle running conditions on highways or when riding at bumps or potholes with predetermined payloads.

[00015] There are various types of shock absorber mounting configurations in a two wheeled vehicle. All the configurations are designed to provide the function of shock absorber as described above but differ slightly on the type of load carrying ability based on vehicle requirements. The first type of shock absorber mounting design consists of a shock absorber and a mounting member supporting on both sides and providing a fixed support which is designed to primarily take shear load. The second type of shock absorber mounting design consists of a shock absorber supported by mounting member fastened on one side secured by mounting nut on the other side which is of cantilever type and takes majorly bending loads. The third type of shock absorber mounting design is one of the most common type used which has free supports on both ends. It consists of a shock absorber and a mounting member which is of variable shaft section located to a fixed plate providing support on both sides. This type of mounting design

takes both bending and shear loads and is mostly used in vehicles that are subjected to take high loads. In the existing design of third type of shock absorber mounting, a shock absorber mounting boss is welded to a frame gusset on both sides. The side that is facing the inside part of frame gusset takes loads in a uniform manner and dissipates the load efficiently. The side that is facing the outside part of frame gusset welding has certain difficulties in load distribution and as a result of this the stress is concentrated towards this end. There are primarily two weak zones. In one of the zones, the shock absorber mounting shaft is welded to frame gusset which gets hardened as a result of welding heat. The other weak zone is a sharp transition zone on the shock absorber mounting shaft where there is high stress concentration. These two weak zones are present very close to each other on the shock absorber mounting shaft, which results in having a very high stressed region. During fatigue loading, the shock absorber mounting shaft is likely to fail in these regions by shear or brittle crack as a result of indentation and pitching effect. Thus, the challenge is to provide a frame assembly with minimum variations for mounting of vehicle parts and at the same time the frame assembly should be capable of providing structural strength. The objective of the present subject matter is to provide an improved design of the shock absorber mounting region.

[00016] The present subject matter relates to improvement in frame design through improvements made in shock absorber mounting region. The load carrying ability is significantly increased by ensuring that the stress concentration is even throughout the frame structure.

[00017] According to an embodiment of the present invention, the frame assembly includes a pair of rear frames. The pair of rear frames extend obliquely rearwardly and are joined by at least one cross-member. Further, a pair of side frames extend obliquely downwardly from at least a portion of the pair of rear frames. At least one reinforcing members are attached as joining means between at least a portion of the pair of rear frames and the pair of side frames. According to one embodiment, the at least one reinforcing members are fixedly attached, for

example, welded between at least a portion of the pair of rear frames and the pair of side frames.

[00018] Further, the rear portion of the frame assembly is suspended by the at least one rear suspension. The at least one rear suspension is attached between at least a portion of the pair of rear frames and the rear wheel of the vehicle. According to an embodiment of the present invention, the at least one rear suspension is mounted to a shock absorber mounting shaft. The shock absorber mounting shaft is fixedly attached to at least a portion of the at least one reinforcing member attached between the pair of rear frames and the pair of side frames.

[00019] According to an embodiment of the present invention, the shock absorber mounting shaft includes a non-anchoring collar area that has a wider contact surface. The wider contact surface provides increased area for attachment with at least a portion of the frame as compared to a conventional attachment portion. The increased contact surface for attachment there between prevents indentation or pitching effect. This non-anchoring collar improves the stress flow distribution in the weaker zones of the shaft.

[00020] According to an embodiment of the present invention, the shock absorber mounting shaft includes varying sections A, B, C and each section is configured to meet a specific function. The mounting shaft supports shock absorber on both left and right sides of the vehicle. In particular, the section A is welded on both sides to the frame to the at least one reinforcing member, the section B accommodates at least a portion of the shock absorber and the section C has a threaded profile and is tightened with the dome nut.

[00021] Further, the shock absorber mounting shaft includes a non-anchoring collar to improve the weak areas. The non-anchoring collar includes a wider contact surface increasing the weld area compared to the conventional mounting shaft such that the indentation or pitching effect is reduced. The non-anchoring collar added to the split section A, that is, A2 helps in splitting the localized stress area into A1 and A2 thereby reducing the stress flow levels occurring at the localized area. The non-anchoring collar also isolates the weld projections and

weld burn to the portions of the frame and the at least one reinforcing member that further improves the welding away from the stress zone and mitigates the indentation and pitching effect.

[00022] According to another embodiment of the present invention, the non-anchoring collar also ensures maximum surface contact butting with a pillion handle mounting bracket thereby eliminating additional washers for surface contact.

[00023] The split areas of A1 and A2 as mentioned above, ensure that the overhang length of the sections A and B are cut short such that it takes better axial loads and bending moment because of the reduced length.

[00024] Further, the addition of the non-anchoring collar area to the mounting shaft provides even distribution of the stress throughout the shaft and to have a smooth flow of stress lines navigated out evenly away from the usual stress concentration areas on the mounting shaft.

[00025] Typically, the shock absorber mounting area on the frame consists of the shock absorber, mounting shaft and the at least one reinforcing member. The at least one reinforcing member is welded to the pair of rear frames and the pair of side frames. The enclosed welding area in the at least one reinforcing member requires a breathing on the shock absorber mounting shaft to relieve some stress at the welding area. A blind hole addition helps in providing breathing and offers corner relief to the at least one reinforcing member such that the load is not directly transferred to the at least one reinforcing member.

[00026] The blind hole design is chosen in such a way that the ratio of K: L and K': L' is in the order of 2:1, where K is the width of the shaft between the welds and L is the width of the blind hole and K' is the diameter of the shaft and L' is the diameter of the hole. Further the depth of the blind hole is achieved through cold forging techniques such that there are no internal voids present and a uniform grain structure is obtained.

[00027] Further, according to an embodiment of the present invention, the blind hole is configured to offer flexibility to the mounting region while taking loads and allows the particular region or the mounting shaft to resume its original

shape. The depth of the blind hole (L) is approximately ½ of the depth of the shaft between the welds (K) and the length of the blind hole (L') is ½ of the shaft length (K').

[00028] Further, according to a preferred embodiment, the blind hole is achieved through cold forging techniques such that the grains in the material align themselves along the stress flow lines. It also helps to improve the stress flow concentration during loading conditions such that the stress on the at least one reinforcing member is relieved.

[00029] The stress concentration factor Kt is a parameter that determines the stress at a localized area. This factor is dependent on the parameters larger diameter 'D', smaller diameter 'd', height of the trailing arm 'h' = (D-d)/2 , transition radius r and load applied to the shaft 'P'. The stress concentration is reduced by optimizing the mentioned parameters and the ratio of D/d & r/d.

[00030] According to a preferred embodiment, the optimized transition radius value is chosen in order to have the lowest stress concentration and maximum surface contact with the mating bracket or washers. The radius improvement also helps in reducing the stress concentration at the transition corners and helps in smooth flow lines during the stress flow in material. As a result, the modified design has an optimized D/d and r/d ratio such that the stress concentration is reduced to a minimum level at the transition radius and the surface contact with the shock absorber is increased to a maximum level.

