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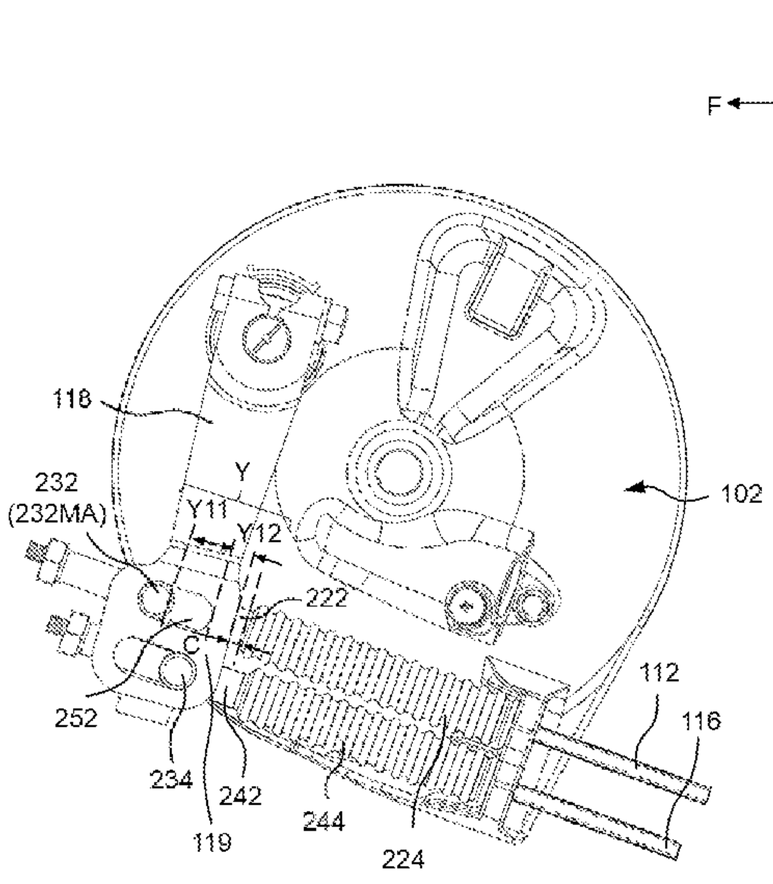

Fig. 6

(57) Abstract: The present subject matter provides a motor vehicle comprising one or more wheels. A wheel-brake system (102) corresponding to each of said one or more wheels is provided. The wheel-brake system (102) includes a cam lever (118) and one or more brake cables (112, 116) are connected thereto. Each of one or more protective cover members (202) is provided on and covering at least a portion of corresponding elastic return member (132, 134). The protective cover member (202, 204) comprises a holding portion (222, 242) having an axial length being greater than a maximum traversal distance (Y11, Y21) of corresponding brake cable (112, 116) about the cam lever (118). The protective cover members (202, 204) have a folding portion (224, 244), which maintain desired clearance even in hard braking condition of any of the brakes.

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A MOTOR VEHICLE AND A BRAKING SYSTEM THEREOF

TECHNICAL FIELD

[0001] The present subject matter, in general, relates to a braking system for a motor vehicle, and, in particular relates, to the braking system working in conjunction with one or more brakes cables.

BACKGROUND

[0002] Conventionally, two-wheeled or three-wheeled saddle type vehicles are provided with a braking system for slowing and/or for stopping the vehicle. The braking system, usually, includes a wheel-brake provided on each of the wheels. For example, a front wheel-brake and a rear wheel-brake are provided for a front wheel and a rear wheel, respectively. Generally, the wheel-brake can be a drum brake that includes a cam lever for actuation of friction pads, which exert frictional force on a brake drum. Drum brakes are preferred due to their low-cost and ease of maintenance. Each of the front wheel-brake and the rear wheel-brake is connected to a corresponding brake lever for actuation. The brake lever can be connected to the wheel-brake in a variety of ways. For example, the brake lever can be connected to the brake by means of a cable. In such a case, one end of the cable may be secured to the wheel brake, and the other end of the cable may be secured to the brake lever. Consequently, actuation of the brake lever may result in actuation of the wheel brake and subsequently, the brake force may be applied resulting in retardation of the vehicle or stoppage.

[0003] Generally, the front wheel and the rear wheel are provided with separate braking systems. Conventional two-wheeled or three-wheeled vehicles include braking systems, which usually include either hand-operated brakes for both the wheels or include a combination of hand-operated and foot-operated brakes. In the latter case, generally, the front wheel-brakes are hand-operated, and include a front wheel-brake lever mounted on a handle of the vehicle for actuation, whereas the rear wheel-brakes are foot-operated by a rear wheel-brake lever provided near a foot-rest of the rider.

[0004] Conventionally, braking systems that allow simultaneous actuation of a front brake-wheel brake and a rear brake-wheel brake by application of a single brake lever have been developed. Such braking system are capable of

synchronously actuating the front wheel-brake and the rear wheel-brake with the help of a single brake lever, for example the rear wheel-brake lever. Accordingly, upon actuation of the single brake lever, such a braking system may allow application of braking force to the front wheel as well as the rear wheel of the vehicle

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The detailed description is described with reference an embodiment in the accompanying Figures. In the Figures, similar numbers are used throughout the drawings to reference like features and components.

[0006] Fig. 1 depicts a right-side view of an exemplary motor vehicle, in accordance with an embodiment of the present subject matter.

[0007] Fig. 2 illustrates a schematic view of a front wheel, in accordance with an embodiment of the present subject matter.

[0008] Fig. 3 depicts an enlarged schematic view of a portion of the front wheel-brake, in accordance with an embodiment of the present subject matter

[0009] Fig. 4 depicts another enlarged schematic view of a portion of the wheel-brake, in accordance with an embodiment of the present subject matter.

[00010] Fig. 5 depicts a first perspective view of a protective cover member, in accordance with an embodiment of the present subject matter.

[00011] Fig. 6 depicts a schematic view of a portion of the wheel brake in an actuated condition of one of the brake cables, in accordance with an embodiment of the present subject matter.

[00012] Fig. 7 depicts a sectional view of the wheel brake depicted in Fig. 6, in accordance with an embodiment of the present subject matter.

[00013] Fig. 8 depicts a schematic side view of a cover member, in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

[00014] Conventionally, each brake cable from each of the front wheel-brake lever and the rear wheel-brake lever is connected to the front wheel-brake and the rear wheel-brake, respectively. An additional brake cable is connecting the rear wheel-brake lever to the front wheel-brake. The front wheel-brake may include a cam lever having a hinge pin each for supporting each of the cables. Therefore, the first cable

and the second cable may be coupled to a cam lever of the front wheel-brake. Each of the brake cable is provided with a spring, which may be a compression spring, which returns the cam lever to reach its initial condition after release of application of the brake lever. The spring or an elastic member plays a critical role in return function of the cam lever and also in providing desired brake feel to the rider. For example, only when one of the brake cable is actuated, the other brake cable connected to same cam lever needs to be retained in its own pre-determined position. This provides a desired feel to the user, which is not loose, when the user additionally applies the other wheel brake later. The spring is provided with a dust seal to protect the spring and inner cables from dust, dirt, moisture, water etc. For example, accumulation of dust or dirt between the spring coils rings may affect the compression of the spring thereby affecting the function of the brake. Moreover, the spring may be damaged from external particles likes stones, water etc., which may make the brake lever loose or over tight or it may result in failure of the spring. Thus, the dust seal protects the springs from aforementioned and other problems.

[00015] However, the conventional dust seals used in the braking systems have certain short comings. For a cam lever provided with two brake cables, when only one of the two brake cables was actuated, the dust seal of the other brake cable hinders relative movement of cam lever with respect to the other brake cable and vice versa. The dust seal interacts with the cam lever hindering the motion of the cam lever. This interference results in poor returning capability of the cam lever leading to safety issues as well as the adversely affecting the brake performance and feel owing to the constrained motion of the cam lever.

