



(51) International Patent Classification:
B62K 25/28 (2006.01)

(21) International Application Number:
PCT/PL2017/050029

(22) International Filing Date:
25 May 2017 (25.05.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P417331 25 May 2016 (25.05.2016) PL

(71) Applicant: LOOP SPOLKA Z O.O. [PL/PL]; ul. Obozna 29B, 30-011 Krakow (PL).

(72) Inventors: MARCZAK, Pawel; ul. Sadowa 18c/27, 38-500 Sanok (PL). DABROWSKI, Jerzy; ul. Grabowskiego 8/4, 31-126 Krakow (PL).

(74) Agent: KACPERSKI, Andrzej; Kancelaria Prawno-Patentowa, ul. Kupa 3/9, 31-057 Krakow (PL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: CUSHIONED FRAME OF ONE-TRACK VEHICLES

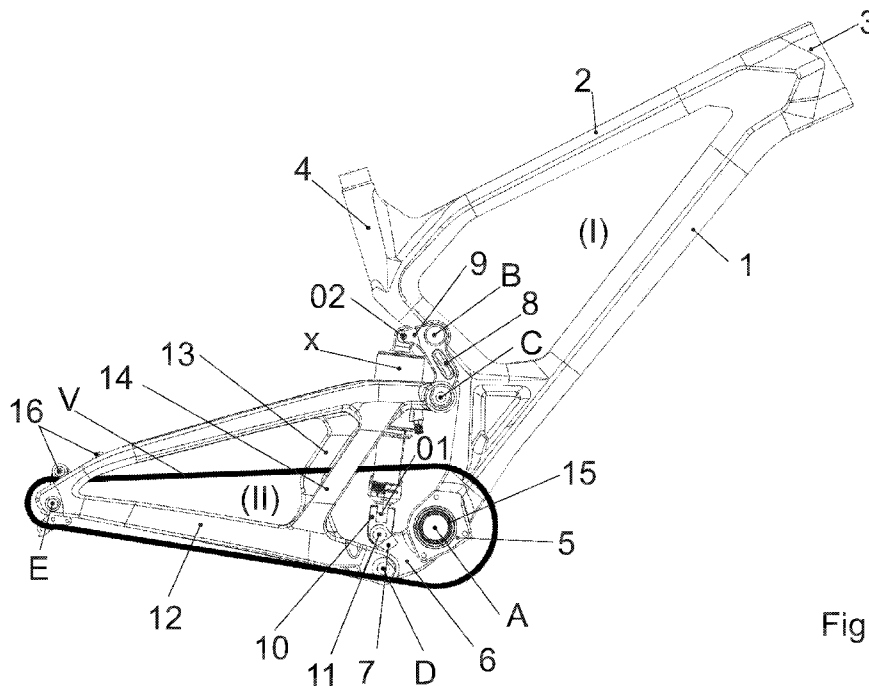


Fig. 1

(57) Abstract: A lower attachment eyelet (O1) for an absorber (X) is offset in the range 30°-90° in relation to the axle of an upper attachment eyelet (O2) for an absorber (X), whereas said absorber (X) has an extension body (10) attached in the lower attachment eyelet (O1).



Cushioned frame of one-track vehicles

The object of the invention is a cushioned frame of one-track vehicles, especially bicycles.

Suspension of a rear wheel of a bicycle, especially of a bicycle intended for mountain off-road ride, should present the following features:

- suspension reacts on every type of roughness - from the smallest to the largest impacts,
- suspension operates at any speed,
- pedaling does not impact on suspension operation,
- braking does not impact on suspension operation,
- a frame rear triangle is rigid, and does not displace aside,
- a suspension system is not susceptible for clearances,
- all consumable elements are easily serviceable (replaceable),
- there is a good access to all tuning elements of a rear shock absorber,
- there is a progressive characteristics - suspension hardens along with the increase of deflection, that prevents thumping,
- the mass of suspension is as small as possible.

The bicycle designers try to optimize the efficiency of a rear wheel shock absorber so, that suspension does not fall into cradling when pedaling and simultaneously reacts on any roughness driven over. The simplest solution is offsetting the pivot point of a swing arm from the axle of a bottom bracket. Such constructions of the rear suspension can be subdivided into three categories: low pivot - in the example US 6877591, high pivot - in the example US 5244224 and virtual pivot point - in the example US 20080054595 A1.