[00031] The concentrated stress flow lines are made smoother through effective changes in cross section area such that the nominal and maximum stresses are reduced approximately up to three times by improving the cross section and by reducing the stress concentration factor in the localized area.

[00032] This type of design ensures the load distribution is better at the shock absorber mounting area and the frame does not get cracked or sheared even in the event of shock absorber failure.

[00033] In addition, according to another embodiment of the present subject matter, the proposed design of the shock absorber mounting shaft also helps to

improve the surface contact with the shock absorber eyelet and the pillion handle bracket during vehicle usage condition.

[00034] Furthermore, according to another embodiment of the present subject matter, the at least one reinforcement member connects and supports the pair of rear frames and pair of side frames and also supports the shock absorber mounting shaft such that the at least one reinforcing member bears a part of the load from the shock absorber and the mounting shaft.

[00035] The at least one reinforcing member is provided a pre-determined relief area at the joining of the pair of rear frames and the pair of side frames. The at least one reinforcing member is improved such that the lost weld area at the convergence point is enclosed and further the embossing is spread out to the sides to have the stress flow dissipated and away from the center in an order.

[00036] Furthermore, the area moment of inertia is significantly improved with the non-anchoring collar addition and the blind hole that helps to achieve a uniform cross sectional area and reduce overhang length of the shaft.

[00037] Furthermore, the nominal stress is reduced with the improvement in cross section area through the addition of the non-anchoring collar and the blind hole. The maximum stress is reduced with the reduction in the stress concentration factor.

[00038] These and other advantages of the present subject matter would be described in greater detail in conjunction with the figures in the following description.

[00039] **Figure 1** illustrates a saddle ride type vehicle 100, which is an exemplary motor vehicle, having an IC engine 101 that is vertically disposed. Preferably, the IC engine 101 is a single-cylinder type IC engine. The two-wheeled vehicle comprises a front wheel 110, a rear wheel 103, a frame assembly 102, a fuel tank 121 and a seat assembly 105. The frame assembly 102 includes a head pipe 111, a main tube (not shown), a down tube (not shown), and seat rails (not shown). The head pipe 111 supports a steering shaft (not shown) and two telescopic front suspension(s) 114 (only one shown) is attached to the

steering shaft through a lower bracket (not shown). The telescopic pair of front fork(s) 114 is covered by a front fender 115 mounted to the lower portion of the telescopic front suspension 114 at the end of the steering shaft. A handlebar 108 is fixed to upper bracket (not shown) and can rotate to both sides. A headlamp assembly 109, a visor guard (not shown) and instrument cluster (not shown) is arranged on an upper portion of the head pipe 111. The down tube may be located in front of the IC engine 101 and extends slantingly downward from head pipe 111. The main tube is located above the IC engine 101 and extends rearward from head pipe 111. The IC engine 101 is mounted at the front by the down tube and connects the rear of the IC engine 101 at the rear portion of the main tube.

[00040] A fuel tank 121 is mounted on the horizontal portion of the main tube (not shown). A rear swing arm (not shown) is connected to the frame assembly 102 to swing vertically, and a rear wheel 103 is connected to rear end of the rear swing arm 118. Generally, the rear swing arm is supported by a rear suspension 117. A tail light unit (not shown) is disposed at the end of the two-wheeled vehicle at the rear of the seat assembly 105. A grab rail 106 is also provided on the rear of the seat rails. A rear fender 127 is disposed above the rear wheel 103.

[00041] Figure 2 illustrates an exemplary vehicle frame assembly for a two-wheeled vehicle. The frame assembly 102 includes a head pipe 111, a main tube 201 extending obliquely downwardly from the head pipe 111. A pair of rear frames 202 extending rearwardly from at least a portion of the main tube 201. The pair of rear frames 202 are connected across by one or more cross-members 206. Further, a pair of side frames 203 extend downwardly from at least a portion of the pair of rear frames 202. The pair of side frames 203 extend towards the main tube 201. Further, the connection between the pair of rear frames 202 and the pair of side frames 203 are strengthened by at least one reinforcing member 204. The at least one reinforcing member is configured to receive a shock absorber mounting shaft 205. The at least one reinforcing member 204 and the shock absorber mounting shaft 205 are mounted on both left hand side and right hand side of the pair of rear frames 202.

[00042] Figure 3 illustrates a shock absorber mounting on to the vehicle frame assembly for a two-wheeled vehicle. At least one rear shock absorber 117 is mounted on to at least a portion of the reinforcing member 204. In particular, the shock absorber mounting shaft 205 is configured to receive at least a mounting portion, an eyelet 117a of the at least one rear shock absorber 117. The eyelet 117a is mounted to the shock absorber mounting shaft 205 through one or more mounting members 117b. According to another embodiment of the present invention, at least a portion of the pillion handle mounting 106a is also mounted to the at least one shock absorber mounting shaft 205. The proposed shock absorber mounting shaft 205 provides maximum surface contact butting with a pillion handle mounting 106a thereby eliminating additional washers for surface contact. The maximum contact surface also prevents any deformation to the pillion handle 106 during vehicle handling conditions, for example, while transporting a vehicle or while handling the vehicle in a compact parking space. Furthermore, the common mounting of the eyelet 117a and the pillion handle mounting 106a eliminates additional need of the washers and common washers can be utilized for a common purpose of mounting both the parts.

[00043] Figure 4(a) illustrates an embodiment of at least one reinforcing member. The at least one reinforcing member 204 includes a side frame mounting portion 401 configured to be attached to at least a portion of the pair side frames (not shown) and a rear frame mounting portion 402 configured to be attached to at least a portion of the pair of rear frames. The side frame mounting portion 401 and the rear frame mounting portion 402 are both continuous surfaces and provides maximum abutting with the joining portions of the frames respectively. Such a reinforcing member 204 can bear maximum load and provides stability to the vehicular parts mounted thereto. Furthermore, the at least one reinforcing member 204 includes features to provide structural stability, involving material addition in the maximum stress concentration areas. In particular, the at least one reinforcing member includes embossed portions at the regions configured to receive portions of other vehicular parts. The embossed portions in the proposed design is spread out to a wider region to enable stress

concentration flow away from the center of the at least one reinforcing member. This way a more stable operation of the at least on reinforcing member 204 can be achieved.

[00044] Figure 4(b) illustrates a side view of the shock absorber mounting shaft. The shock absorber mounting shaft 205 is welded to at least a portion of the at least one reinforcing member 204. According to an embodiment of the present invention, the shock absorber mounting shaft 205 includes a non-anchoring collar area A2 that has a wider contact surface. The wider contact surface provides increased area for attachment with at least a portion of the frame as compared to a conventional attachment portion. The increased contact surface for attachment there between prevents indentation or pitching effect. This non-anchoring collar A2 improves the stress flow distribution in the weaker zones of the shock absorber mounting shaft 205.

