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(54) Title: MOTORCYCLE REAR-BRAKE ADAPTOR UNIT

RIDER WITH CONSTANT ACCESS TO REAR BRAKE

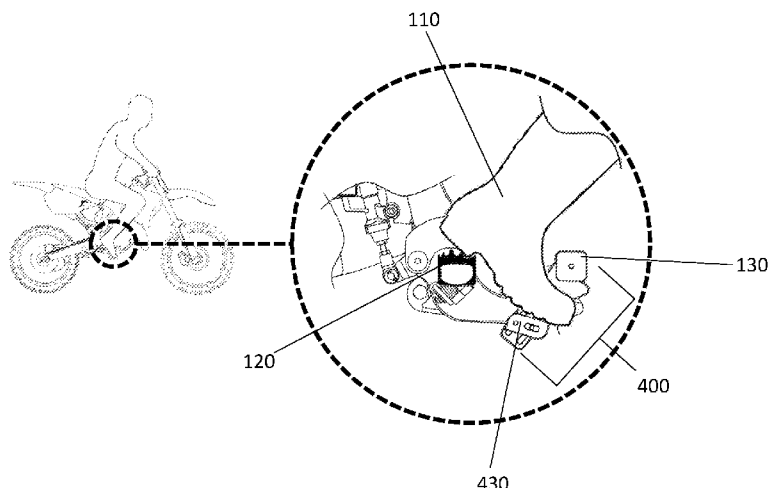


FIG. 12

(57) Abstract: An ergonomic motorcycle, rear-brake adaptor unit operative to provide constant and immediate accessibility to a rider whose foot is resting on a foot peg when riding in any of variety of riding postures that typically impede immediate access to the rear-brake pedal.



MOTORCYCLE REAR-BRAKE ADAPTOR UNIT

BACKGROUND OF THE INVENTION

[001] The current invention relates to rear braking in motorcycling; and particularly, to enhancing access to rear braking in all riding postures.

[002] In many motorcycle riding postures, a rider must lift his foot from a foot peg to actuate rear braking with a right foot pedal. For example, riders positioned near the front of the seat, in an attack posture, or even in the center of the seat, in a normal riding posture, are compelled to place their foot on the foot peg at an orientation in which the natural range of ankle motion designed impedes quick and easy access to the step-plate. Accordingly, riders are further compelled to lift their foot from the foot peg and hold it above the step-plate to ensure quick access.

[003] This lack of freedom of motion is frequently exacerbated by protective footwear commonly worn by riders. Current rear brake configurations not only cause rider discomfort and fatigue by causing a rider to hold the foot off the foot peg for uninterrupted access to the step-plate (brake pedal), they also facilitate accidents. In addition to the increase in braking time, the current configuration also promotes rider over brake when “hitting” the step-plate; whereas constant contact with the step-plate facilitates more accurate gaging of the degree of appropriate braking.

[004] Therefore, there is a need to provide comfortable and easy access to rear braking for all riding postures to shorten response time.

SUMMARY OF THE INVENTION

[005] According to the teachings of the present invention there is provided a motorcycle, rear-brake adaptor unit including: an adapted rear-brake lever in communication with a rear brake

hydraulic master cylinder; a step-plate connected to the adapted rear-brake lever, the step-plate disposed in a position accessible to a downwardly sloping rider foot resting on a foot peg.

[006] According to a further feature of the present invention, there is also provided an adapted step-plate having a connection configuration for receiving the adapted rear-brake lever.

[007] According to a further feature of the present invention, the adapted rear-brake lever is implemented as a step-plate extension.

[008] According to a further feature of the present invention, the step-plate extension is releasably mounted to the adapted step-plate so as to form an angle between 10° - 70° relative to the horizontal.

[009] According to a further feature of the present invention, the step-plate extension is releasably mounted to the adapted step-plate so as to form an angle between 20° - 50° relative to the horizontal.

[0010] According to a further feature of the present invention, there is also provided a spring arrangement configured to bias the step-plate extension into a deployment position.

[0011] According to a further feature of the present invention, the spring arrangement includes a coil torsional spring arrangement configured to bias the step-plate extension into a deployment position.

[0012] According to a further feature of the present invention, there is also provided a detent mechanism configured to releasably secure the step-plate extension in a non-deployment position.

[0013] According to a further feature of the present invention, the spring arrangement includes a compression spring arrangement configured to bias the step-plate extension into either a deployment or a non-deployment state.

[0014] According to a further feature of the present invention, there is also provided a lower step-plate mounted to the lever extension, the lower step-plate securable in any one of a plurality of longitudinal positions within the step-plate extension.

[0015] According to a further feature of the present invention, wherein the lower step-plate is securable in any one of a plurality of orientations.

[0016] According to a further feature of the present invention, there is also provided a limiter bolt configured to define a maximum deployment angle of the step-plate extension.

[0017] According to a further feature of the present invention, the adapted rear-brake lever is implemented as a brake-lever extension.

[0018] According to a further feature of the present invention, there is also provided a lower step-plate mounted to the brake-lever extension, the lower step-plate securable in any one of a plurality of positions within the brake-lever extension.

[0019] According to a further feature of the present invention, the lower step-plate is operative to be secured in any one of a plurality of orientations.

[0020] There is also provided according to the teachings of the present invention, a motorcycle, rear-brake adaptor unit including, a motorcycle rear-brake lever in communication with a rear master brake cylinder; a step-plate mounted to the motorcycle rear-brake lever;

[0021] a lever extension integrally connected to the motorcycle rear-brake lever; and a lower step-plate mounted to the lever extension, the lower step-plate disposed in a position accessible to a downwardly sloping rider foot resting on a foot peg.

[0022] According to a further feature of the present invention, the lower step-plate is securable in any one of a plurality of positions within the lever extension.

[0023] According to a further feature of the present invention, the lower step-plate is securable in any one of a plurality of orientations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention is best understood in view of the accompanying drawings in which:

[0025] **FIG. 1A** is a schematic depiction of knee and foot posture during natural/attack position;

[0026] **FIG. 1B** is a schematic depiction of an unsustainable foot posture enabling access to the brake pedal necessitated by riding in the natural or the attack positions of FIG. 1A;

[0027] **FIG. 2** is a schematic depiction of foot posture during a wheelie maneuver;

[0028] **FIG. 3** is a schematic depiction of foot posture during dual riding;

[0029] **FIG. 4** is a schematic, perspective side-view of a pivotally-mounted, rear-brake adaptor unit, implemented as a step-plate extension;

[0030] **FIG. 5A** is a schematic, perspective side-view of a connection configuration of the step-plate extension of FIG. 4 to the upper step-plate, according to an embodiment;

[0031] **FIG. 5B** is a schematic, side-view of the connection configuration of Fig. 4, depicting a range of angles at which step-plate extension can be configured to facilitate rider needs; according to an embodiment;