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[00016] For example, the cam lever interferes with folds provided on the dust seal, especially the ones or more portion provided at cam lever end. The motion of the cam lever is retarted or stuck by the dust seal provided on the non-actuated brake cable. In certain conditions, due to excess friction between the folds of the dust seal and the cam lever, the dust seal gets stuck with the cam lever adversely affecting its smooth motion. Thus, the cable operating efficiency of the either of the brake cables is adversely affected. The conventional dust seal also causes issues for assembly/ tightening / adjustment of an adjuster nut for setting right free play / ineffective

stroke because of the dust seal getting stuck with the cam lever thereby affecting clearance of the hinge pin in corresponding slot of the cam lever.

[00017] Moreover, the friction between the dust seal and the cam lever causes wear and tear of the dust seal thereby causing damage of the dust seal. Damage of the dust seal exposes the brake cable (the inner cable) and the spring to the atmosphere. The exposure to atmosphere and due to accumulation of dust, water and dirt, the function and life of the cable and the spring are adversely affected.

[00018] Thus, a braking system for a motor vehicle is designed as per the present subject matter to overcome the above stated and other problems of the conventional braking systems known in the art.

[00019] The present subject matter provides a motor vehicle with one or more wheels and corresponding one or more wheel-brake systems for the wheels.

[00020] In one embodiment, the wheel brake comprises a cam lever, which is capable of actuating the wheel-brake system upon actuation of at least one brake lever of each wheel brake of the motor vehicle. The term 'brake lever' is not limiting and may include a brake pedal.

[00021] In one embodiment, one or more brake cables are connected to the cam lever for actuation of wheel brake through at least any one of the brake cables.

[00022] In one embodiment, one or more elastic return members corresponding to the one or more brake cables are provided to enable the cam lever and corresponding brake cables as well to return to an initial conditions/ positions eliminating the need for any separate additional torsion spring or the like for the cam lever. The elastic return member retains corresponding brake cable in an intact position when other brake cable is actuated thereby reducing/ eliminating vibration and undesired free play of the other brake cable or lever.

[00023] In one embodiment, one or more protective cover members are provided on and for covering at least a portion of corresponding elastic return members. The protective cover members cover each of the elastic return members thereby ensuring smooth functioning of all the brake cables.

[00024] It is a feature of the present invention that the protective cover member comprises of a holding portion having an axial length large enough to maintain a predetermined clearance between a folding portion and the cam lever even during

actuation of one or more brake levers of the vehicle (even during hard braking requiring complete actuation of brake lever or brake pedal).

[00025] In one embodiment, the protective cover member comprises a holding portion, which is having an axial length being greater than a safe distance defined between a hinge member (i.e. in a maximum slidable condition in the corresponding slot) and a first end of the cam lever, wherein the first end is an end of the cam lever in close proximity to the folding portion.

[00026] The safe distance is also computed as sum of a maximum possible relative traversal distance of corresponding brake cable about the cam lever and a length of a first end of the cam lever. Additionally, the protective cover member is configured not to interfere with the cam lever.

[00027] For example, the holding portion of the protective cover member ensures that the protective cover member has sufficient clearance between a folding portion of the protective cover member and the cam lever. Thus, any fouling or stuck up of the folding portion of the protective cover member with cam lever is completely eliminated.

[00028] In one embodiment, the cam lever comprises one or more slots and corresponding one or more hinge members are provided thereat. Each hinge member gets functionally connected to a corresponding brake cable through an adjuster nut.

[00029] In one embodiment, the holding portion of the protective cover member has an axial length being greater than a maximum possible traversal distance of corresponding hinge members along corresponding slots of the cam lever.

[00030] In one preferred embodiment, the holding portion is having an axial length greater than a sum of the maximum possible traversal distance (of the hinge member in the slot) and an end length of a first end, which is in proximity to the protective cover member, of the cam lever.

[00031] The aforementioned can be defined in other words as, the axial length is marginally greater than a gap between the hinge member (positioned in the slot at far end away from the protective cover member) and the end of the cam lever.

[00032] In one embodiment, each of the one or more brake cables comprises an inner cable and an outer sheath. The inner cables have one end connected to

corresponding hinge member and the one or more elastic return members are disposed between the hinge member and the support member or anchor part or abutment. The support member may be provided on a plate member of a drum brake.

[00033] In one embodiment, the elastic return members are compression-type springs that are provided for each brake cable and the protective cover members substantially cover the elastic cover members. Further, the protective cover member has the folding portion, which gets compressed along with the elastic return member, wherein the protective cover member covers the elastic return member during compression without getting stuck with the cam lever.

[00034] In one embodiment, the folding portion of the protective cover member comprises one or more drain holes being provided on a trough portion of plurality folds thereof.

[00035] In one embodiment, an outside diameter of holding portion of the protective cover member is less than a lateral clearance between the flange members of the cam lever.

[00036] In one embodiment, the axial length is maintained such that a minimum clearance between the folding portion of the protective cover member and the cam lever is maintained even though other brake cable alone is actuating cam lever fully during any hard braking.

[00037] The present subject matter is applicable to braking systems with cam lever having one or more brake cables connected thereto.

[00038] The protective cover member provides functional and aesthetic improvement as the folding portion is subjected to smooth compression during braking without any stuck-up with cam lever.

[00039] The protective cover member can be assembled and serviced with ease as it does not interfere with other parts like cam lever.

[00040] The brake lever/ brake pedal offer superior brake feel, as free play zone can be distinguished from start of braking or braking zone as the protective cover member does not interfere with any functional brake parts like cam lever or elastic return member making it easier to actuate brake control on any road conditions.

[00041] These and other advantages of the present subject matter would be described in greater detail in conjunction with an embodiment of a two wheeled motor vehicle with the Fig. s in the following description. Arrows wherever provided in the top right corner of the drawings indicate the directions with reference to the vehicle. The arrow 'F' indicates forward direction, the arrow 'R' indicates rearward direction, the arrow 'Up' indicated upward direction, and the arrow 'Dw' indicates downward direction.

[00042] Fig. 1 depicts a right-side view of an exemplary motor vehicle 100, in accordance with an embodiment of the present subject matter. The motor vehicle 100 comprises a frame member 150 supporting a front wheel 103 and a rear wheel 105. The front wheel 103 and the rear wheel 105 are rotatably supported by front suspension system 111 and the rear suspension system (not shown), respectively. In one embodiment, the rear wheel 105 may be additionally supported by a swingarm (not shown). The front wheel 103 is provided with a front wheel-brake system 102 (shown as dotted line) and the rear wheel 105 is provided with a rear wheel-brake system 104. In the present embodiment, the front wheel-brake system 102 and the rear wheel-brake system 104 are drum brakes. The invention is not limited to drum brakes, as it is applicable to motor vehicles with a combination of drum brake and disc brakes. The wheel-brake systems may be actuated using a hydraulic actuation, a mechanical actuation or a combination of hydraulic and mechanical systems.

[00043] A power unit 190 is either fixedly mounted to the frame member 150 or is swingably connected to the frame member 150. The power unit 190 can be at least one of an internal combustion engine and an electric traction motor or both (hybrid). The power unit 190 is coupled to a transmission system (not shown) for transferring power to at least one of the rear wheels 105 and the front wheels 103. Further, the front wheel 103 is pivotally supported by the frame member 150 and a handle bar assembly 155 is functionally connected to the front wheel 103 for maneuvering the vehicle 100. The handle bar assembly 155 supports at least one brake lever 156 for actuation of at least one front wheel-brake system 102 and/or rear wheel-brake system 104. In one embodiment, the vehicle 100 has a rider foot-support structure

(not shown) extending on either side of the vehicle 100 for the rider to rest his/her feet.

[00044] A brake pedal is provided near the rider foot-support structure of the motor vehicle 100 for actuation of brake using foot. In the depicted embodiment, the vehicle 100 has a step-through portion, the power unit 190 is swinging-type mounted rearward of the step-through portion and the transmissions to the rear wheel 105. The motor vehicle 100 is provided with a braking system constituting the front wheel-brake system 102 and the rear wheel-brake system 104. In one embodiment, the braking system comprises a synchronized wheel-brake system lever (not shown) for applying both the front wheel-brake system 102 as well as the rear wheel-brake system 104.