The suspensions with the low pivot point operate well on small roughnesses and at low speeds, but handle worse at high speeds, especially on higher obstructions. Additionally, the low positioned pivot point causes the disadvantageous cradling of suspension when pedaling and energy loss of the driver. On the other hand, the high positioned pivot point

causes that when the suspension operates, the line of the wheel features the backward displacement, in reference to the riding direction, as thus this construction fits better to travel over the bigger obstructions at higher speeds. The problem with a such positioned pivot point is the excessive elongation of the chain, that in turn causes the disadvantageous excessive movement of the cranks in the opposite direction, opposite to the pedaling direction. This effect is called pedal kickback.

An attempt to solve the problem constitutes a suspension system with a temporary virtual pivot point (VPP). But the system does not provide the full advantages as the low pivot point and the high pivot point. Such type of constructions are an average of both positions of the suspension pivot points, with often worsening other suspension parameters, such as suspension hardening when braking.

The two-swing-arm suspension system is known from US 20140103617 A1. None of the swing arms constitutes a direct connecting bracket between the frame front portion and the rear wheel. The system consists of a main and rear portion of a frame and a shock absorber with an extension arm. The main frame portion includes a top tube, head tube, seat tube, bottom bracket and down tube. On the down tube, at a bottom bracket, there is a joint of the bottom swing arm that includes a pair of chain stays and a first and second arm. A forward end of a shock absorber is attached pivotally to the main frame. A rearward end of the shock absorber is attached to an extension body that is attached pivotally to the swing arm. The auxiliary swing arm, connected jointly to the frame main portion through a connecting bracket, includes a pair of the seat stays. The system allows to optimize the efficiency of suspension in the bicycle frame, to minimize the interaction between the rider and the frame rear portion when pedaling and to isolate braking from operation of suspension.

Extension of the solution is disclosed in US 20150137477 A1. The construction of suspension includes additionally the absorber offset from the frame plane. The shock absorber is attached directly to the frame front portion and to the frame rear portion, called a swing arm, through the mounting flanges.

From US 20070246909 A1 there is known a bicycle frame which is based on the suspension with a virtual pivot point (VPP) which consists of two connecting brackets, the upper and lower, to which a shock absorber is attached, which is located in a frame front portion. The frame front portion includes a top tube, head tube, seat tube, on which there are located an attachment point of the upper connecting bracket, bottom bracket and down tube. An attachment point of the lower connecting bracket is located at the down tube, next to the bracket. The frame rear portion is attached axially to the frame front portion and consists of two seat stays and two chain stays, two wheel dropouts, and the upper and lower attachments of the connecting brackets. The pivot point displaces backward and downward on the parabolic trajectory in the suspension with the virtual pivot point. The aim of this invention is to introduce the bicycle frame with two connecting brackets - the upper and lower. The system allows the absorber to operate with the small change of its angle of 0.94° , that improves the suspension efficiency in the frame.

From PL 217956 there is known a bicycle suspension called FDS (floating damping system), which uses two connecting brackets - an upper and a lower, which rotate in opposite directions, and between which the absorber is compressed, which is placed symmetrically in relation to the frame. The frame rear portion, a swing arm, is attached axially to a frame front portion and consists of two seat stays and two chain stays, two wheel dropouts, and two brackets linking seat stays and chain stays. The solution according to the invention features lack of rigid connection between an absorber and a frame and thus it allows to omit disadvantageous stresses that exist in the attachment point. Additionally, the advantageously located attachment of the lower connecting bracket is introduced, which is equipped with bearings in the axle of the frame bottom bracket. The system allows to optimize the efficiency of suspension in a bicycle frame, to minimize the interaction between a rider and a frame rear portion when pedaling.

The aim of the invention is to solve the problem of the hampered access to an absorber and to allow its serving and setting up.

The essence of the solution according to the invention consists in that the lower eyelet of the absorber is offset in the range $30^\circ - 90^\circ$ in relation to the axle of the

upper eyelet of the absorber, whereas the absorber has an extension body attached to the lower eyelet.