[0032] **FIGS. 6A-6B** are schematic, perspective cross-sectional side-views of a retractable step-plate extension in deployed and non-deployed states, respectively; according to a torsion spring embodiment;

[0033] **FIGS. 6C-6D** are schematic, cross-sectional perspective cross-sectional side-views of the step-plate extension depicting a limiter bolt operative to define a deployment angle in accordance with rider needs; according to a torsion spring embodiment,

[0034] **FIGS. 7A-7B** are schematic, perspective side-views of a retractable step-plate extension in deployed and non-deployed states, respectively; according to a compression spring embodiment,

[0035] **FIG. 8** is a perspective side-view of a motorcycle rear-brake adaptor unit implemented as a brake-lever extension; according to a second embodiment,

[0036] **FIG. 9** is an exploded perspective view of the motorcycle the brake-lever extension of FIG. 9 depicting connection with a motorcycle frame and existing brake actuation hardware; according to an embodiment,

[0037] **FIG. 10** is a perspective rear-view of the brake-lever extension of FIG. 10 in a deployment state; according to embodiment,

[0038] **FIG. 11** is a perspective side-view of a rear-brake adaptor unit implemented integrally with the motorcycle brake lever; according to an embodiment, and

[0039] **FIG. 12** is a schematic depiction of highlighting constant access to a brake pedal foot posture enabled by the brake adaptation unit; according to an embodiment.

[0040] It will be appreciated that for the sake of clarity, elements shown in the figures may not be drawn to scale and reference numerals may be repeated in different figures to indicate corresponding or analogous elements.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0041] In the following detailed description, specific details are set forth in order to facilitate understanding of the invention; however, it should be understood by those skilled in the art that the present invention may be practiced without these specific details. Furthermore, well-known methods, procedures, and components have not been omitted to highlight the invention.

[0042] The present invention is an ergonomic motorcycle rear-brake adaptor unit facilitating access to the rear brake pedal for riders in all riding postures.

[0043] Turning now to the figures, **FIGS. 1A-1B** depict a rider in a natural/attack posture. As shown, in close-ups **100** and **105**, the rider is compelled to position the foot underneath rear-brake step-plate **130** at a downward angle between 20°-30° relative to the horizontal while the foot rests on foot peg **120**. Stepping on step-plate **130** from such foot posture is a physiologically difficult, if not impossible, task because foot access to step-plate **130** can easily exceed a 20° dorsiflexion limit. The thick protective boots **110** further inhibit ankle motion to the point that a rider must assume an impossible foot posture above step-plate **130** as shown in close up **140** of **FIG. 1B**. It should be appreciated that these braking impediments also exist when a rider is seated in a normal riding position in the middle of the seat, as noted above.

[0044] **FIG. 2** is a schematic depiction of foot posture during a wheelie maneuver. As shown in close-up **200**, during the maneuver foot position naturally assumes a position underneath step-plate **130**. The absence of instantaneous, rear brake control means there is a very high risk of flipping the motorcycle backwards and causing injury or even endangering life.

[0045] **FIG. 3** depicts a dual rider scenario in which the front rider is sitting in a position shifted to the front of the seat thereby creating the foot posture non-conducive to complete rear brake control, as shown in close-up **300**.

[0046] **FIG. 4** is a schematic, perspective side-view of an ergonomic, motorcycle rear-brake adaptor unit **400** including an adapted rear-brake lever implemented as a step-plate extension **420**, an adjustable, lower step-plate **430** and an adapted step-plate **415**, according to an embodiment. As shown, adapted step-plate **415** interfaces with the distal end of brake lever **410** pivotally mountable to a bike frame (not shown) at revolt joint **450**. Lever **410** is linked to hydraulic master cylinder **440** through push rod **445**.

[0047] In operation, foot pressure **A** applied to lower step-plate **430** rotates lever **410** rotation **B** and drives push rod **445** into cylinder **440** as if the pressure was applied to upper step-plate **415**

thereby advantageously providing rear braking capacity from two possible foot positions found in various riding postures.

[0048] **FIGS. 5A-5B** are schematic, perspective side-views of a connection configuration of step-plate extension **420** with adapted step-plate **415**, according to an embodiment. As shown, step-plate extension **420** is mounted to adapted plate **415** through bolt **447** and secured with bolts **445** at any chosen angle between 10° to 70° relative to the horizontal, as depicted in Fig. **5B**, to facilitate rider needs. It should be appreciated that in a certain embodiment step-plate extension **420** is connectable to brake lever **410** directly.

[0049] Lower step-plate **430** is rotatable and slidably mounted to step-plate extension **420** by way of parallel grooves **425** and secured at the desired height in grooves **425** at the desired orientation by way of bolts **427**.

[0050] It should be appreciated that other connection configuration means providing functionality of bolts **445**, **427** and grooves **440** and **425** are also included within the scope of the present invention.

[0051] **FIGS. 6A-6B** are schematic, perspective, cross-sectional side-views of a retractable embodiment of step-plate extension **420** in deployed and non-deployed states, respectively, according to a torsion spring embodiment.

[0052] As shown, step-plate extension **420** is fitted with a spring arrangement operative to retract step-plate extension **420** when needed and recoil into a deployment position. The spring arrangement **640** in which the spring coil is anchored in the body of upper step-plate **415** and biased to drive step-plate extension **420** into a deployment angle defined by limiter bolt **470** as will be further discussed. Step-plate extension **420** includes a detent mechanism that in a certain embodiment includes an embedded plunger spring **620** driving an engagement ball **615** disposed

in a sleeve such that ball **615** locks into a corresponding spherical catch **610** disposed in the body of upper plate **415**.

[0053] As noted above, step-plate extension **420** is not permanently fixed at a deployment angle to advantageously enable step-plate extension **420** to rotate upwards toward brake lever **410** responsively to impact with obstacles, or the road during sharp banking, and recoil into a deployment angle. When upward rotation achieves a threshold angle, engagement ball **615** is captured by spherical catch **610** thereby releasably securing extension **420** in a substantially horizontal, non-deployment position until the rider unlocks the detent by pushing step-plate **430** downwards sufficiently to release plunger engagement ball **615** from spherical catch **610**. After release, torsion spring **640** drives step-plate extension **420** into a deployment angle.

[0054] In another variant embodiment, the coil portion of the torsion spring arrangement **640** is anchored in step-plate extension **420**. Additionally, in a certain variant embodiment the biasing spring of plunger engagement ball **615** is disposed in the body of upper step-plate **430** and catch **610** is disposed in step-plate extension **420**. It should be appreciated that other types of detent mechanisms are included within the scope of the present invention.

[0055] **FIGS. 6C-6D** are schematic, perspective cross-sectional side-views of step-plate extension **420** having a deployment angle limiter bolt **470** defining an angle of deployment. As shown, limiter bolt **470** is disposed in a threaded sleeve **465** and advances or regresses in sleeve **465** depending on rotation direction. Abutment of limiter **470** on the body of upper pedal **415** defines a deployment angle of step-plate extension **420**.