[00045] In the present embodiment, the brake lever 156, which is interchangeably referred to as 'front wheel-brake system lever', and the synchronized wheel-brake system lever may be disposed on a right-hand side or on a left-hand side of a handle bar assembly 155 of the vehicle, respectively. In another implementation, instead of providing the synchronized wheel-brake system lever on the handle bar assembly, a foot pedal provided near rider foot serves as the synchronized wheel-brake system lever to apply the front wheel-brake system 102 as well as the rear wheel-brake system 104.

[00046] Thus, in an embodiment with synchronized braking system, the front wheel-brake system 102 receives a synchronized-front brake cable 112 and independent front brake cable 116 (shown in Fig. 2) and the rear wheel brake 104 receives a rear brake cable 114.

[00047] Fig. 2 illustrates a schematic view of a front wheel, in accordance with an embodiment of the present subject matter. The front wheel 103 comprises a wheel rim 115, which supports a tyre. In the depicted embodiment, the wheel 103 is an alloy type wheel with an arm portion and a hub portion integrated with the rim 115. In the depicted embodiment, the front wheel-brake system 102 is a drum brake mounted to the hub portion of the wheel 103. The synchronized-front brake cable 112 and the independent-front brake cable 116 may be connected to the front wheel-brake system 102.

[00048] The front-wheel brake 102 includes a cam lever 118 and each of the synchronized-front brake cable 112 and the independent-front brake cable 116 are functionally connected to the cam lever 118. The cam lever 118 is rotatably supported on a plate member 120 of the front wheel-brake system 102. The plate member 120 is provided with at least a cable abutment 122, wherein one end of outer sheaths of the brake cables 112, 116 are supported on the cable abutment 122 and inner cables of the brake cables 112, 166 are slidable through the outer sheaths and the cable abutment 122. The front-brake lever 156 (shown in Fig. 1) is connected to the cam lever 118 of the front wheel-brake system 102 through the independent-front brake cable 116 and the synchronized-brake lever is connected to the cam lever 118 of the front wheel 103 through the synchronized front brake cable 112.

[00049] Fig. 3 depicts an enlarged schematic view of a portion of the front wheel-brake system, in accordance with an embodiment of the present subject matter. The front wheel-brake system 102 includes a cable abutment 122, wherein an outer sheath 112O, 116O of the brake cables 112, 116 abut against the cable abutment 122. The front wheel-brake system 102 comprises a cam lever 118 provided with one or more slots 252, 254. In the depicted embodiment, the cam lever 118 is provided with a first slot 252 and a second slot 254. In one embodiment, the cam lever 118 comprises two flange members 118A, 118B (shown in Fig. 8) spaced in lateral direction The front wheel-brake system 102 further includes one or more hinge members 232, 234 corresponding to the one or more slots 252, 254 for supporting each of the synchronized front brake cable 112 and the independent-front brake cable 116, respectively, at the corresponding slots 252, 254.

[00050] The hinge members 232, 234 are disposed in the slots 252, 254 and are slidable in the slots 252, 254. Each of the hinge members 232, 234 are provided with a hole and the brake cables 112, 116 pass through the holes. Further, an end portion of the brake cables 112, 116 is provided with an adjuster nut 162, 164. The adjuster nut 162, 164 may be internally threaded to firmly hold the synchronized front brake cable 112 and the independent-front brake cable 116 with the corresponding hinge members 232, 234.

[00051] A first elastic return member 132 and a second elastic return member 134 are provided between the cable abutment 122 and the hinge members 232, 234. The elastic return members 132, 134 are annularly provided over the inner cables 112I, 116I of the brake cables 112, 116, wherein in one embodiment the elastic return members 132, 134 are compression-type springs. During actuation of the brake, the brake lever 156/ brake pedal is actuated and the inner cable 112I, 116I of any of the brake cables 112, 116 is pulled due to which the spring 132/134 is compressed. The cam lever 118 is rotated about and along with a cam-pin 121 for application of the brake. When the brake lever 156/ brake pedal is released, the elastic return members 132 allows the cam lever 118 to return to an initial position, which is a non-actuated positon of the brake due to brake shoe return spring (not shown). The elastic return member 132, 134 will also maintain the hinge members 232, 234 of the non-actuated brake cable at a desired position, when both the brake levers are released.

[00052] The wheel-brake system 102 is provided with one or more protective cover members 202, 204 corresponding to the brake cables 112, 116. The protective cover members 202, 204 (hereinafter also referred to as "cover member" for brevity) corresponds to one or more brake cable 112, 116 and cover at least a portion of the elastic return member 132, 134. In the present embodiment, a first protective cover member 202 and a second protective cover member 204 are provided. The first protective cover member 202 includes a folding portion 224 and a holding portion 222 (shown in Fig. 4). Similarly, the second protective cover member 204 includes a folding portion 244 and a holding portion 242 (Fig. 4). The holding portion 222, 242 is provided with an axial length large enough to maintain a predetermined clearance between the folding portion 224, 244 and the cam lever 118 during actuation of the one or more brake levers 156, even during actuation of one brake lever or both brake levers during normal or hard braking conditions. The construction and function of the protective cover member is explained below.

[00053] Fig. 4 depicts another enlarged schematic view of a portion of the wheel-brake system, in accordance with an embodiment of the present subject matter. Fig. 5 depicts a first perspective view of a protective cover member, in accordance with an embodiment of the present subject matter. The first protective cover member 202 has the folding portion 224, which is having a substantially cylindrical profile with

plurality of folds. The holding portion 222 has a plain cylindrical profile without any folds. In one embodiment, the holding portion 222 may have a substantially tapering diameter to enables better holding around the elastic return member (not shown). The folding portion 224 has an overall diameter D1 (taken in terms of extreme radial opposite ends), which is greater than a diameter D2 of the holding portion 222. When the synchronized brake lever/ pedal is applied, the inner cable 112I of synchronized-front brake cable 112 is pulled thereby causing the cam lever 118 to rotate/ pivot causing actuation of the brake. The elastic return member 132 (shown in Fig. 3) gets compressed and consequentially the first protective cover member 202 is also compressed. The hinge member 232 provide in the slot 252 pulls the cam lever. During the actuation of the synchronized-front brake cable 112, the independent-front brake cable 116 remains undisturbed. The hinge member 234 corresponding to the independent-front brake cable 116 remains undisturbed as the hinge member 234 slides in the slot 254 to compensate for the movement of the cam lever effectively not disturbing the original position of the hinge member 234.

[00054] The first protective cover member 202 is provided with the holding portion 222 of an axial length L1, which is capable of maintaining a predetermined clearance between the folding portion 224, 244 and the cam lever 118 during actuation of the one or more brake levers 156, even during actuation of one brake lever or both brake levers during normal or hard braking conditions. In one embodiment, the axial length L1 is greater than a maximum traversal distance Y11 of corresponding brake cable 112 about the cam lever 118. For example, in the depicted embodiment, the maximum traversal distance Y11 of the brake cable 112 is equivalent to the travel of the corresponding hinge member 232 in the slot 252. Similarly, the holding portion 242 for the cover member 204 has an axial length L2 greater than a sum of maximum traversal distance Y21 of the corresponding brake cable 116 about the cam lever 118 and a length Y12 of a first end 119 of the cam lever, wherein first end 119 is an end of the cam lever 118 which is in proximity to the folding portion 224. In a preferred embodiment, the axial length L1 of the holding portion 222 is greater than a safe distance Y of the maximum traversal distance Y11 and an end length Y12 of a first end 119 of the cam lever 118. The

end length Y12 is typically common for all slots of the cam lever 118. The term 'large enough' corresponds to the safe distance Y defined below.

$$L1 >= (Y11+Y12)$$

Or

$$L1 >= Y$$

[00055] The first end 119 is a portion of the cam lever 118, which is in proximity to the cover member 202, 204 for their folding portion 224, 244. Thus, the axial length of the holding portion 222, 242 of the cover member is specifically configured depending on the maximum traversal distance of the brake cable about the corresponding slot and the end length. The term 'length' is not limited to length taken in straight line and it includes true length of non-linear profiles like curved profile of the slots. Further, the folding portion 224 has an overall diameter D1, which is smaller than a gap provided between the flange member 118A, 118B (shown in Fig 7).