The absorber is located asymmetrically in relation to the frame plane in the range from 5 to 15 mm to the left hand side, and from 0 to 15 mm to the right hand side. There is a right hand bracket that is located at the right hand side, defined in reference to the driving direction, in relation to the driving chain.

The pivotal attachment of a lower connecting bracket to a frame front portion, through a down tube, can be located only on one side in a bottom bracket axle, which side is opposite to a driving chain.

Location of the pivot point of a lower connecting bracket in a bottom bracket axle eliminates an additional bearing point in a frame front triangle. In addition to that, use of the bottom bracket as a pivot point for the lower connecting bracket enhances rigidity of the construction, at the same time making it simpler and reducing its mass. Offsetting the attachment of the absorber allows its rotation to the position in which the access is provided for setting up and servicing.

The subject-matter of the invention is disclosed by an example of execution of the one side attachment of a lower connecting bracket, which side is opposite to a driving chain, in the figure, where:

Fig. 1 - presents a side view of a frame,

Fig. 2 - presents a frame in a front asymmetric view with a asymmetric lower connecting bracket, and chain position referring to a right hand bracket,

Fig. 3 - presents a frame in a rear view, with the marked planes of a frame and an absorber,

Fig. 4 - presents a suspension system in a perspective view.

The bicycle frame according to the invention consists of a main tube 1, top tube 2 and head tube 3, that connects them both. The top tube 2 reaches a seat tube 4. There is a bottom bracket 5 of the frame at the end of the seat tube 4. In the bottom bracket 5 there is a pivot point A for a lower connecting bracket 6 with its compressing arm 7. In the seat tube 4 there is a pivot point B with bearings for an upper connecting bracket 8 with its compressing arm 9. The connecting brackets 6, 8 rotate in the opposite directions. The pivotal attachment of the lower connecting

bracket 6 to the frame front portion and the down tube 2, is located only on one side in the axle of the bottom bracket in the pivot point A, which side is opposite to the driving chain V.

The absorber X is located between two compressing arms of the lower connecting bracket 6 and the upper connecting bracket 8 - the arm 7 and the arm 9. The absorber X is located asymmetrically in relation to the frame plane P1 in the range from 5 to 15 mm to the left hand side, in reference to the drive direction, and from 0 to 15 mm to the right hand side.

The absorber X has the lower attachment eyelet O1 and the upper attachment eyelet O2. The lower attachment eyelet O1 is located with the offset in the range 30° - 90° , in relation to the axle of the upper attachment eyelet O2. The absorber X has an extension body 10, which is attached to the lower attachment eyelet O1. The extension body 10 has its own bearing 11 common with the arm 6.

The swing arm 12 is equipped with bearings in the connecting bracket 6 at the end opposite to the pivot point A and in the connecting bracket 8 at the end opposite to the pivot point B. The swing arm 12 has two pivot points C and D, between which are two vertical stays 13 and 14 on the opposite sides of the plane P1. The right vertical stay 14 is located on the right hand side, in reference to the drive direction, in relation to the driving chain V.

The suspension system uses the connecting brackets 6, 8 with bearings in four points A, B, C, D. The upper connecting bracket 6 is attached to the left hand side of the frame, in reference to the drive direction and is screwed on the right hand side to the bottom bracket shell 15.

The dropout of the wheel E and the eyelets of the brakes 16 are located in the rear portion.

In the solution according to the invention there is enough space for a larger wheel and the access to the absorber regulation is improved. The absorber is located asymmetrically in relation to the frame plane P1, and its plane P2 is offset from the

frame plane P1 in the range of 8.5 mm. The possibility of the different configuration of mounting and setting the absorber does not limit the construction.

The solution according to the invention is characterized in the virtual pivot point (VPP). Owing to this, that the pivot point changes its position, it can be achieved that the suspension will operate nearly independently from the drive. This suspension features the optimal anti-compression, that means it will not squat during each push on the pedals and at the same time will react on every road roughness.