[0056] In another embodiment, deployment angle limiter **470** is configured to advance in predefined segments in the absence of threading. In another embodiment, limiter **470** is set into the body of adapted upper step-plate **415** and abuts on step-plate extension **420** to define maximum deployment angle.

[0057] **FIGS. 7A-7B** are schematic, cross-sectional perspective side-views of variant embodiment of the spring arrangement of a retractable step-plate extension **420** in deployed state and a non-deployed state, respectively; according to a compression spring embodiment.

[0058] As shown, step-plate extension **420** is fitted with a compression spring **710** configured to bias plunger **715** into a state of abutment with surfaces **730**. When plunger **715** is in abutment with upper surface **720** step-plate extension **420** is releasably secured in a non-deployment position whereas when in abutment with lower surface **725**, plunger **715** is driven downward until plunger **715** is releasably secured in catch **730** where step-plate extension **420** assumes a deployment position.

[0059] In this variant embodiment, step-plate extension **420** is not permanently fixed in a deployment angle to advantageously enable step-plate extension **420** to rotate upwards responsively to impact with obstacles during travel and recoil into a deployment angle. When upward rotation achieves a threshold angle between 10°-15° relative to the horizontal, plunger **715** will be driven past an angle of abutment with surface **725** and assume a substantially horizontal, non-deployment position until the rider releases plunger engagement by pushing lower step-plate **430** downwards.

[0060] It should be appreciated that in certain embodiment, spring arrangement is implemented with one or more tension springs, a leaf spring, a bistable spring, or other biasing elements providing such functionality.

[0061] **FIG. 8** is a perspective side-view of a second embodiment of a motorcycle rear-brake adaptor unit **400** including an adapted rear-brake lever implemented as a brake-lever extension **820** pivotally mounted to bracket **810** with step-plate **430**. Attachment of bracket **810** to motorcycle frame **860**, foot peg **120** to bracket **810**, and lower step-plate **430** to brake-lever extension **820** are shown in the exploded view of **FIG. 9**. Also shown in **FIG. 9** is the interface

between pivotally mounted brake-lever extension **820** with push rod **445** such that rod **445** can be advantageously driven by either motorcycle lever **410** or brake-lever extension **820** upon application of pressure to the respective step plate.

[0062] **FIG. 10** is a perspective rear-view of the brake-lever extension embodiment of motorcycle rear-brake adaptor unit during operation. As shown, pressure **A** applied to lower step-plate **430** brake-lever extension **820** around pivotal mount **850** and also rotates lever **410** around pivotal mount **450** as depicted by arrows **C**.

[0063] In a certain embodiment, brake-lever extension **820** is implemented as two lever elements, **825** and **820** that releasable interlock at chosen angle in accordance with rider needs.

[0064] **FIG. 11** is a perspective side-view of rear-brake adaptor unit **400** including an adapted rear-brake lever implemented as an integral lever extension **422**; according to an embodiment.

[0065] As shown, integral lever extension **422** extends directly from brake lever **410** and provides brake access when riding posture is non-conducive to use of step-plate **415** as noted above. This embodiment also employs configurable lower step-plate **430**. In a certain variant embodiment, adapted step-plate **415** is implemented in the absence of adaptations.

[0066] **FIG. 12** is a schematic depiction of a rider utilizing the brake adaptation unit **400** to maintain constant contact with a step-plate **430** while foot **110** rests on foot peg **120** to advantageously negate the danger and discomfort associated with holding the foot above upper step-plate **130** as necessitated by the various riding postures noted above.

[0067] Motorcycle rear-brake adaptor unit is constructed from aluminum, metallic alloys, polymeric materials, or a combination as employed in the construction of motorcycle brake levers. Known constructions methods like machining, casting, forging, or printing, for example, are all suitable construction methods.

[0068] It should be appreciated that embodiments formed from combinations of features set forth in separate embodiments are also within the scope of the present invention.

[0069] While certain features of the invention have been illustrated and described herein, modifications, substitutions, and equivalents are included within the scope of the invention.

CLAIMS

What is claimed is:

1. A motorcycle, rear-brake adaptor unit comprising:
 - a rear-brake lever in communication with a rear brake hydraulic master cylinder;
 - a step-plate connected to the rear-brake lever;
 - one foot peg; and
 - a lower step-plate in operative communication with the rear-brake lever, the lower step-plate disposed in a position behind the step-plate in a plane lower than the step-plate, the position providing simultaneous foot access to both the step-plate and the lower step-plate when a rider foot is resting on the one foot peg.
2. The motorcycle, rear-brake adaptor unit of claim 1, further comprising a step-plate extension connecting the step-plate and the lower step-plate.
3. The motorcycle, rear-brake adaptor unit of claim 2, wherein the step-plate is implemented as an adapted step-plate facilitating rotation of the step-plate extension within the adapted step-plate.
4. The motorcycle, rear-brake adaptor unit of claim 3, wherein the step-plate extension is releasably mounted to the adapted step-plate so as to form an angle between 10°-70° relative to the horizontal.

5. The motorcycle, rear-brake adaptor unit of claim 3, wherein the step-plate extension is releasably mounted to the adapted step-plate so as to form an angle between 20°-50° relative to the horizontal.
6. The motorcycle, rear-brake adaptor unit of claim 3, further comprising a spring arrangement configured to bias the step-plate extension into a deployment position.
7. The motorcycle, rear-brake adaptor unit of claim 6, wherein the spring arrangement includes a coil torsional spring.
8. The motorcycle, rear-brake adaptor unit of claim 7, further comprising a detent mechanism configured to releasably secure the step-plate extension in a non-deployment position.
9. The motorcycle, rear-brake adaptor unit of claim 6, wherein the spring arrangement includes a compression spring.
10. The motorcycle, rear-brake adaptor unit of claim 2, wherein the lower step-plate is securable in any one of a plurality of longitudinal positions within the step-plate extension in accordance with a connection configuration of the step-plate extension.
11. The motorcycle, rear-brake adaptor unit of claim 10, wherein the lower step-plate is securable in any one of a plurality of orientations in accordance with the connection configuration of the step-plate extension.