[00056] Fig. 6 depicts a schematic view of a portion of the wheel brake in an actuated condition of the brake cable, in accordance with an embodiment of the present subject matter. The holding portion 222 is having an axial length L1 (as shown in Fig. 5) which is greater than a safe distance Y. The safe distance Y is distance taken between the hinge member 232, which is in a maximum slidable condition 232MA, and a first end 119 of the cam lever 118. In other words, the hinge member 232 is having a maximum slidable condition or position, which is at a farther end in the corresponding slot 252 from an initial position/ resting position of the hinge member 232.

[00057] Further, as presented in computational formulae above, the axial length L1 is greater than a sum of a maximum traversal distance Y11 of corresponding hinge members 232 along corresponding slot 252, and a length Y12 of a first end 119, which is in proximity to the folding portion 224 of the protective cover member 202, of the cam lever 118 thereby maintaining a predetermined clearance 'C' between the folding portion 224, 244 and the cam lever 118 eliminating interference / fouling of protective cover member 202, 204 with the cam lever 118.

[00058] In one embodiment, the vehicle 100 comprises a synchronized braking system with a wheel-brake system 102 receiving a synchronized-brake cable 112

and an independent brake cable 116, wherein the maximum traversal distance Y11/ Y21 is taken for a hinge member 232/ 234, which is corresponding to a slot 252/ 254 having maximum slot length. Thus, even in cam levers with varying slot lengths, the slot with the maximum slot length is taken to compute the safe distance Y thereby determining the axial length L1 of the holding portion 222, 242 of the protective cover member 202, 204. The present subject matter is applicable to braking system irrespective of variations in hinge member design or diameter.

[00059] Fig. 7 depicts a sectional view of the wheel brake depicted in Fig. 6, in accordance with an embodiment of the present subject matter. Further, the folding portions 224, 244 have an overall diameter D1, which is smaller than a gap provided between the flange members 118A, 118B, which are spaced apart in lateral direction.

[00060] Further, in the depicted embodiment, the independent-front brake cable 116 is actuated by application of the front brake lever 156 (shown in Fig. 1). Thus, the cam lever 118 is rotated in anti-clockwise direction whereby the hinge member 234 of the brake cable 116 pulls the cam lever. In such condition, the synchronized-front brake cable 112 is in an unactuated condition. The hinge member 232 of the synchronized-front brake cable 112 slides in the slot 252. The cam lever 118 does not interfere with the other cover member whereby any interference between the corresponding cover member and the cam lever 118 is eliminated without comprising on the protection function of the elastic return member even during hard braking. Further, the holder portion 222 is accommodated at the gap between the flange member 118A, 118B without interfering with the cam lever 118 as the axial length L1 of the holding portion 222 is configured so as not to interfere with the cam lever. Thus, a nearest portion (or the nearest fold) of the folding portion 224, 244 has a pre-determined clearance with cam lever 118 even in a fully actuated condition of the cam lever 118. The axial length L1 of the holding portions 222, 242 are provided to be greater than a corresponding safe distance Y of a maximum traversal distance of the hinge member 232, 234 in the slot 252, 254 and a length of the first end 119 of the cam lever 118.

[00061] Fig. 8 depicts a schematic side view of a cover member, in accordance with an embodiment of the present subject matter. The cover member 302 comprises a

folding portion 324 and a holding portion 322. The holding portion 322 is provided with an axial length being greater than a maximum traversal distance of the brake cable or a corresponding hinge member about a cam lever to eliminate any interference between the cover member 302 and the cam lever. Braking feel and performance are improved due to elimination of friction unnecessarily generated between cover member and cam lever during their relative movements whenever actuating one of rear and front brake controls.

[00062] As the interference between the cover members 202, 204 and the cam lever is avoided, friction between the aforementioned parts is avoided. This reduces the wear and tear of cover members 202, 204 significantly, thereby improving durability, life and serviceability and maintenance cost of the system. Further, overall braking performance, and safety is improved due to effective self-returnability of cam lever whenever brake is released. This reduces any risk involved in wheel locking and skidding due to potential failures of self-returnability, when brake control is released.

[00063] The folding portion 324 includes a plurality of involutes or bellows formed by plurality of crest portions FC1 and plurality of trough portions FT1. The protective cover member 302 is made of an elastic material. One or more drain holes 362 are provided on said crest portion FC1 of the folding portion 324 and at a bottom portion of the cover member 302. Thus, any water entering the cover member 302 is effectively drained thereby protecting the elastic return member for any damage from rusting or corrosion due to accumulation of water or dirt.

[00064] In one embodiment, the holding portion 322 comprising a first end 323 that abuts corresponding hinge member, wherein the first end 323 is provided with a first profile to confirm and complement with a second profile of said hinge member. For example, the hinge member may have a circular or an oval cross-section and the first end 323 of the cover member 302 is provided with a concave cut with circular or oval profile to but against the hinge member without any clearance thereby eliminating any gap for entry of water or dirt.

[00065] The present subject matter is not limited to a braking system having a cam lever being actuated by two or more brake cables, as it is applicable to system with

a single brake cable, which actuates the cam lever and a braking system actuated by a combination of mechanical and hydraulic actuation.

[00066] 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:

100	motor vehicle
102	front wheel-brake system
103	front wheel
104	rear wheel-brake system
105	rear wheel
111	front suspension
112	synchronized-front brake cable
112I	inner cable
112O	outer sheath
115	wheel rim
116	independent-front brake cable
116I	inner cable
116O	outer sheath
118	cam lever
118A/ 118B	flange members
119	first end
120	plate member
121	cam-pin
122	cable abutment
132/134	elastic return member
150	frame member
155	handle bar assembly
156	brake lever
162/164	adjuster nut
190	power unit
202/ 204/ 302	cover member
222/ 242/ 322	holding portion
224/ 244/ 324	folding portion
232/ 234	hinge member
252/ 254	slot
323	first end
362	drain hole
L1	axial length
Y11/ Y21	maximum traversal distance
Y	safe distance
Y12	end length
D1/ D2	diameter

We claim:

1. A motor vehicle (100) comprising:

one or more wheels (103, 105); and

a wheel-brake system (102, 104) corresponding to each of said one or more wheels (103, 105), said wheel-brake system (102, 104) comprising:

a cam lever (118), said cam lever (118) capable of actuating said wheel-brake system (102) upon actuation of one or more brake levers (156) of said motor vehicle (100);

one or more brake cables (112, 116) for actuating said wheel-brake system (102);

one or more protective cover members (202, 204, 302), said protective cover member (202, 204, 302) comprises:

a holding portion (222, 242, 322), and a folding portion (224, 244, 324),

said holding portion (222, 242) is having an axial length (L1) large enough to maintain a predetermined clearance between said folding portion (224, 244) and said cam lever (118) during actuation of said one or more brake levers (156).

2. The motor vehicle (100) as claimed in claim 1, wherein

said cam lever (118) comprising one or more slot(s) (252, 254) to accommodate corresponding one or more hinge members (232, 234), said one or more hinge member (232, 234) selectively slidable within corresponding said slot(s) (252, 254);

one or more elastic members (132, 134) corresponding to one or more brake cables (112, 116),

each of said one or more protective cover members (202, 204, 302) provided on and covering at least a portion of corresponding said elastic return member (132, 134), and

said one or more brake cables (112, 116) connected to corresponding said one or more hinge members (232, 234), wherein

said holding portion (222, 242) is having an axial length (L1) greater than a safe distance (Y) taken between said one or more hinge members (232, 234) in a maximum slidable condition (232MA) and a first end (119) of said cam lever (118), said first end (119) is in proximity to the folding portion (224, 244, 324) of the protective cover member (202, 204, 302).

3. The motor vehicle (100) as claimed in claim 1, wherein said axial length (L1) being greater than a sum of a maximum traversal distance (Y11, Y21) of corresponding to one or more hinge members (232, 234) along corresponding one or more slots (252, 254), and a length (Y12) of a first end (119), which is in proximity to the folding portion (224, 244, 324) of said protective cover member (202, 204, 302), of said cam lever (118).