[00045] According to an embodiment of the present invention, the shock absorber mounting shaft 205 includes varying sections A1, A2, B, C and each section is configured to meet a specific function. The shock absorber mounting shaft 205 supports shock absorber on both left and right sides of the vehicle. In particular, the section A is welded on both sides to the frame to the at least one reinforcing member 204, the section B accommodates at least a portion of the shock absorber and the section C has a threaded profile and is tightened with the dome nut.

[00046] Further, the shock absorber mounting shaft 205 includes a non-anchoring collar A2 to improve the weak areas. The non-anchoring collar A2 includes a wider contact surface increasing the weld area compared to the conventional shock absorber mounting shaft 205 such that the indentation or pitching effect is reduced. The non-anchoring collar A2 added to the section A helps in splitting the localized stress area into A1 and A2 thereby reducing the stress flow levels occurring at the localized area. The non-anchoring collar A2 also isolates the weld projections and weld burn to the portions of the frame and the at least one reinforcing member 204 that further improves the welding away from the stress zone and mitigates the indentation and pitching effect.

[00047] According to another embodiment of the present invention, the non-anchoring collar A2 also ensures maximum surface contact butting with a pillion handle mounting bracket thereby eliminating additional washers for surface contact.

[00048] The split areas of A1 and A2 as mentioned above, ensure that the overhang length of the sections A and B are cut short such that it takes better axial loads and bending moment because of the reduced length.

[00049] Further, the addition of the non-anchoring collar A2 area to the shock absorber mounting shaft 205 provides even distribution of the stress throughout the shaft 205 and to have a smooth flow of stress lines navigated out evenly away from the usual stress concentration areas on the mounting shaft.

[00050] **Figure 4(c)** illustrates a side view of the sectional view of the shock absorber mounting shaft as illustrated in **Figure 4(b)**. Typically, the shock absorber mounting area on the frame consists of the shock absorber, mounting shaft 205 and the at least one reinforcing member 204. The at least one reinforcing member 204 is welded to the pair of rear frames and the pair of side frames. The enclosed welding area in the at least one reinforcing member 204 requires a breathing on the shock absorber mounting shaft 205 to relieve some stress at the welding area. A blind hole 403 addition helps in providing breathing and offers corner relief to the at least one reinforcing member 204 such that the load is not directly transferred to the at least one reinforcing member 204.

[00051] The blind hole 403 design is chosen in such a way that the ratio of K: L and K': L' is in the order of 2:1, where K is the width of the shaft 205 between the welds and L is the width of the blind hole 403 and K' is the diameter of the shaft 205 and L' is the diameter of the blind hole 403. Further the depth of the blind hole 403 is achieved through cold forging techniques such that there are no internal voids present and a uniform grain structure is obtained.

[00052] Further, according to an embodiment of the present invention, the blind hole 403 is configured to offer flexibility to the mounting region while taking loads and allows the particular region or the mounting shaft 205 to resume its original shape. The depth of the blind hole (L) is approximately ½ of the depth of

the shaft between the welds (K) and the length of the blind hole (L') is ½ of the shaft length (K').

[00053] Further, according to a preferred embodiment, the blind hole 403 is achieved through cold forging techniques such that the grains in the material align themselves along the stress flow lines. It also helps to improve the stress flow concentration during loading conditions such that the stress on the at least one reinforcing member 204 is relieved.

[00054] According to an embodiment of the present invention, the shock absorber mounting shaft 205 includes varying cross sections of descending diameters as compared to the diameter of the non-anchoring collar. The non-anchoring collar includes cross-sections of descending diameters on either side. The shock absorbing mounting shaft 205 is either a stud or a pin in one preferred embodiment.

[00055] According to an embodiment of the present invention, the shock absorber mounting shaft 205 includes the non-anchoring pin A2 disposed in approximately mid portion. Such that, the shock absorber mounting shaft 205 includes a blind hole 403 on the inner side, towards the portion of the shock absorber mounting shaft 205 being attached to the reinforcing member 204 and includes a threaded configuration on the outer side. The threaded configuration is configured to receive at least one shock absorber 117. The varying cross-sections of the shock-absorber mounting shaft 205 including A1, A2, B, and C provides the synergistic effect of having differentially descending diameters on either side of the non-anchoring collar A2, a blind hole 403 on the inner side and the threaded configuration on the cross-section C. This provides the compliance on the blind hole while preventing plastic deformation of the specific region.

[00056] **Figure 5(a)** illustrates a top view of the vehicle frame assembly according to an embodiment of the present invention. The shock absorber mounting shaft 205 is attached to both the sides of the pair of rear frames 202 of the vehicle frame assembly 102. **Figure 5(b)** and **Figure 5(c)** illustrates a sectional view of the shock absorber mounting shaft mounted to the at least a portion of the reinforcing member. Typically, the shock absorber mounting area

on the frame consists of the shock absorber 117, mounting shaft 117a and the at least one reinforcing member 204. The at least one reinforcing member 204 is welded to the pair of rear frames 202 and the pair of side frames. The enclosed welding area in the at least one reinforcing member 204 requires a breathing on the shock absorber mounting shaft 205 to relieve some stress at the welding area. A blind hole 403 addition helps in providing breathing and offers corner relief to the at least one reinforcing member 204 such that the load is not directly transferred to the at least one reinforcing member 204.

[00057] The blind hole 403 design is chosen in such a way that the ratio of K: L and K': L' is in the order of 2:1, where K is the width of the shaft 205 between the welds and L is the width of the blind hole 403 and K' is the diameter of the shaft 205 and L' is the diameter of the blind hole 403. Further the depth of the blind hole 403 is achieved through cold forging techniques such that there are no internal voids present and a uniform grain structure is obtained.

[00058] Further, according to an embodiment of the present invention, the blind hole 403 is configured to offer flexibility to the mounting region while taking loads and allows the particular region or the mounting shaft 205 to resume its original shape. The depth of the blind hole (L) is approximately ½ of the depth of the shaft between the welds (K) and the length of the blind hole (L') is ½ of the shaft length (K').

[00059] Further, according to a preferred embodiment, the blind hole 403 is achieved through cold forging techniques such that the grains in the material align themselves along the stress flow lines. It also helps to improve the stress flow concentration during loading conditions such that the stress on the at least one reinforcing member is relieved.

[00060] The stress concentration factor Kt is a parameter that determines the stress at a localized area. This factor is dependent on the parameters larger diameter 'D', smaller diameter 'd', height of the trailing arm 'h' = (D-d)/2 , transition radius r and load applied to the shaft 'P'. The stress concentration is reduced by optimizing the mentioned parameters and the ratio of D/d & r/d.