12. The motorcycle, rear-brake adaptor unit of claim 1, further comprising a brake-lever extension connecting the rear-brake lever and the lower step-plate.
13. The motorcycle, rear-brake adaptor unit of claim 12, wherein the lower step-plate is securable in any one of a plurality of positions within the brake-lever extension in accordance with a connection configuration of the brake-lever extension.
14. The motorcycle, rear-brake adaptor unit of claim 12, wherein the lower step-plate is securable in any one of a plurality of orientations in accordance with a connection configuration of the brake-lever extension.
15. A motorcycle, rear-brake adaptor unit comprising:
 - a rear-brake lever in communication with a rear brake hydraulic master cylinder;
 - a step-plate connected to the rear-brake lever;
 - a lower step-plate;
 - a step-plate extension connecting the step-plate and the lower step-plate,
 - wherein the lower step-plate is disposed in a position accessible to a downwardly sloping, rider foot resting on a foot peg,
 - wherein the step-plate is implemented as an adapted step-plate facilitating rotation of the step-plate extension within the adapted step-plate; and
 - a limiter bolt configured to define a maximum deployment angle of the step-plate extension.
16. A motorcycle, rear-brake adaptor unit comprising,
 - a motorcycle rear-brake lever in communication with a rear master brake cylinder;

a step-plate mounted to the motorcycle rear-brake lever;
an integral lever extension integrally connected to the motorcycle rear-brake lever;
one foot peg; and
a lower step-plate mounted to the integral lever extension, the lower step-plate
disposed in a position behind the step-plate in a plane lower than the step-plate,
the position providing simultaneous foot access to both the step-plate and the
lower step-plate when a rider foot is resting on the one foot peg.

17. The motorcycle, rear-brake adaptor unit of claim 16, wherein the lower step-plate is securable
in any one of a plurality of positions within the integral lever extension in accordance with a
connection configuration of the integral lever extension.
18. The motorcycle, rear-brake adaptor unit of claim 16, wherein the lower step-plate is securable
in any one of a plurality of orientations in accordance with a connection configuration of the
integral lever extension.