4. The motor vehicle (100) as claimed in claim 1, wherein each of said one or more brake cables (112, 116) is comprising an inner cable (112I, 116I) and an outer sheath (112O, 116O), said inner cable (112I, 116I) has one end connected to corresponding one or more hinge members (232, 234), and one or more elastic return members (132, 134) is disposed over corresponding said inner cable (112I, 116I) and is accommodated between said hinge member (232, 234) and a cable abutment (122) for the one or more brake cables (112, 116) of the wheel-brake system (102).

5. The motor vehicle (100) as claimed in claim 4, wherein said cable abutment (122) is formed on a plate member (120) of the wheel brake (102), and said plate member (120) supports a cam-pin (121), said cam lever (118) is fixedly provided with said cam-pin (121), and wherein said elastic return members (132, 134) are compression-type springs that allows the cam lever (118) to return to an initial condition after release of brake.

6. The motor vehicle as claimed in claim 3, wherein said folding portion (224, 244, 324) of each of said protective cover member (202, 204, 302) comprises plurality of folds (F1) formed by plurality of crest portions (FC1) and plurality of

trough portions (FT1), and said protective cover member (202, 204, 302) is made of an elastic material.

7. The motor vehicle as claimed in claim 6, wherein said folding portion (224, 244, 324) comprises one or more drain holes (362), and said drain holes (362) being provided on said crest portion (FC1).

8. The motor vehicle (100) as claimed in claim 2, wherein said holding portion (222, 242, 322) comprises a first end (323) abutting on corresponding said hinge member (232, 234), wherein said first end (323) is provided with a first profile to confirm and complement with a second profile of said hinge member (232, 234).

9. The motor vehicle (100) as claimed in claim 1, wherein said vehicle (100) comprises a synchronized braking system with said wheel-brake system (102) receiving a synchronized-brake cable (112) and an independent brake cable (116), wherein said maximum traversal distance (Y11, Y21) is taken for a hinge member (232, 234) corresponding to said slot (252, 254) having maximum slot length.

10. The motor vehicle (100) as claimed in claim 1, wherein said holding portion (222, 242) comprises one of a uniform cross-section or a tapering cross-section, and wherein said elastic return member (132, 134) includes a compression-type spring.