[00061] Figure 6(a) and Figure 6(b) illustrates a comparative study of the flow of stress lines along the shock absorber mounting shaft without and with proposed non-anchoring collar addition respectively. As illustrated in **Figure 6(a)** the side that is facing the outside part of the frame welding has certain difficulties in load distribution and as a result of this the stress is concentrated towards this end. There are primarily two weak zones. In one of the zones, the shock absorber mounting shaft 205 is welded to the at least one reinforcing member which gets hardened as a result of welding heat. The other weak zone is a sharp transition zone on the shock absorber mounting shaft 205 where there is high stress concentration. These two weak zones are present very close to each other on the shock absorber mounting shaft 205, which results in having a very high stressed region. During fatigue loading, the shock absorber mounting shaft 205 is likely to fail in these regions by shear or brittle crack as a result of indentation and pitching effect. Whereas, as illustrated in the **Figure 6(b)**, the shock absorber mounting shaft 205 includes a non-anchoring collar A2 area that has a wider contact surface. The wider contact surface provides increased area for attachment with at least a portion of the frame as compared to a conventional attachment portion. The increased contact surface for attachment there between prevents indentation or pitching effect. This non-anchoring collar improves the stress flow distribution in the weaker zones of the shaft.

[00062] The non-anchoring collar 403 includes a wider contact surface increasing the weld area compared to the conventional shock absorber mounting shaft 205 such that the indentation or pitching effect is reduced. The non-anchoring collar 403 added to the section A helps in splitting the localized stress area into A1 and A2 thereby reducing the stress flow levels occurring at the localized area. The non-anchoring collar 403 also isolates the weld projections and weld burn to the portions of the frame and the at least one reinforcing member 204 that further improves the welding away from the stress zone and mitigates the indentation and pitching effect.

[00063] According to another embodiment of the present invention, the non-anchoring collar 403 also ensures maximum surface contact butting with a

pillion handle mounting bracket thereby eliminating additional washers for surface contact.

[00064] The split areas of A1 and A2 as mentioned above, ensure that the overhang length of the sections A and B are cut short such that it takes better axial loads and bending moment because of the reduced length.

[00065] Further, the addition of the non-anchoring collar area to the mounting shaft provides even distribution of the stress throughout the shaft and to have a smooth flow of stress lines navigated out evenly away from the usual stress concentration areas on the mounting shaft.

[00066] Therefore, due to the proposed design of the shock absorber mounting shaft, the stress flow lines are evenly propagated outside of the mounting shaft and away from the center.

[00067] Although the subject matter has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternate embodiments of the subject matter, will become apparent to persons skilled in the art upon reference to the description of the subject matter. It is therefore contemplated that such modifications can be made without departing from the spirit or scope of the present subject matter as defined.

I/We claim:

1. A frame assembly (102) for a two or three-wheeled vehicle (100), said frame assembly (102) comprising:

   a pair of rear frames (202) extending rearwardly from a main frame (201);

   a pair of side frames (203) extending downwardly from at least a portion of the pair of rear frames (202);

   a reinforcing member (204) disposed adjoiningly in between at least a portion of said pair of rear frames (202), said reinforcing member (204) is configured to connect said pair of rear frames (202) and said pair of side frames (203); and

   a shock absorber mounting shaft (205) attached to at least a portion of said reinforcing member (204), said shock absorber mounting shaft (205) includes varying cross-sections A1, A2, B, and C, wherein said varying cross-section A2 is a non-anchoring collar.

2. The frame assembly (102) for a two or three-wheeled vehicle (100) as claimed in claim 1, wherein, the section A1 is welded on both sides to the at least one reinforcing member (204), the section B accommodates at least a portion of the shock absorber (117) and the section C has a threaded profile configured to receive one or more mounting member (117b).

3. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 1, wherein, said shock absorber mounting shat (205) is configured to receive an eyelet (117a) of the at least one shock absorber (117).

4. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 1, wherein, said shock absorber mounting shat (205) is configured to receive at least a portion of a pillion handle mounting (106a) of the pillion handle (106).

5. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 1, wherein, said eyelet (117a) and said pillion handle mounting (106a) is attached to said shock absorber mounting shaft (205) through one or more mounting members (117b).

6. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 1, wherein, the shock absorber mounting shaft (205) includes a blind hole (403), said blind hole (403) is in the ratio of K: L and K': L', where K is the width of the shock absorber mounting shaft 205 and L is the width of the blind hole (403) and K' is the diameter of the shock absorber mounting shaft (205) and L' is the diameter of the blind hole (403).

7. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 1, wherein, said varying cross-sections A1, B and C are configured to include differentially descending diameters as compared to a diameter of the non-anchoring collar (A2).

8. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 7, wherein, the K: L ratio is approximately 2:1.

9. The frame assembly (102) for two or three-wheeled vehicle (100) as claimed in claim 7, wherein, the depth of the blind hole (403) is approximately ½ of the depth of the shock absorber mounting shaft (205) between the width (K) and the length of the blind hole (L') is ½ of the shock absorber mounting shaft length (K').

10. A shock absorber mounting shaft (205) configured to receive at least one shock absorber (117) of a two or three-wheeled vehicle (100), said shock absorber mounting shaft (205) includes:

varying cross sections A1, A2, B, and C, the section A1 is welded on both sides to at least one reinforcing member (204), the section A2 is a non-anchoring collar, the section B accommodates at least a portion of the shock absorber (117) and the section C has a threaded profile configured to receive one or more mounting

member (117b), said non-anchoring collar (A2) is disposed in approximately mid portion of the shock absorber mounting shaft (205).

5

ABSTRACT

A FRAME ASSEMBLY FOR A VEHICLE

The present subject matter generally relates to a two or three-wheeled vehicle, and more particularly, to a frame assembly for a two-wheeled or a three-wheeled vehicle. The frame assembly (102) includes a pair of rear frames (202) extending rearwardly from a main frame (201), a pair of side frames (203) extending downwardly from at least a portion of the pair of rear frames (202), a reinforcing member (204) disposed adjoiningly in between at least a portion of said pair of rear frames (202), said reinforcing member (204) is configured to connect said pair of rear frames (202) and said pair of side frames (203), and a shock absorber mounting shaft (205) attached to at least a portion of said reinforcing member (204), said shock absorber mounting shaft (205) includes varying sections A, B, C.