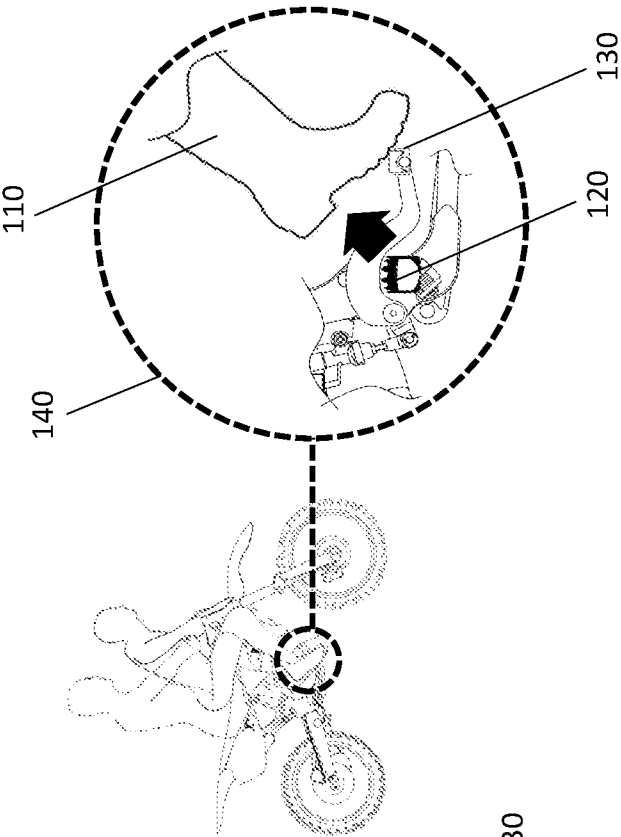


FIG. 1B

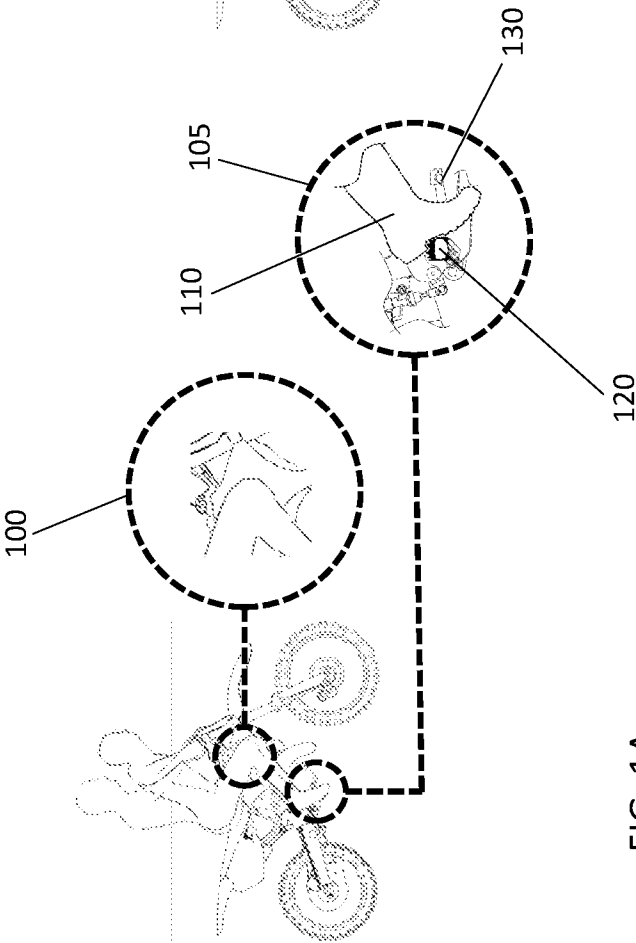


FIG. 1A

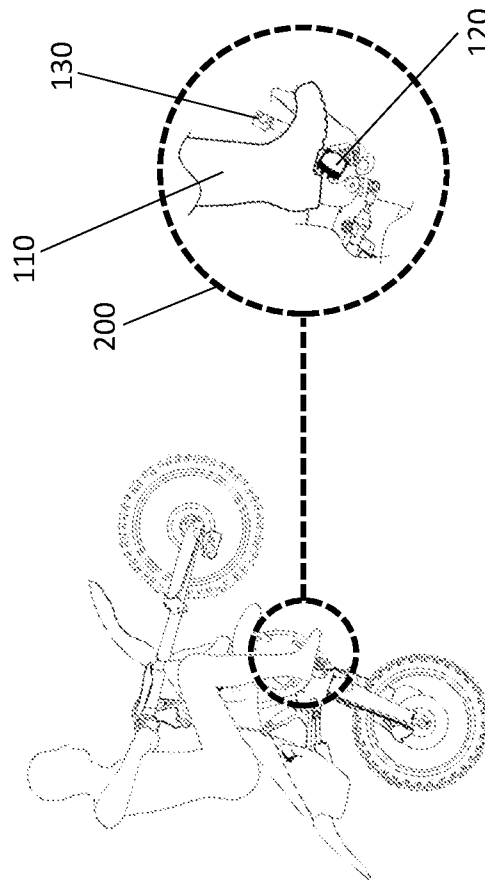


FIG. 2

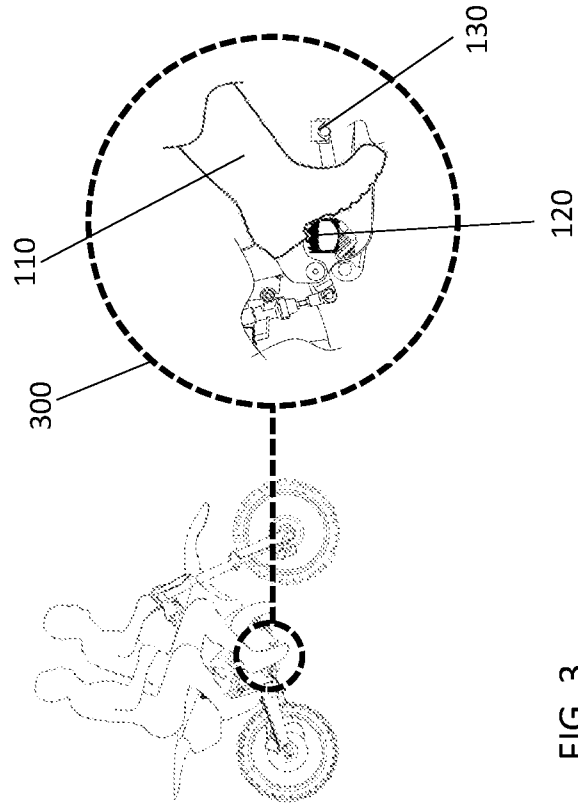


FIG. 3

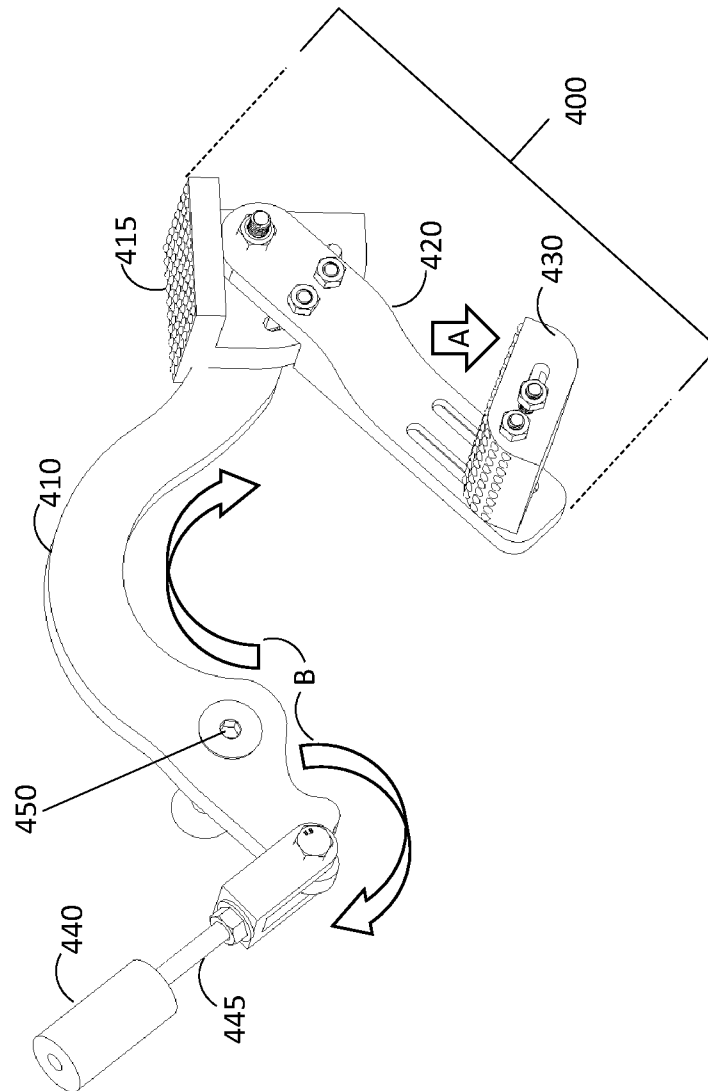


FIG. 4