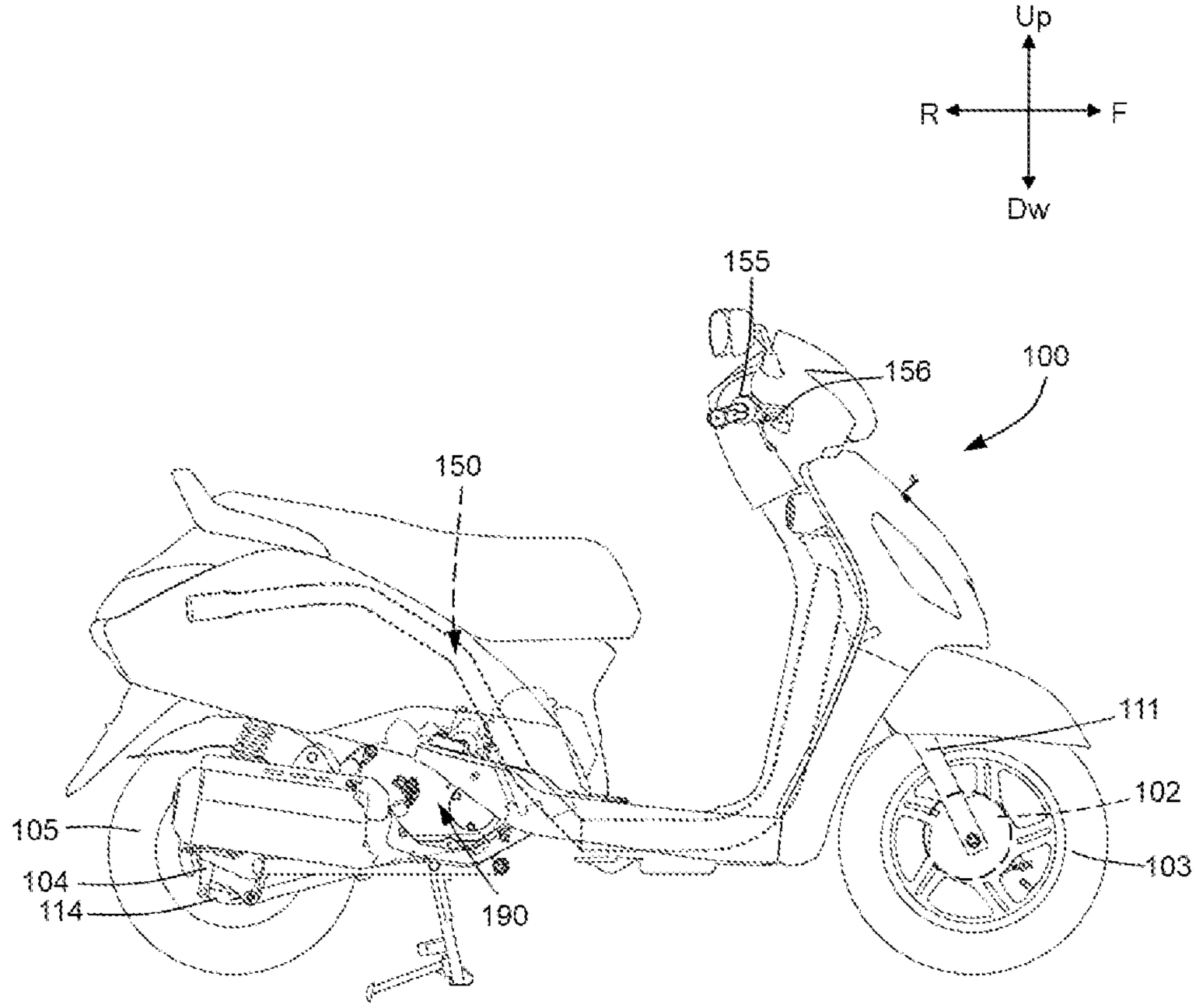


Fig. 1

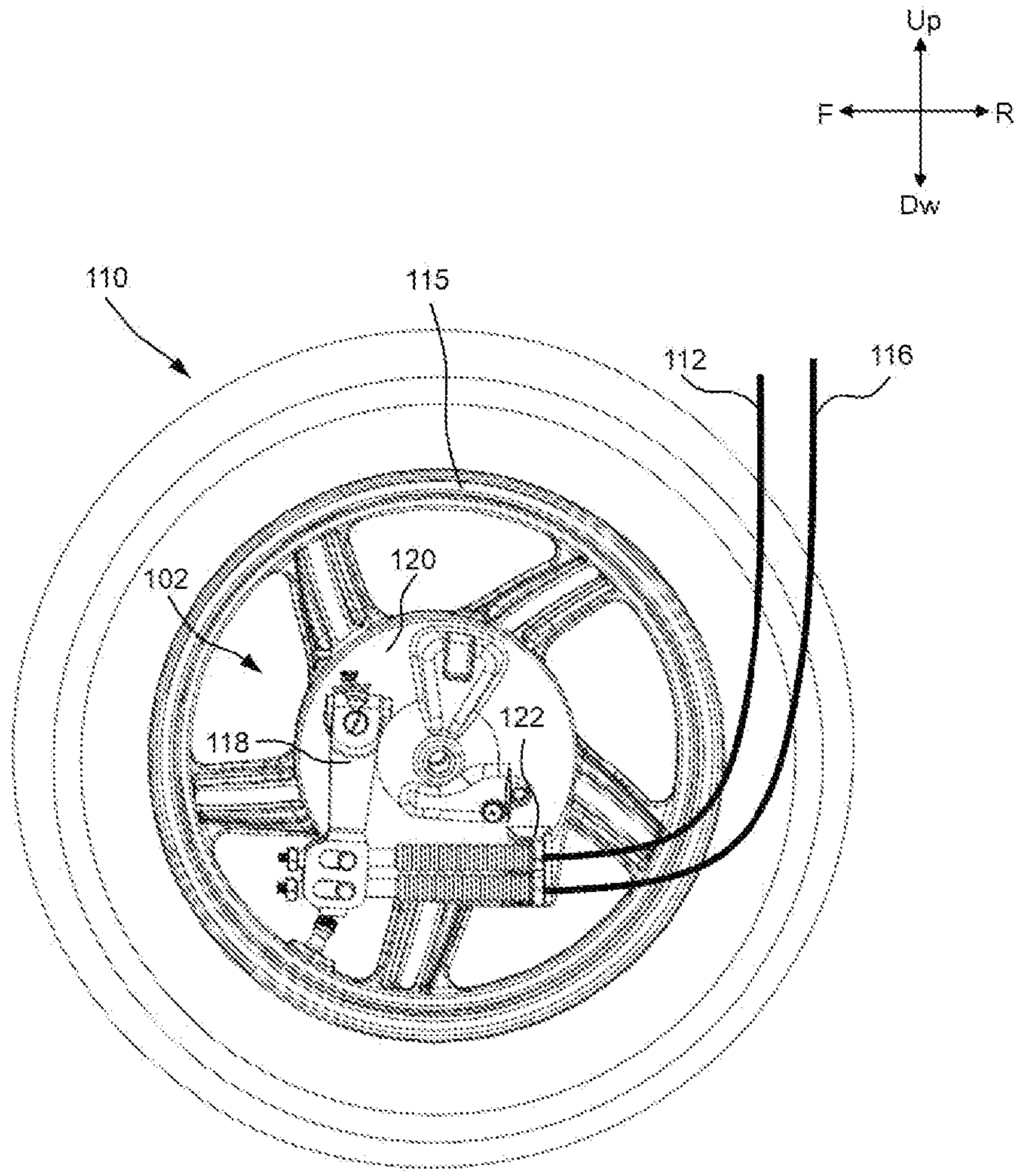


Fig. 2

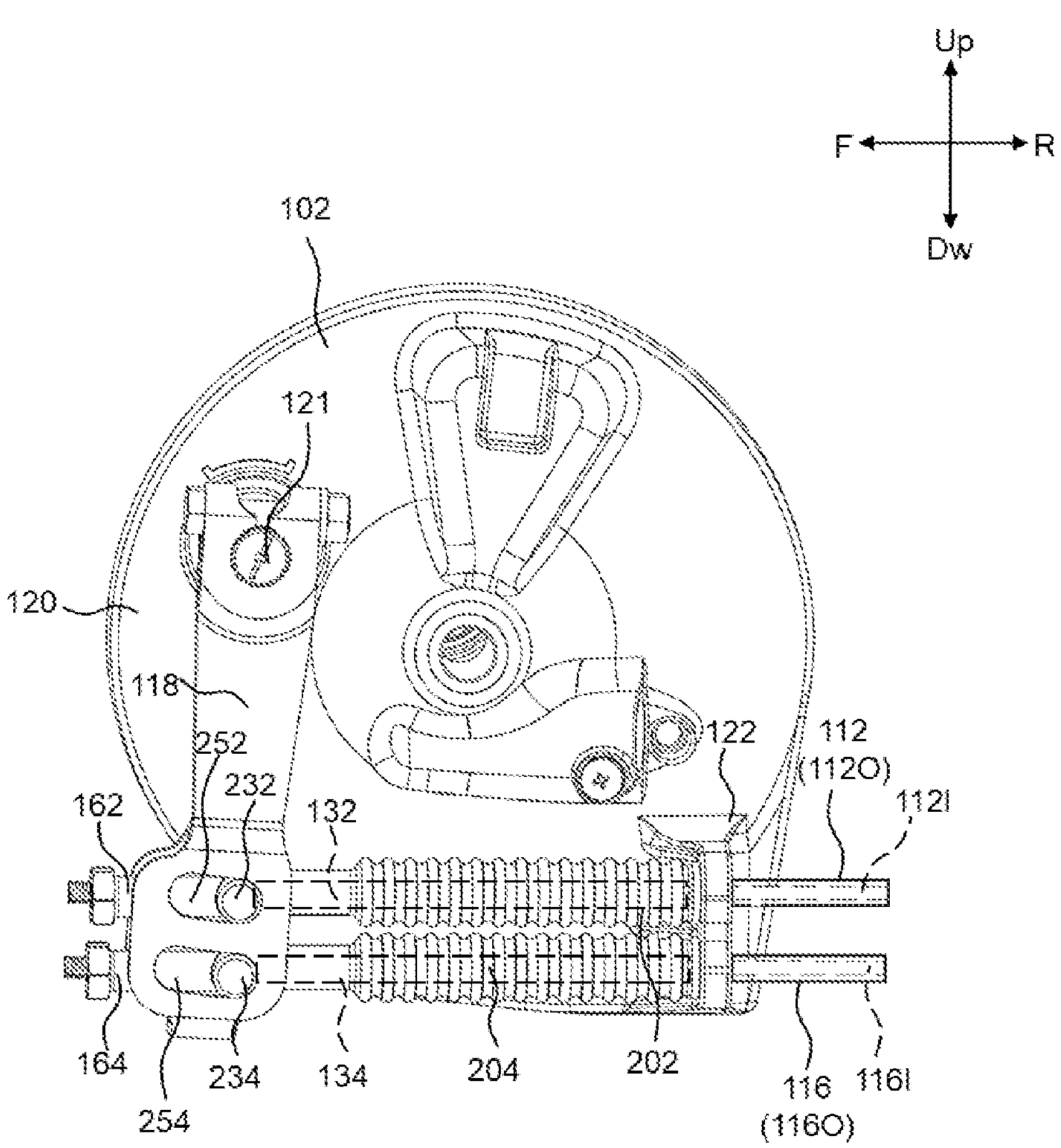
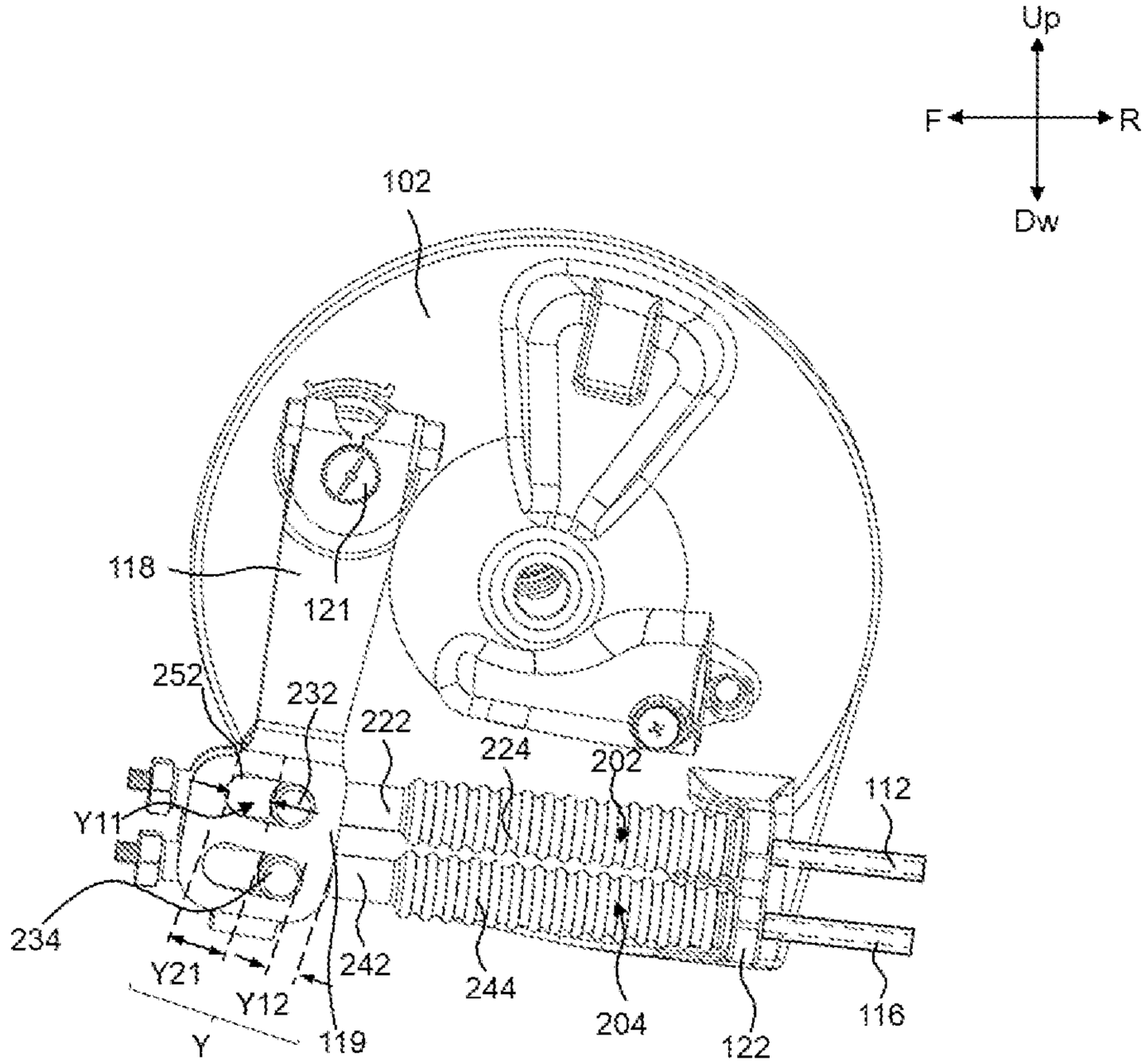