<To be published with Figure 5(a), 5(b), and 5(c)>

Sheet No.: 1
No. of Sheets: 6

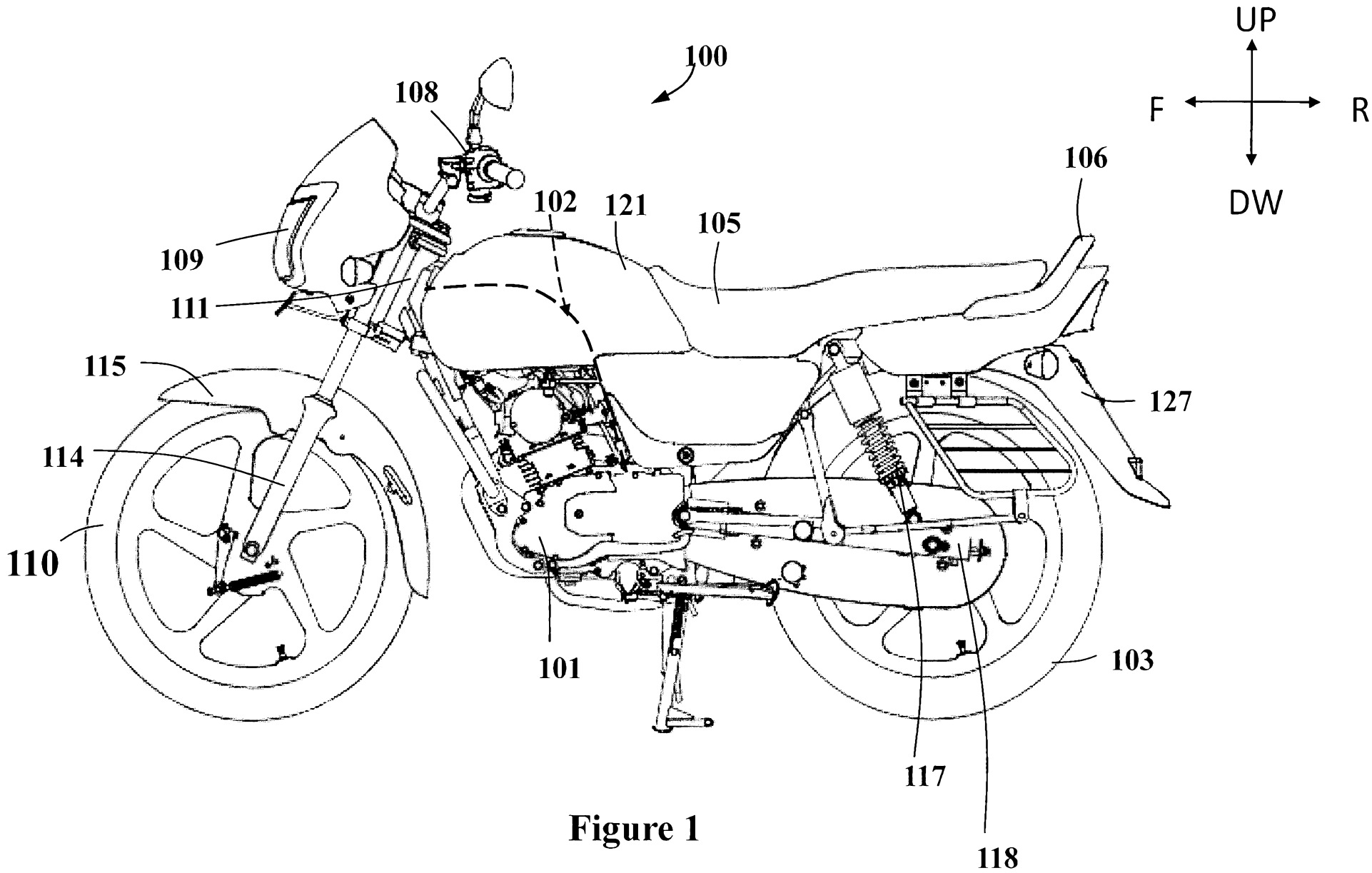


Figure 1