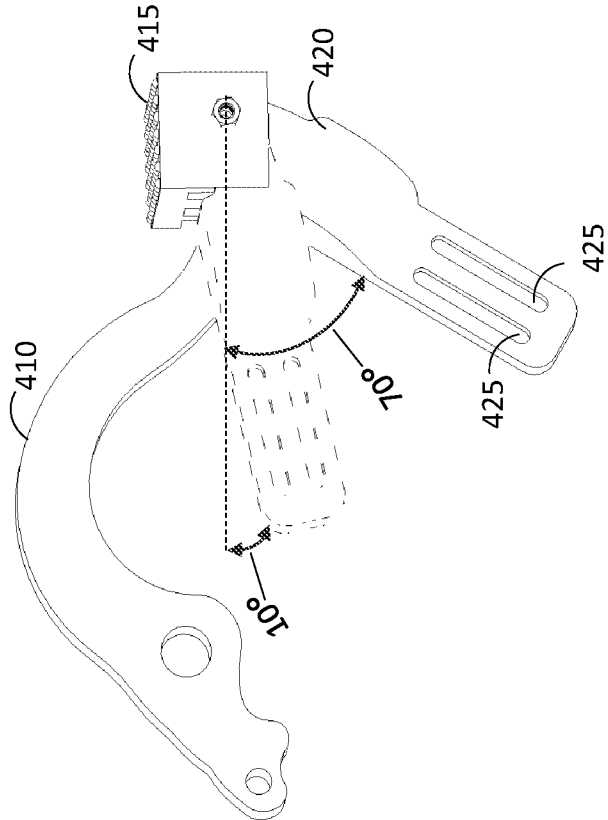


FIG. 5B

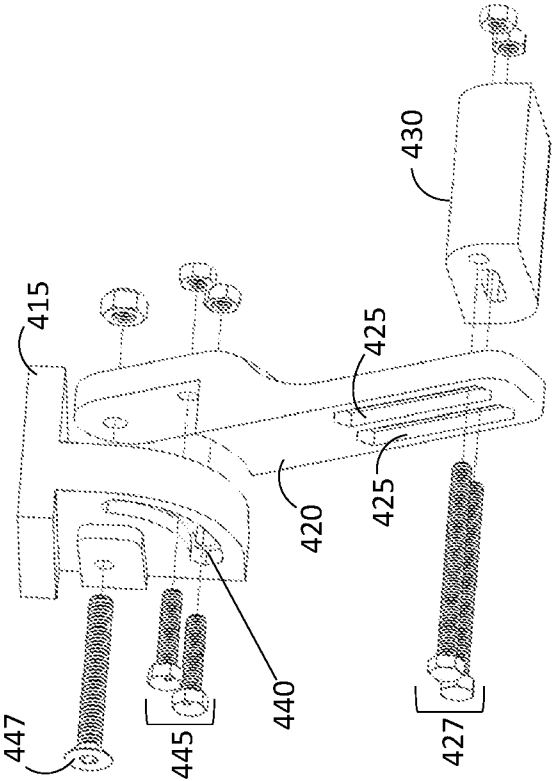


FIG. 5A

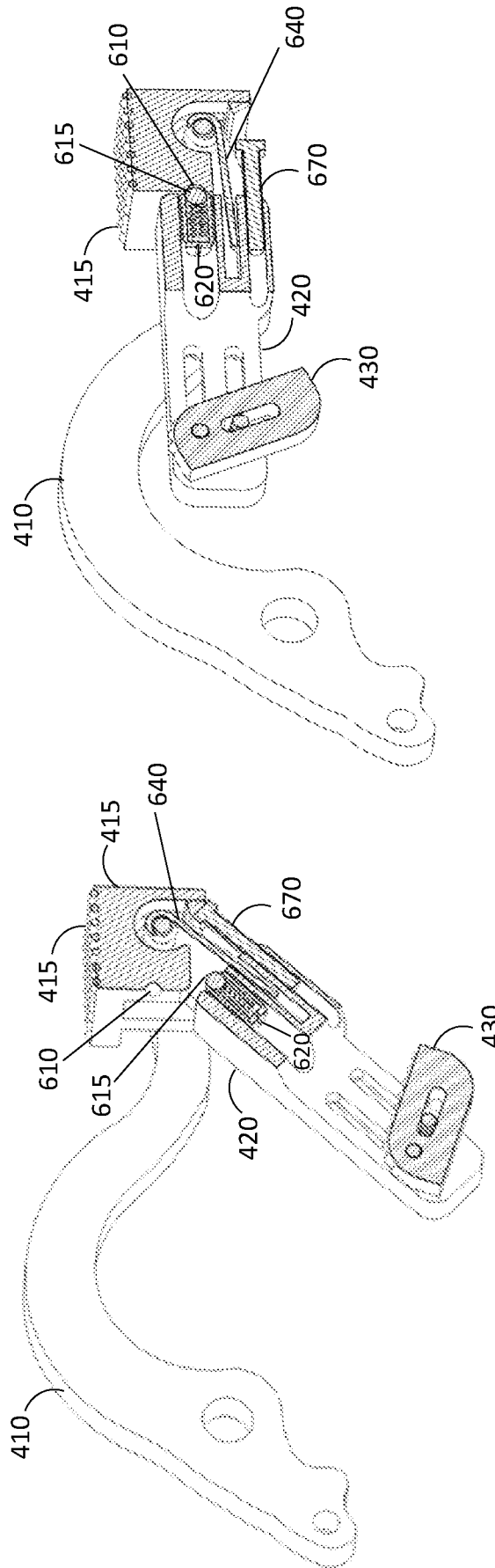


FIG. 6B

FIG. 6A

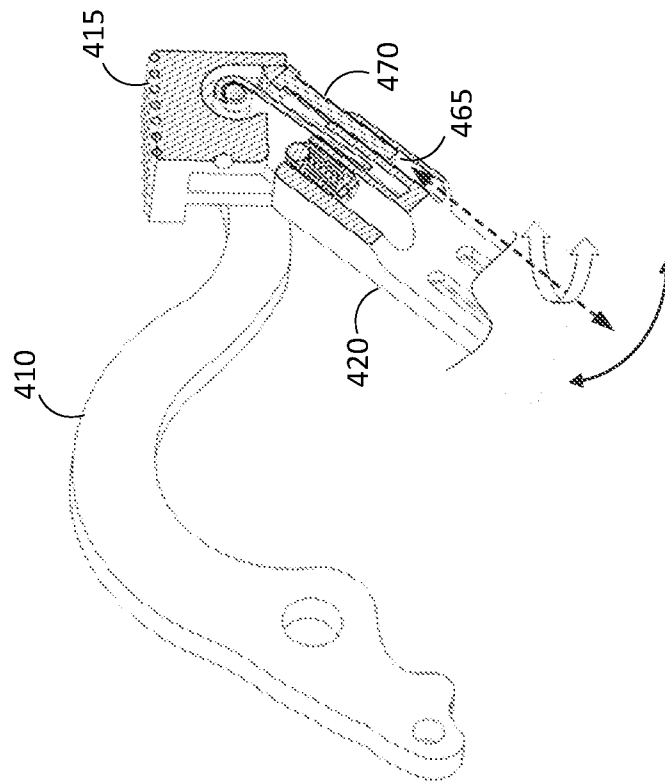


FIG. 6D

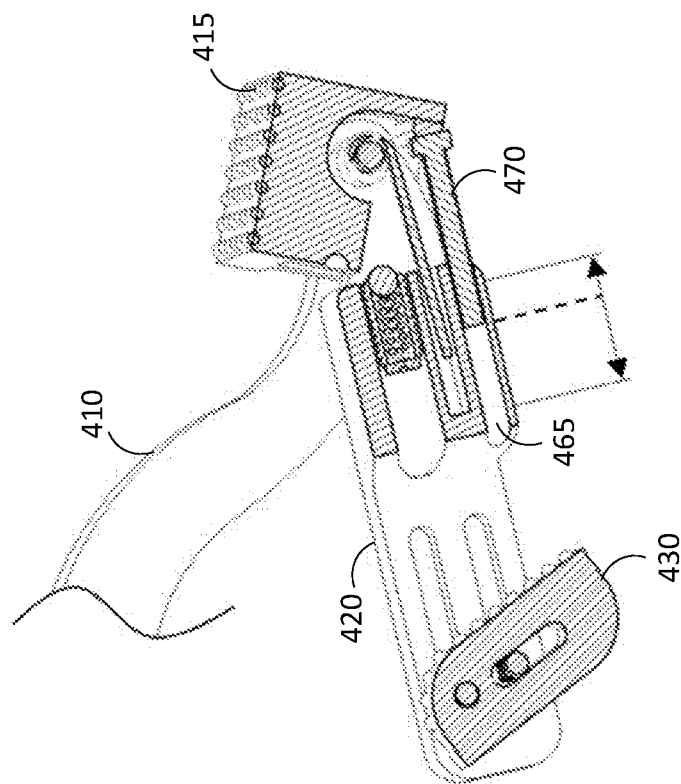