Claims

1. A cushioned frame of one-track vehicles, especially bicycles, consisting of a frame front portion and rear portion, between which there are two connecting brackets - an upper and a lower, which both constitute a lever to compress an absorber while deflection of suspension, **characterized in that** a lower attachment eyelet (O1) for an absorber (X) is offset in the range 30°- 90° in relation to the axle of an upper attachment eyelet (O2) for an absorber (X), whereas said absorber (X) has an extension body (10) attached in the lower attachment eyelet (O1).
2. A cushioned frame according to claim 1 **characterized in that** said absorber (X) is located asymmetrically in relation to the frame plane (P1) in the range from 5 to 15 mm to the left hand side, and from 0 to 15 mm to the right hand side.
3. A cushioned frame according to claim 1 **characterized in that** there is a right vertical stay (14) that is located at the right hand side, defined in reference to the driving direction, in relation to said driving chain (V).
4. A cushioned frame according to claim 1 **characterized in that** pivotal attachment of a lower connecting bracket (6) to a frame front portion (I) through a down tube (2), is located only on one side of the axle of a bottom bracket (A), which side is opposite to a driving chain (V).

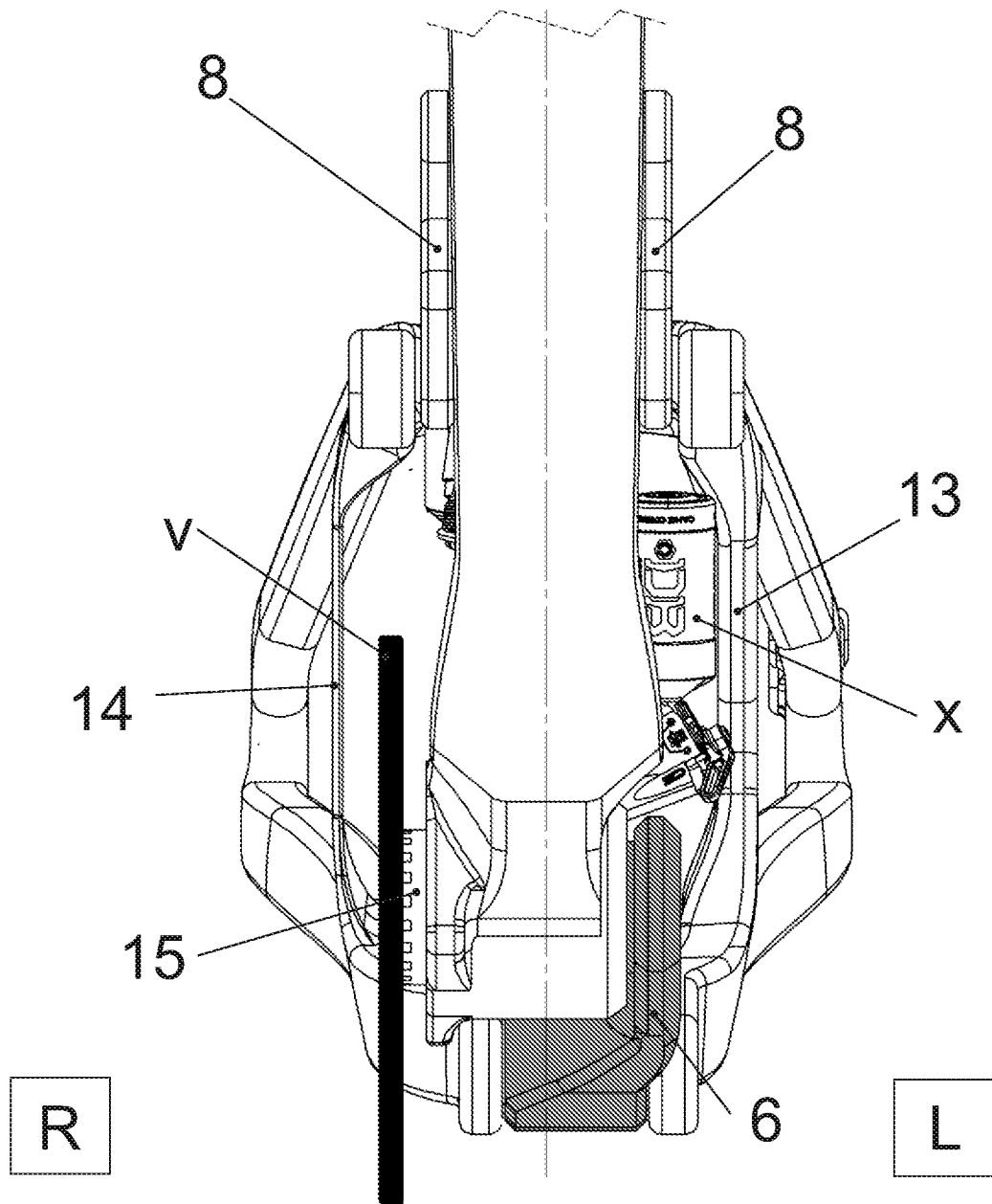


Fig.2

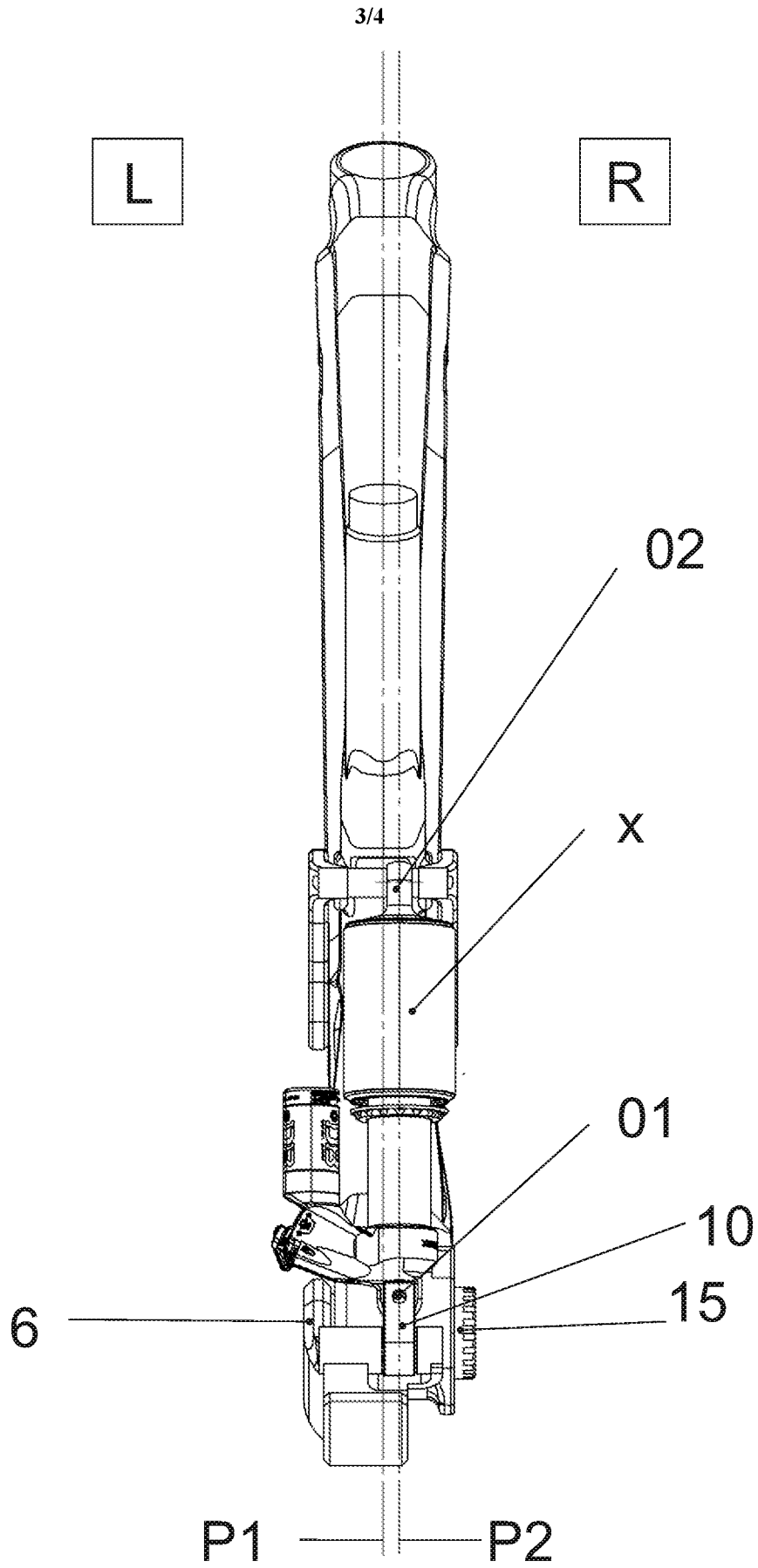


Fig.3

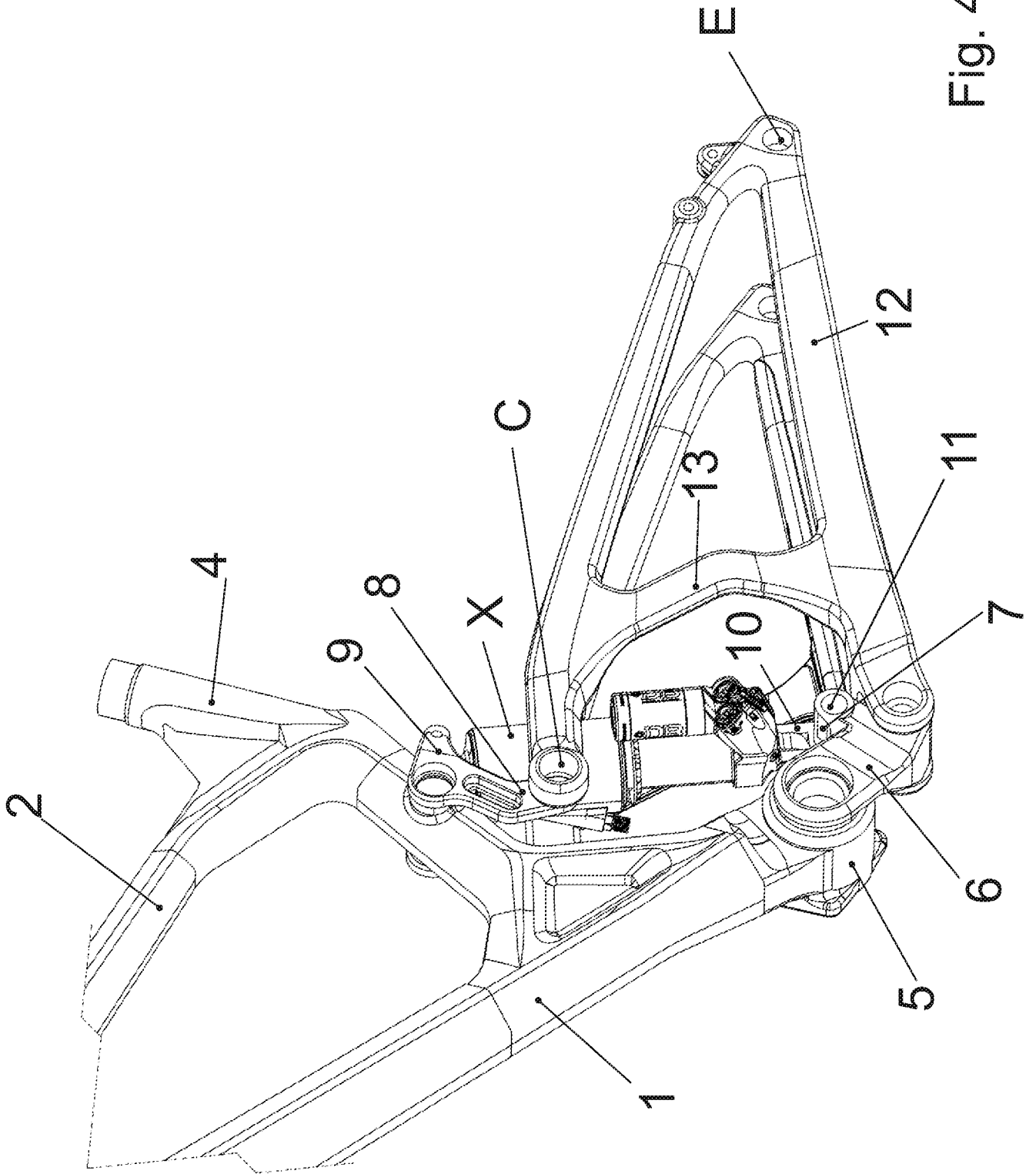


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2017/050029

A. CLASSIFICATION OF SUBJECT MATTER
INV. B62K25/28
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
B62K
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|--|-----------------------|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | EP 2 907 736 A1 (SPECIALIZED BICYCLE COMPONENTS [US]) 19 August 2015 (2015-08-19) figures 1-5 ----- | 1,3 |
| X | WO 2012/024697 A1 (ZAWISTOWSKI PETER [US]) 23 February 2012 (2012-02-23) figures 23A-230 ----- | 1-4 |
| A | EP 2 186 719 A2 (WEAGLE DAVID [US]) 19 May 2010 (2010-05-19) figure 6 ----- | 1 |
| A | US 2009/315296 A1 (BERTHOLD BRIAN DAVID [US]) 24 December 2009 (2009-12-24) figures 1-16 ----- | 1 |
| | -/-- | |