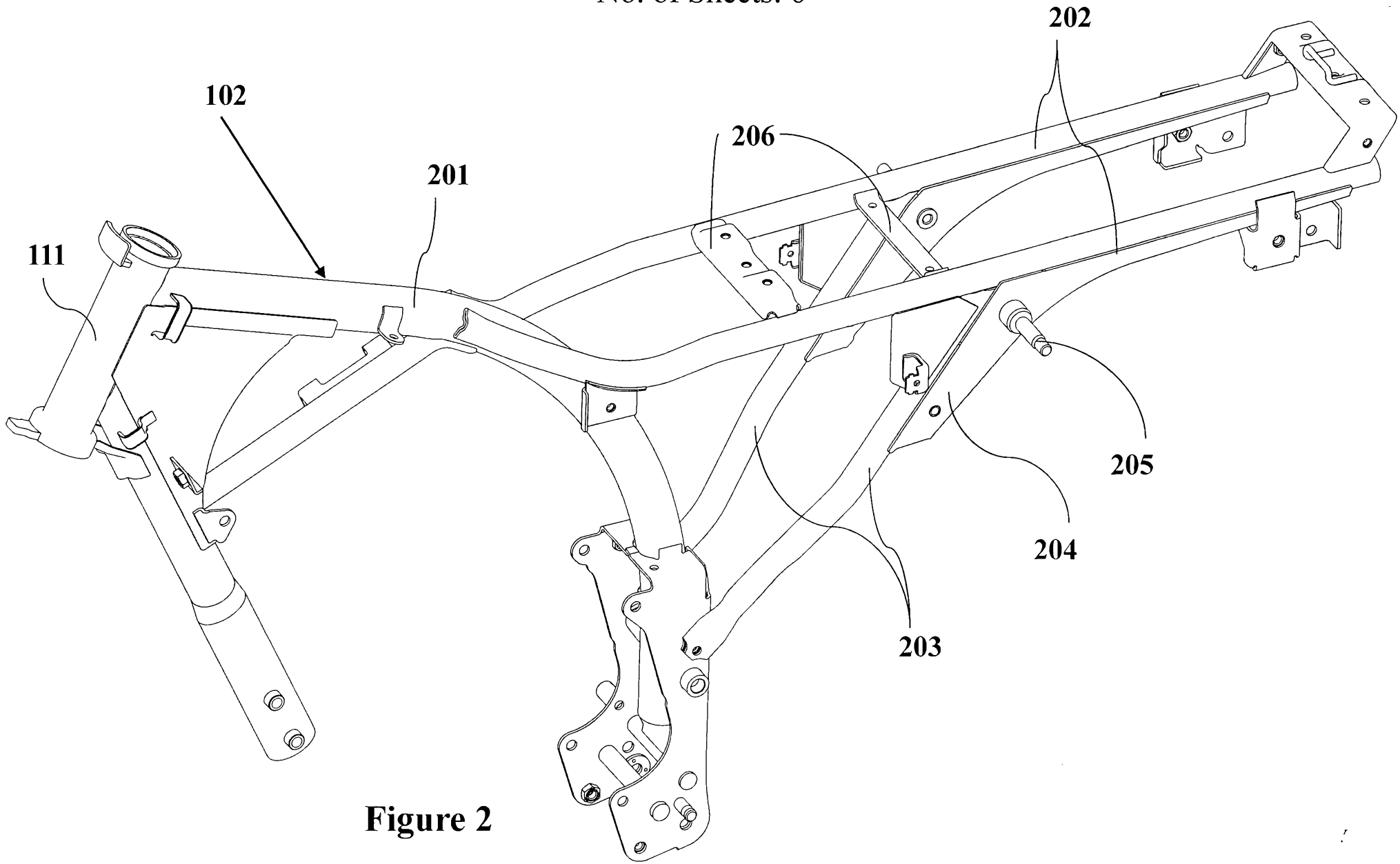


Figure 2

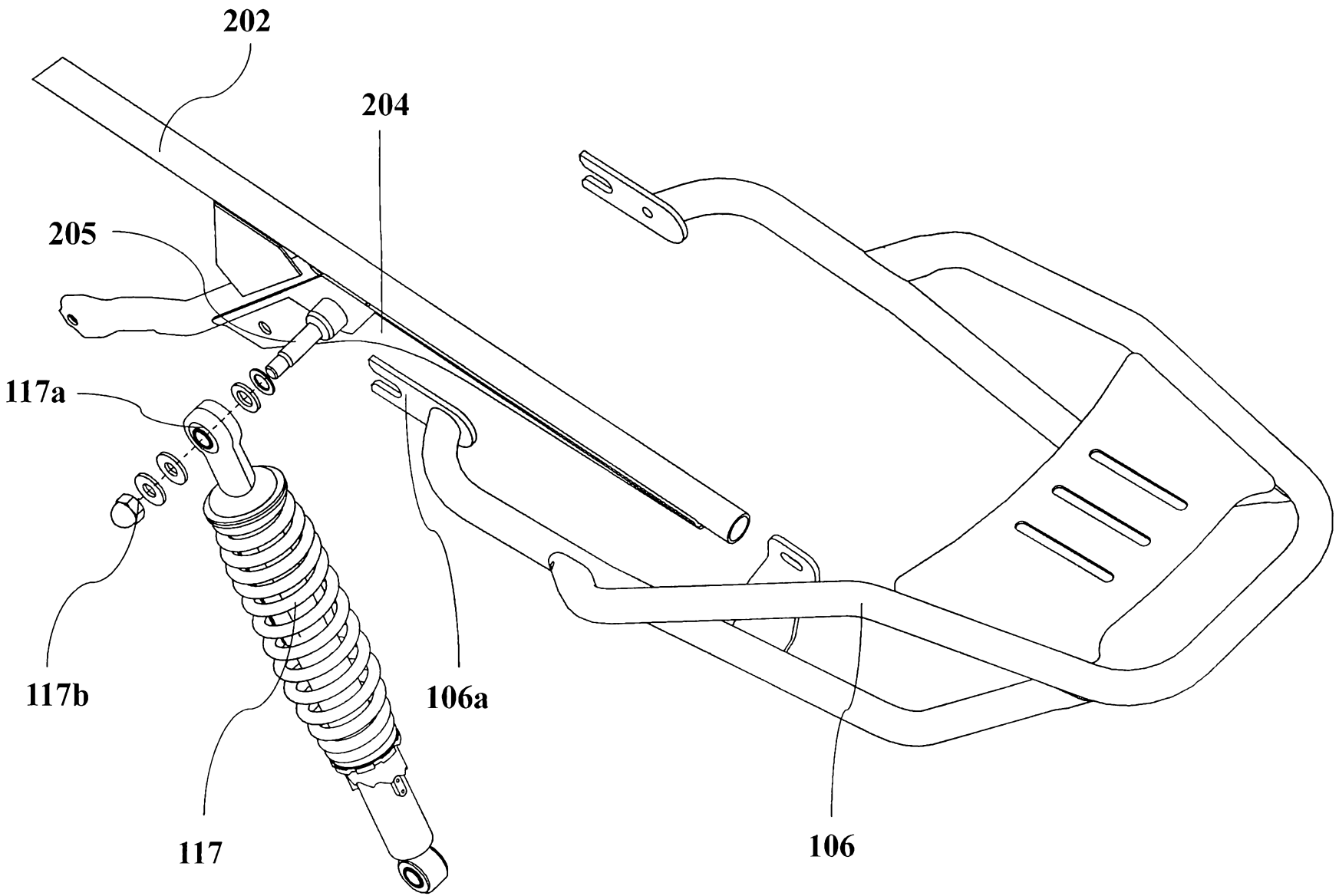


Figure 3

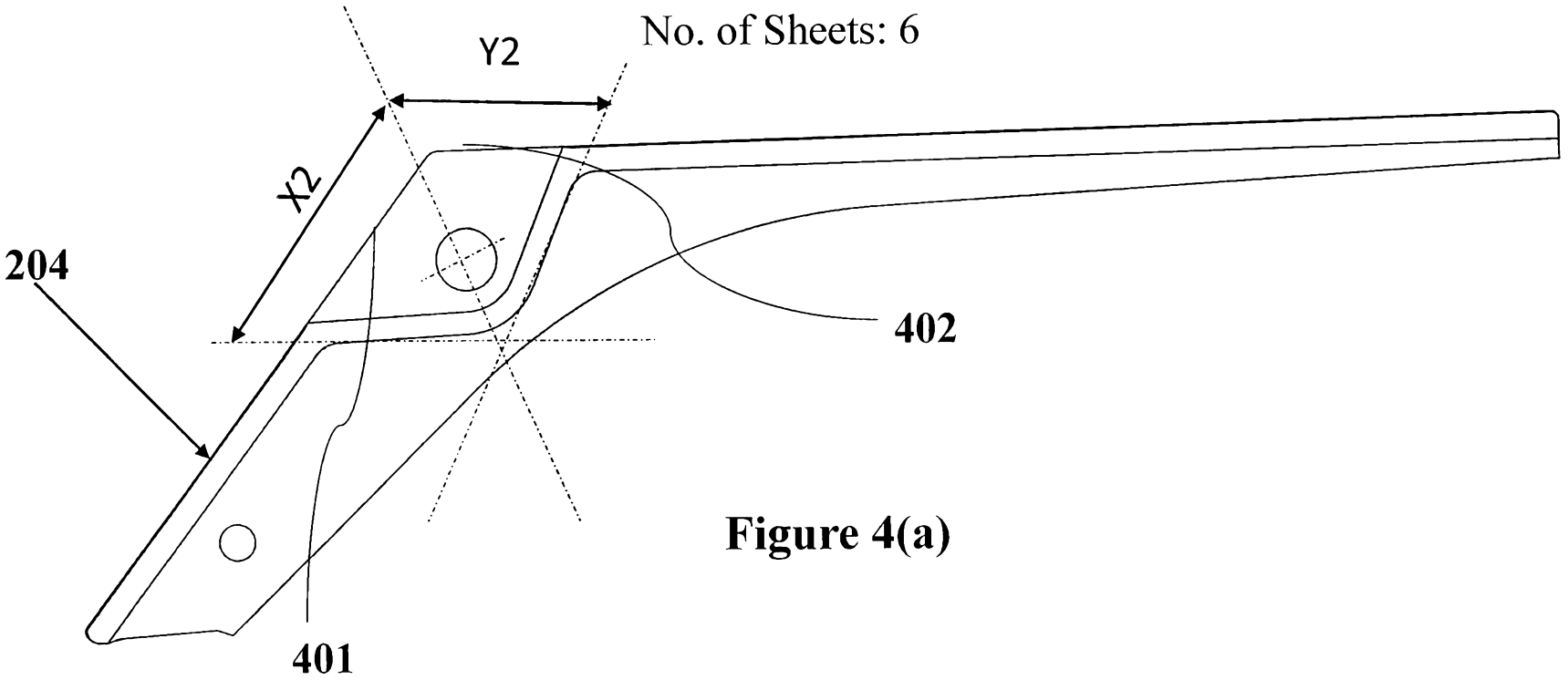


Figure 4(a)