FIG. 6C

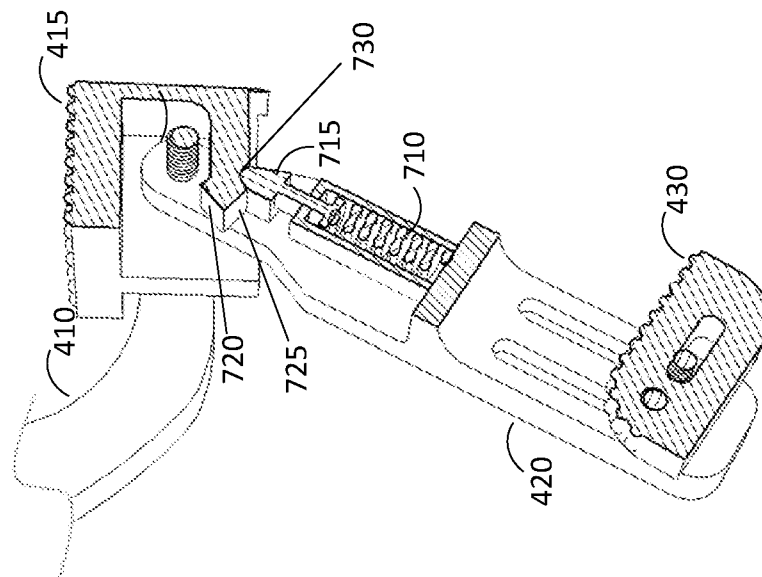


FIG. 7B

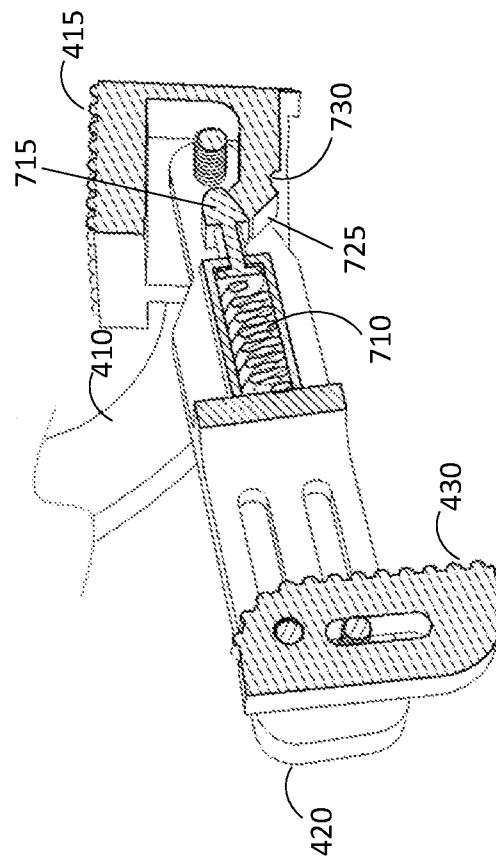


FIG. 7A

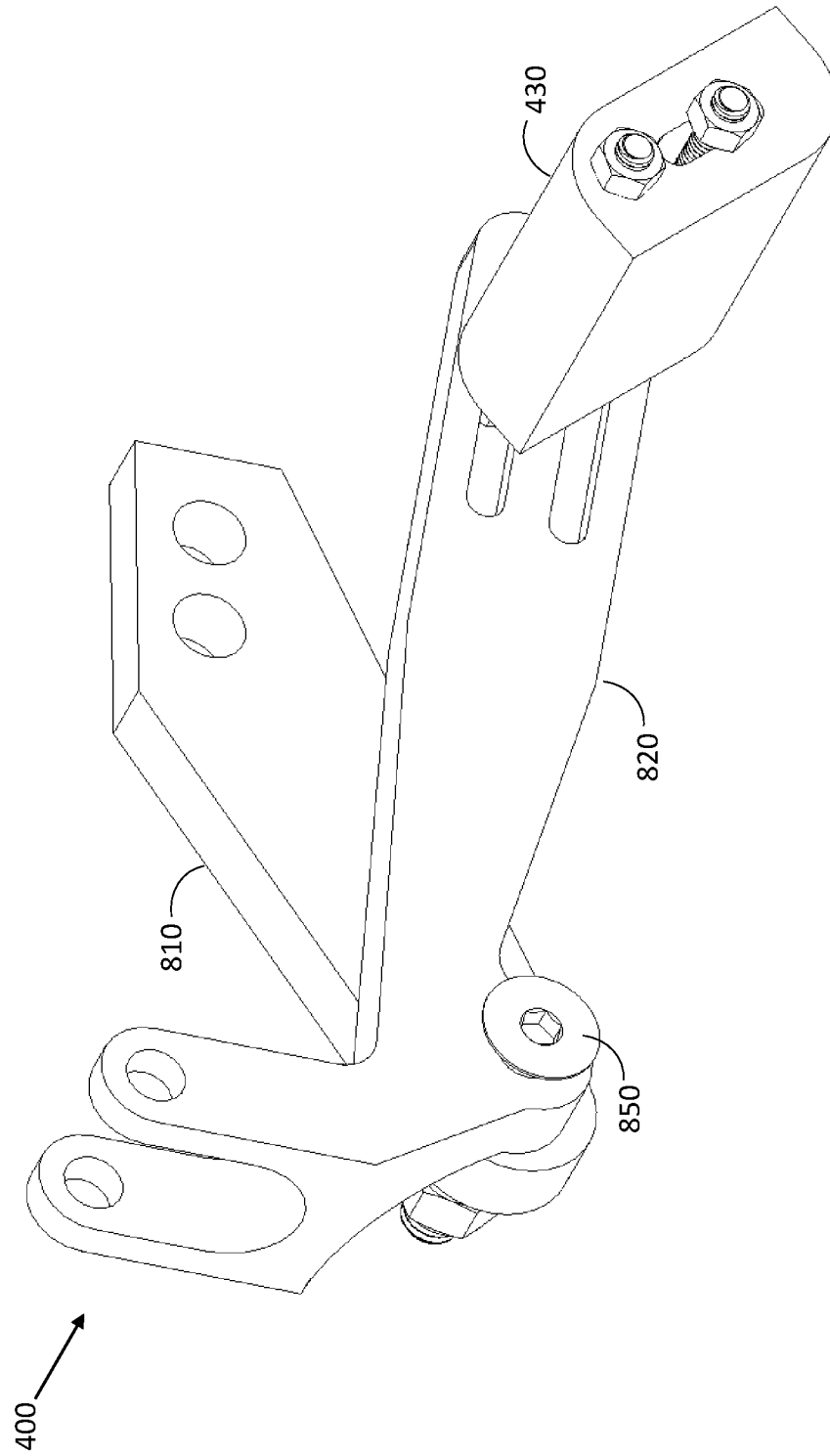


FIG. 8

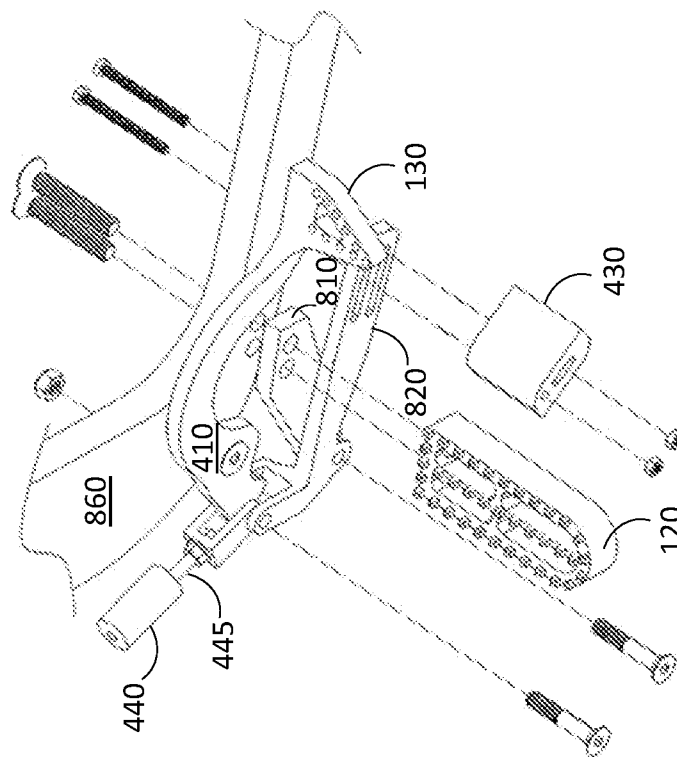
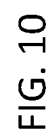