Up
F
R
Dw
102
121
120
118
252
232
162
132
122
112
(112O)
112I
164
234
134
204
202
116
(116O)
116I
254

Fig. 3


Up
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102
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121
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224
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112
Y11
234
Y21
Y12
242
244
204
122
116
Y
119

Fig. 4

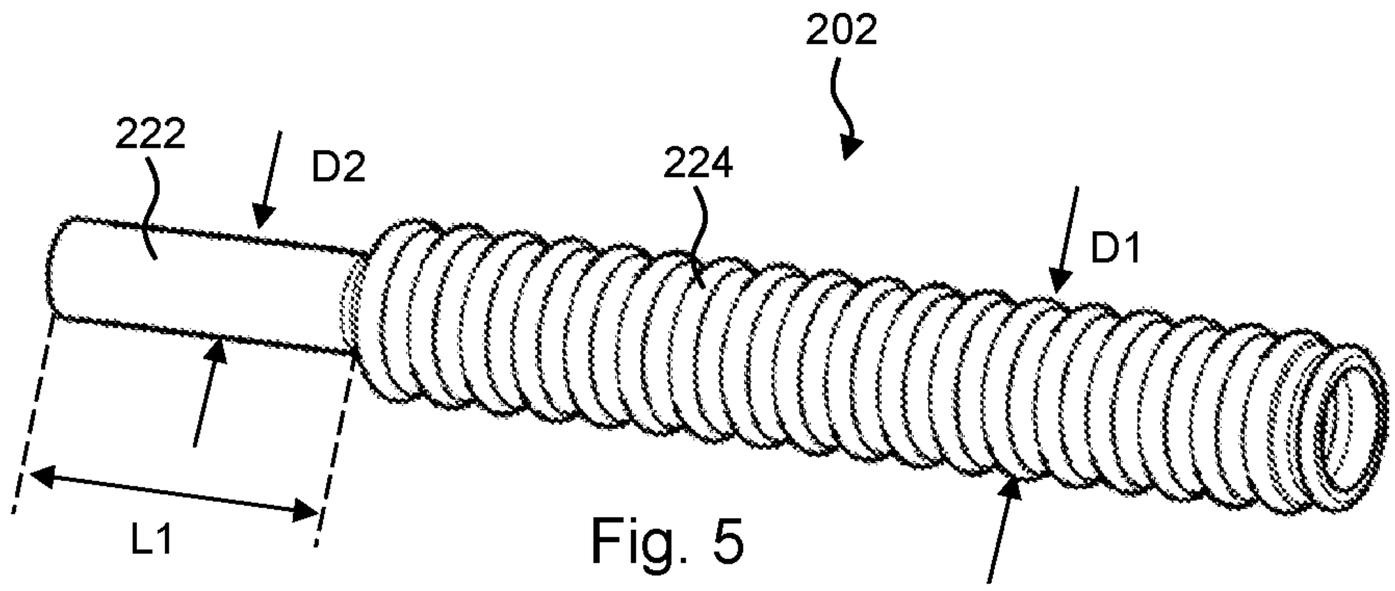
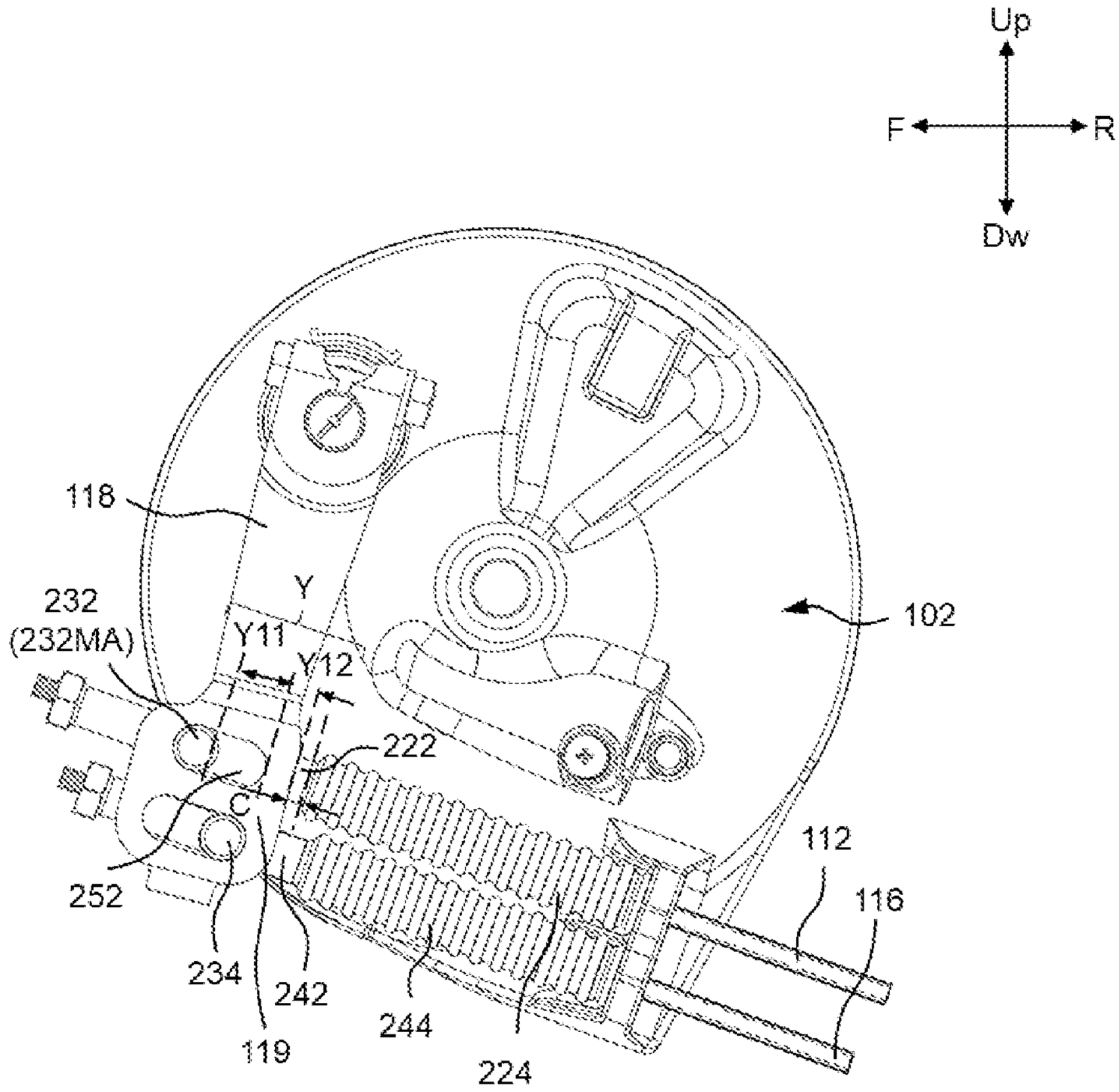


Fig. 5


Up
F
R
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232
(232MA)
Y
Y11
Y12
222
C
252
234
242
119
244
224
102
112
116