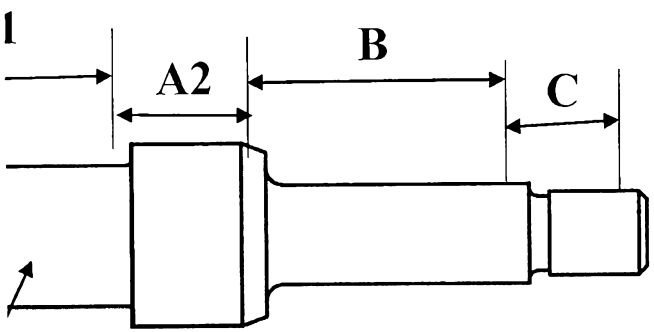


Figure 4(b)

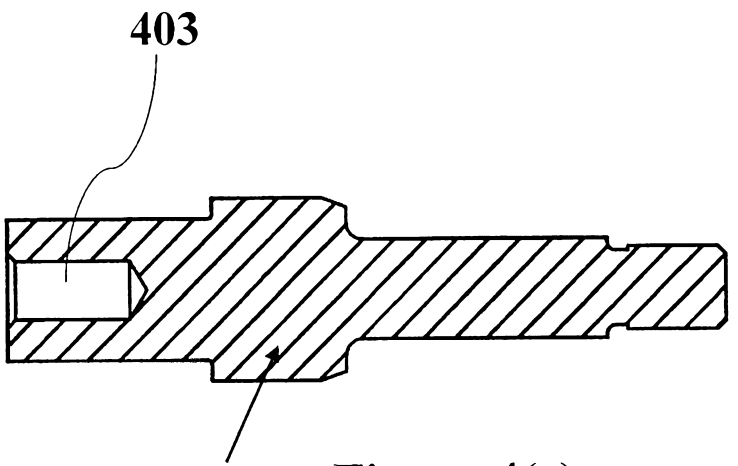


Figure 4(c)

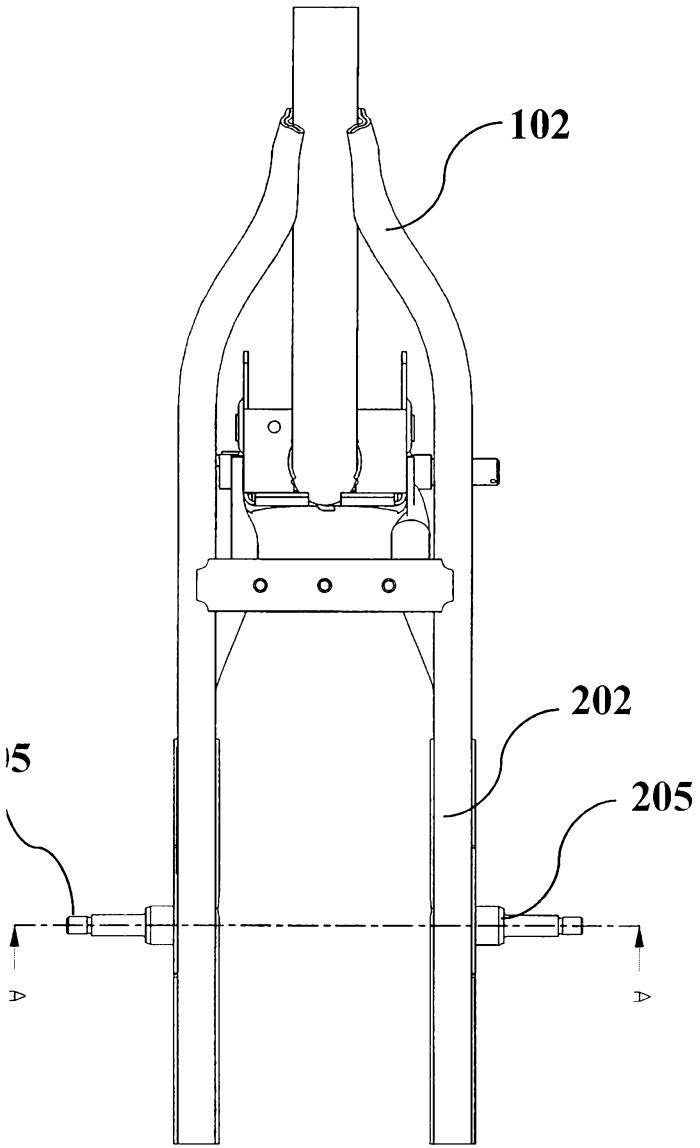


Figure 5(a)

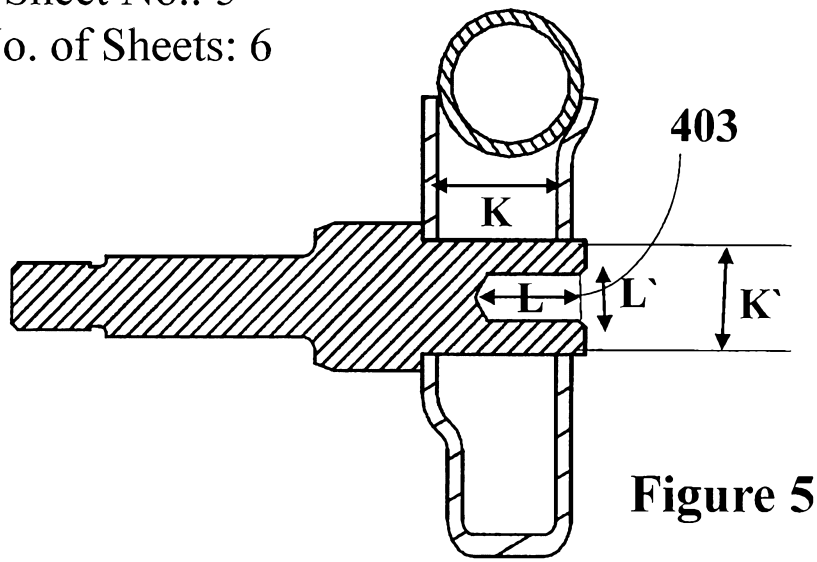


Figure 5(b)

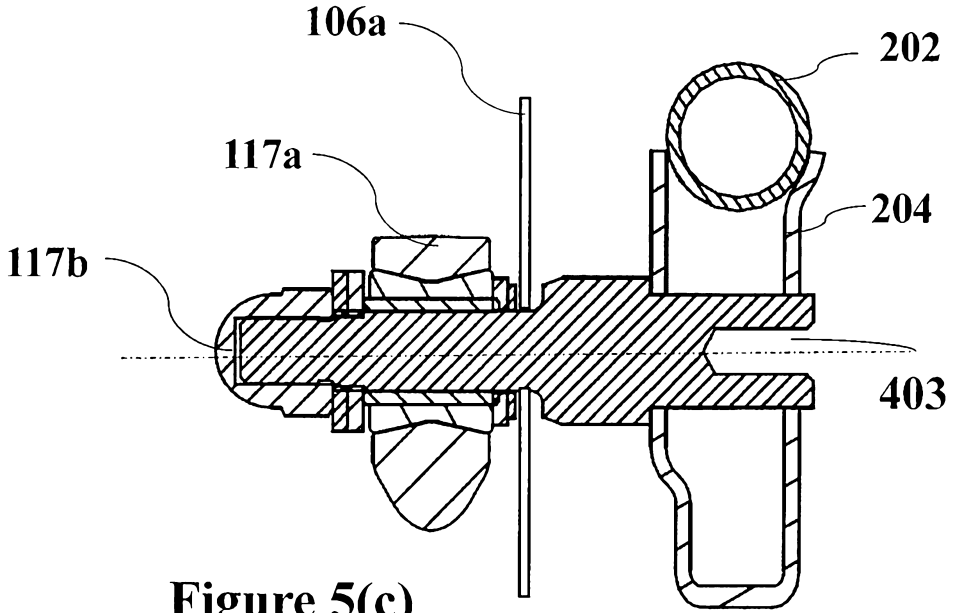


Figure 5(c)