FIG. 9



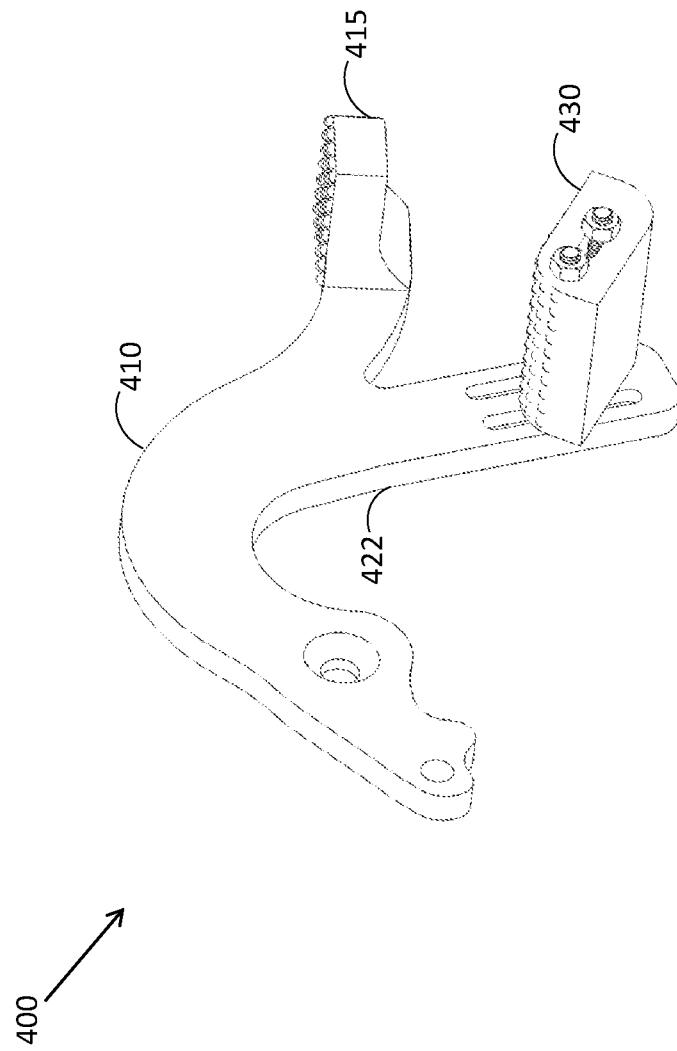


FIG. 11

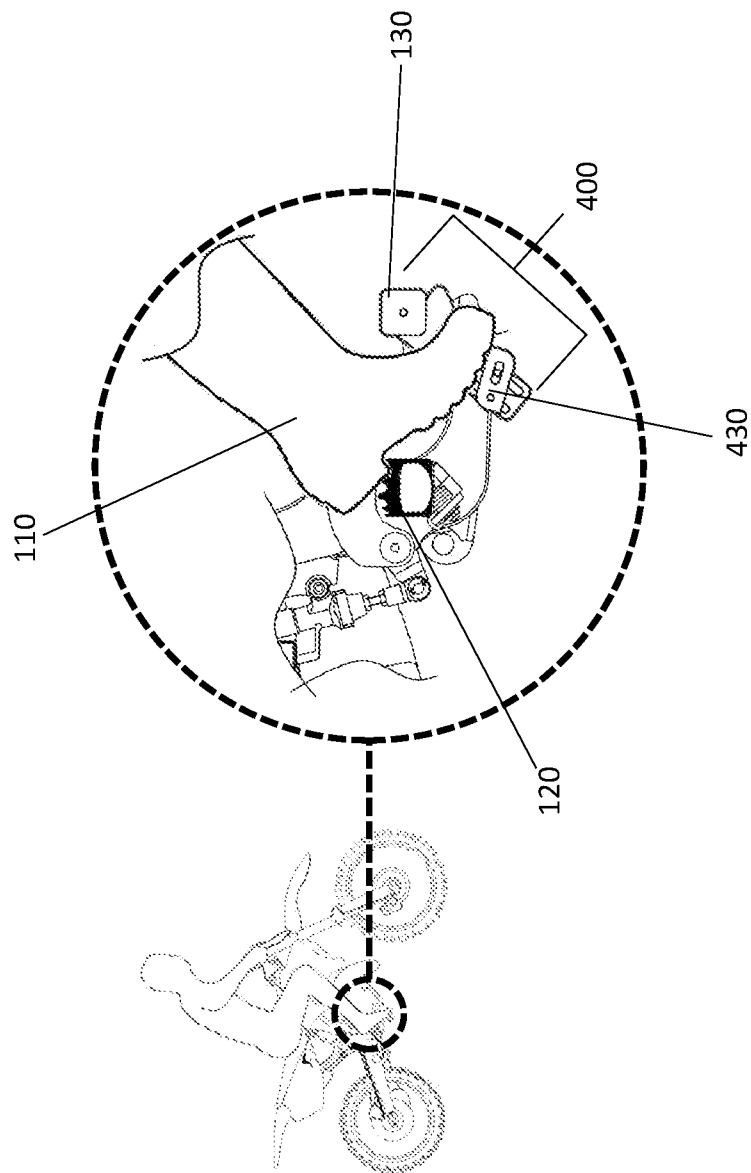


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2020/050548

A. CLASSIFICATION OF SUBJECT MATTER

INV. B62L3/04 B62K23/04 G05G1/487
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)

B62L B62K G05G

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	Chris McMachen: "Altrider DualControl Brake System - Adventure Motorcycle Magazine", 4 November 2015 (2015-11-04), XP055726944, Retrieved from the Internet: URL:https://adventuremotorcycle.com/news/news-altrider-dual-control-brake-system [retrieved on 2020-09-02] page 1 - page 5	1,2
A	----- US 7 264 255 B1 (WINFREY JEFF [US]) 4 September 2007 (2007-09-04) column 4; figure 4 -----	3-18
A		1-18



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

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"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

2 September 2020

Date of mailing of the international search report

10/09/2020

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Authorized officer

Huber, Florian

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IL2020/050548

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7264255	B1	04-09-2007	NONE