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "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 18 August 2017 | Date of mailing of the international search report 28/08/2017 |
| Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 | Authorized officer Molina Encabo, Aitor |

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2017/050029

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|--|-----------------------|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| A | EP 2 228 290 A2 (HUANG STEPHEN [TW]) 15 September 2010 (2010-09-15) figures 1-9 ----- | 1 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/PL2017/050029

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date | |
|--|------------------|-------------------------|------------------|------------|
| EP 2907736 | A1 | 19-08-2015 | EP 2569213 A1 | 20-03-2013 |
| | | | EP 2907735 A1 | 19-08-2015 |
| | | | EP 2907736 A1 | 19-08-2015 |
| | | | TW 201202085 A | 16-01-2012 |
| | | | TW 201400348 A | 01-01-2014 |
| | | | US 8006993 B1 | 30-08-2011 |
| | | | US 2012074666 A1 | 29-03-2012 |
| | | | US 2013341886 A1 | 26-12-2013 |
| | | | US 2014103617 A1 | 17-04-2014 |
| | | | US 2015028561 A1 | 29-01-2015 |
| | | | WO 2011142882 A1 | 17-11-2011 |
| ----- | | | | |
| WO 2012024697 | A1 | 23-02-2012 | EP 2605953 A1 | 26-06-2013 |
| | | | US 2012126506 A1 | 24-05-2012 |
| | | | US 2016083043 A1 | 24-03-2016 |
| | | | WO 2012024697 A1 | 23-02-2012 |
| ----- | | | | |
| EP 2186719 | A2 | 19-05-2010 | AT 425073 T | 15-03-2009 |
| | | | AT 461104 T | 15-04-2010 |
| | | | AU 2004276310 A1 | 07-04-2005 |
| | | | AU 2004276314 A1 | 07-04-2005 |
| | | | CA 2536779 A1 | 07-04-2005 |
| | | | CA 2537049 A1 | 07-04-2005 |
| | | | CA 2702879 A1 | 07-04-2005 |
| | | | CN 1871157 A | 29-11-2006 |
| | | | CN 1964885 A | 16-05-2007 |
| | | | EP 1663767 A2 | 07-06-2006 |
| | | | EP 1663768 A2 | 07-06-2006 |
| | | | EP 1939084 A2 | 02-07-2008 |
| | | | EP 2186719 A2 | 19-05-2010 |
| | | | ES 2324786 T3 | 14-08-2009 |
| | | | ES 2342347 T3 | 05-07-2010 |
| | | | JP 4955390 B2 | 20-06-2012 |
| | | | JP 2007506618 A | 22-03-2007 |
| | | | JP 2007506619 A | 22-03-2007 |
| | | | NZ 545518 A | 28-11-2008 |
| | | | US 2005067806 A1 | 31-03-2005 |
| | | | US 2005067810 A1 | 31-03-2005 |
| US 2006119070 A1 | 08-06-2006 | | | |
| US 2007024022 A1 | 01-02-2007 | | | |
| US 2011115181 A1 | 19-05-2011 | | | |
| WO 2005030507 A2 | 07-04-2005 | | | |
| WO 2005030564 A2 | 07-04-2005 | | | |
| ----- | | | | |
| US 2009315296 | A1 | 24-12-2009 | CA 2635634 A1 | 20-12-2009 |
| | | | US 2009315296 A1 | 24-12-2009 |
| ----- | | | | |
| EP 2228290 | A2 | 15-09-2010 | AT 555000 T | 15-05-2012 |
| | | | EP 2228290 A2 | 15-09-2010 |
| | | | TW 201033075 A | 16-09-2010 |
| ----- | | | | |