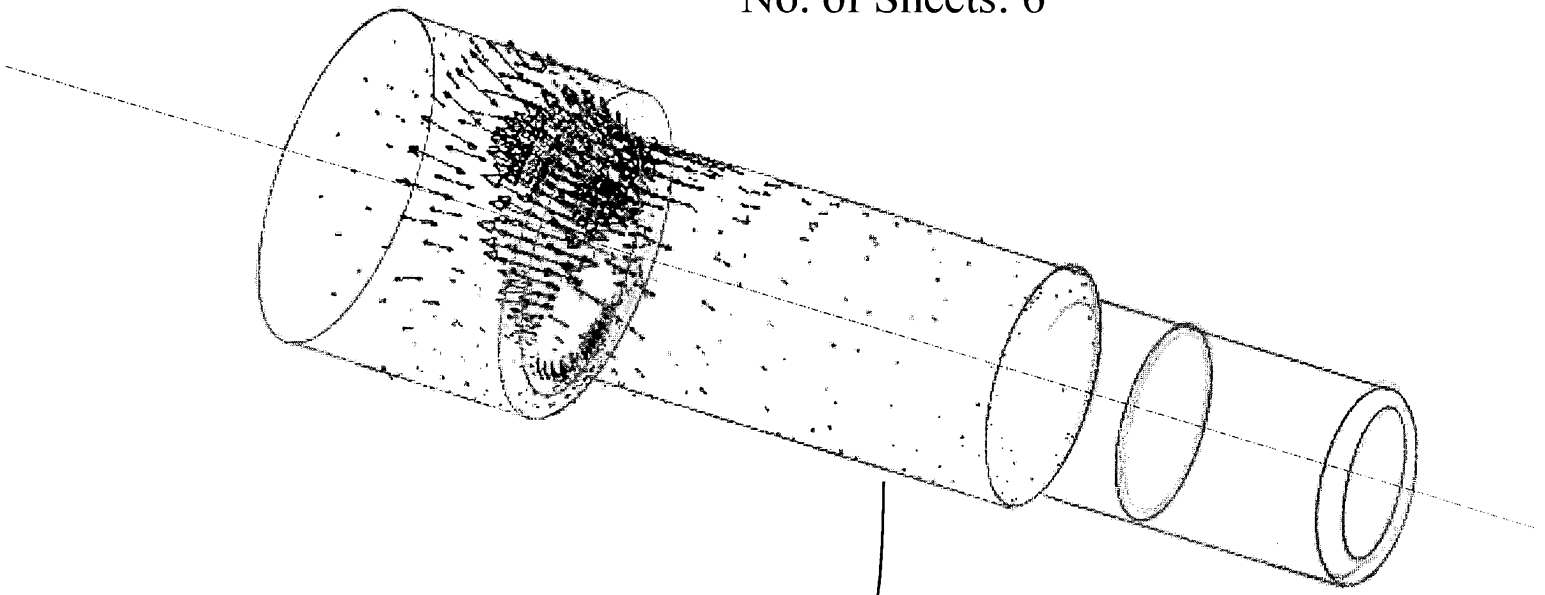


Figure 6(a)

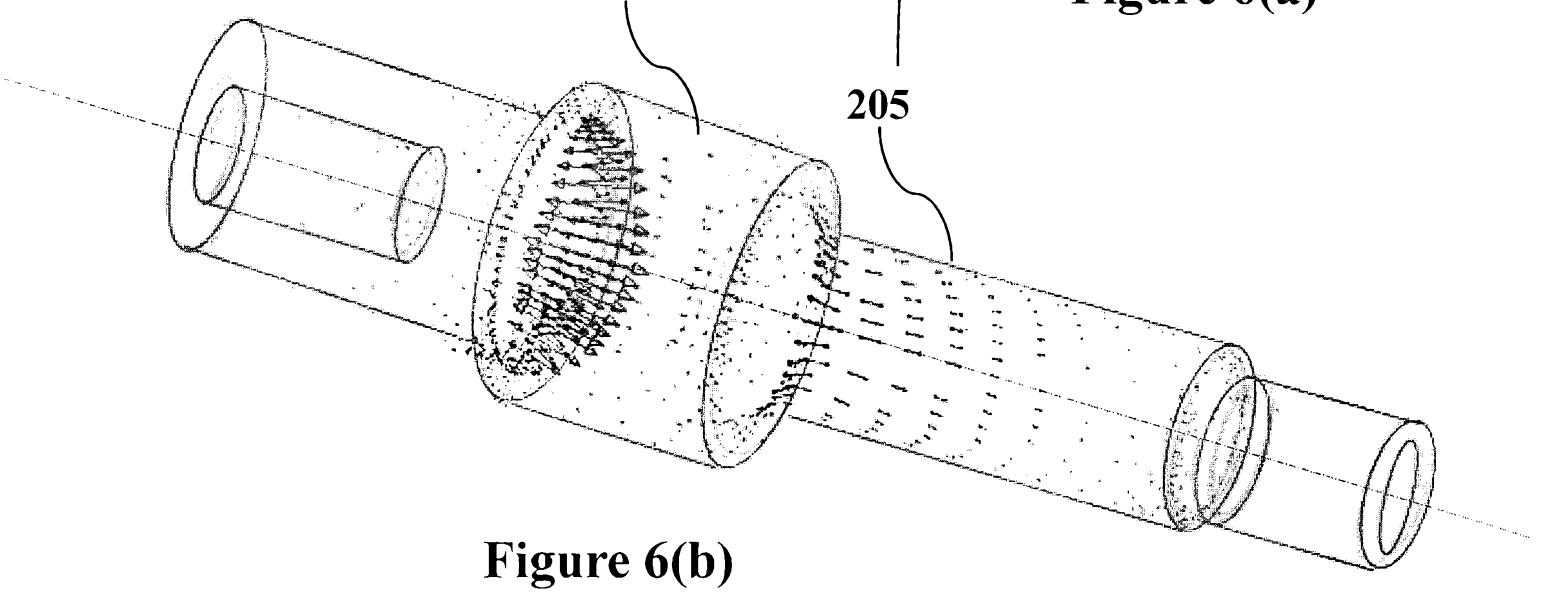


Figure 6(b)