Fig. 6

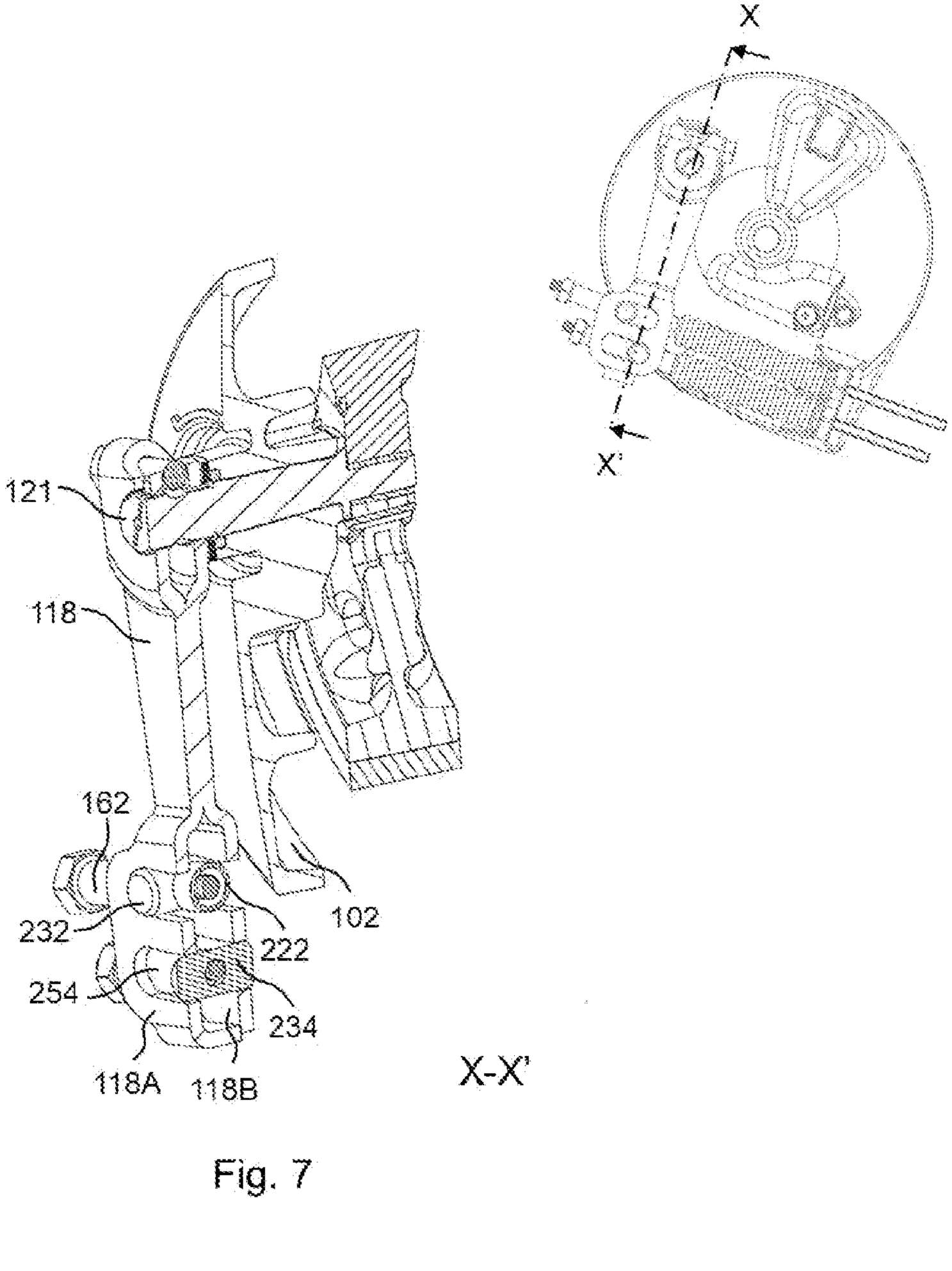

Fig. 7

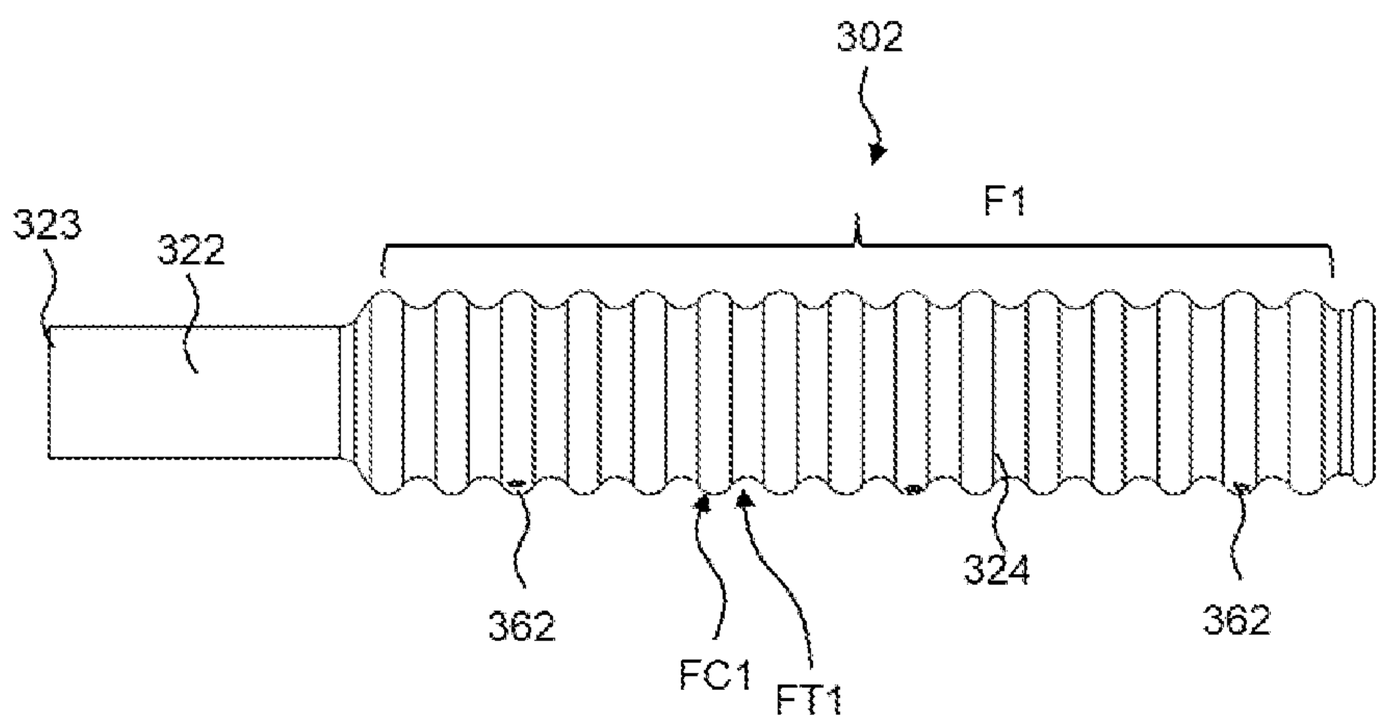

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2020/050905

A. CLASSIFICATION OF SUBJECT MATTER
B62L3/08,B60T11/04,F16D125/62,F16D125/64 Version=2021.01

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)

B62L, B60T, F16D

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)

Google, Youtube, TotalPatent One,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Sushant, "What Is Sync Brake System Or SBS & How It Works?",CARBIKETECH,URL:https://carbiketech.com/tvs-sync-brake-system-sbs/ retrieved ON 02.02.2021, 16 MARCH, 2019 (16.03.2019), Description; Figures	1-4, 6, 8-10
Y	Description; Figures	5, 7
Y	---------- Automobile Info Only, "TVS Jupiter Grande SBT Synchronized Braking System Detailed Real Life Review", YouTube, 06 MAY, 2019 (06.05.2019), retrieved ON 02.02.2021, retrieved from URL: https://www.youtube.com/watch?v=KGjO4tF1UAo 0:50-1:00	5, 7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05-02-2021	05-02-2021
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Dwaipayan Mahato Telephone No. +91-1125300200