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(54) Title: A LEG STRESS RELIEVING APPARATUS FOR VEHICLE OCCUPANTS

(57) Abstract: The present disclosure relates to the field of apparatuses for releasing stress on legs of vehicle occupants. The apparatus (100), of the present disclosure, releases stress on legs of vehicle occupants by causing up and down leg movements of the occupants, thereby reducing the risk of lower limb disorders such as deep vein thrombosis. The apparatus (100) comprises at least one platform (125) and at least one motorized means. The platform (125) is configured to support either one or both feet of the seated vehicle occupant thereon. The motorized means is configured for controlled raising or lowering of the platform (125) to cause up and down movement of either one or both legs of the seated occupant.

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A LEG STRESS RELIEVING APPARATUS FOR VEHICLE OCCUPANTS

FIELD

The present disclosure relates to the field of apparatuses for relieving stress on legs of seated vehicle occupants.

BACKGROUND

The background information herein below relates to the present disclosure but is not necessarily prior art.

During long distance journeys in a vehicle, occupants of the vehicle tend to feel exhausted or fatigued as they are not able to move their legs due to restricted leg space in the vehicle, thereby resulting in jamming of legs, specifically knees. To avoid this, occupants usually take short breaks during the journey resulting in increased travel time. Additionally, it is not advisable to take such frequent breaks while travelling on highways owing to safety reasons.

Long distance journeys may also cause the vehicle occupants to suffer from various lower limb disorders such as deep vein thrombosis either during the journey or after a few days of completing the journey. One of the causes of the lower limb disorders is prolonged pressing of the occupant's thighs against passenger seats whilst they remain seated without sufficiently moving their legs for a long period of time. This subsequently causes deep vein thrombosis in which the blood clots in the veins of thighs.

Therefore, there is felt a need of a leg stress relieving apparatus for seated vehicle occupants.

OBJECTS

Some of the objects of the present disclosure, which at least one embodiment herein satisfies, are as follows.

An object of the present disclosure is to provide an apparatus that releases stress on legs of seated vehicle occupants.

Another object of the present disclosure is to provide an apparatus that reduces the risk of lower limb disorders like deep vein thrombosis in vehicle occupants during/after long distance journeys.

Another object of the present disclosure is to provide an apparatus that can be mounted on a floor of a vehicle's passenger cabin.

Yet another object of the present disclosure is to provide an apparatus that is sturdy.

Yet another object of the present disclosure is to provide an apparatus that is easy to operate.

Other objects and advantages of the present disclosure will be more apparent from the following description, which is not intended to limit the scope of the present disclosure.

SUMMARY

The present disclosure envisages a leg stress relieving apparatus for seated vehicle occupants. The apparatus comprises at least one platform and at least one motorized means. The platform is configured to support either one or both feet of the seated vehicle occupant thereon. The motorized means is configured for controlled raising or lowering of the platform to cause up and down movement of either one or both legs of the seated occupant placed on the platform.

The apparatus further comprises a casing, a first member, at least one support member, and a second member. The casing is attached to the floor of a passenger cabin of the vehicle. The first member is attached to a floor of the vehicle. The support member is mounted on the first member, and is angularly displaceable about a joint between the first member and the support member. The second member is mounted on the support member, and is connected to the platform. The support member is angularly displaceable about a joint between the second member and the support member. The motorized means is configured to raise or lower the second member, thereby raising or lowering the platform.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

A leg stress relieving apparatus for vehicle occupants, of the present disclosure, will now be described with the help of the accompanying drawing, in which:

Figure 1 illustrates an isometric view of an apparatus, in accordance with an embodiment of the present disclosure;

Figure 2 illustrates another isometric view depicting an arrangement of a first member, support members, a second member, and a biasing member of the apparatus of Figure 1;

Figure 3 illustrates yet another isometric view depicting an arrangement of the first member, support members, and the second member of the apparatus of Figure 2;

Figure 4 illustrates an isometric view of the first member of the apparatus of Figure 1;

Figure 5 illustrates an isometric view of the second member of the apparatus of Figure 1;

Figure 6 illustrates an isometric view depicting an arrangement of the biasing member and the second member of the apparatus of Figure 1;

Figure 7 illustrates an isometric view depicting a casing mounted on a floor of the vehicle of Figure 1;

Figure 8 illustrates an isometric view depicting the apparatus mounted on the floor of the vehicle of Figure 1;

Figure 9 illustrates another isometric view of the apparatus depicting positions of the first member, the support members, and the second member when the second member is raised;

Figure 10 illustrates another isometric view of the apparatus depicting positions of the first member, the support members, and the second member when the second member is lowered;

Figure 11 illustrates a block diagram of the apparatus depicting electrical connections between components of the apparatus;

Figure 12 illustrates a schematic view of a vehicle occupant and the apparatus when a platform of the apparatus is at lowermost position; and

Figure 13 illustrates a schematic view of the vehicle occupant and the apparatus when the platform of the apparatus is at uppermost position.

LIST OF REFERENCE NUMERALS

100 – Apparatus

102 – Floor

105 – Casing

110 – First member

115 – Support member

120 – Second member

125 – Platform

140 – First U-clips

145 –First pair of pins

150 – Second U-clip

155 – Bracket

170 – Gear

175 – Rack

180 – Holes

185 – Biasing member

190 – Limiter

192 – Space

195 – Limiting rod

200 – Vehicle occupant

205 – Passenger seat

210 – Motor

215 – First sensor

220 – Second sensor

225 – Control unit

230 – Timing unit

250 – Battery

255 – Switch

DETAILED DESCRIPTION

Embodiments, of the present disclosure, will now be described with reference to the accompanying drawing.

Embodiments are provided so as to thoroughly and fully convey the scope of the present disclosure to the person skilled in the art. Numerous details, are set forth, relating to specific components, and methods, to provide a complete understanding of embodiments of the present disclosure. It will be apparent to the person skilled in the art that the details provided in the embodiments should not be construed to limit the scope of the present disclosure. In some embodiments, well-known processes, well-known apparatus structures, and well-known techniques are not described in detail.

The terminology used, in the present disclosure, is only for the purpose of explaining a particular embodiment and such terminology shall not be considered to limit the scope of the present disclosure. As used in the present disclosure, the forms "a", "an", and "the" may be intended to include the plural forms as well, unless the context clearly suggests otherwise. The terms "comprises", "comprising", and "including" are open ended transitional phrases and therefore specify the presence of stated features, elements, modules, units and/or components, but do not forbid the presence or addition of one or more other features, elements, components, and/or groups thereof.

When an element is referred to as being "mounted on", "connected to", or "coupled to" another element, it may be directly on, engaged, connected or coupled to the other element.

The terms first, second, third, etc., should not be construed to limit the scope of the present disclosure as the aforementioned terms may be only used to distinguish one element, component, region, layer or section from another component, region, layer or section. Terms such as first, second, third etc., when used herein do not imply a specific sequence or order unless clearly suggested by the present disclosure.

The present disclosure envisages a leg stress relieving apparatus for vehicle occupants (hereinafter also referred to as apparatus). The apparatus, of the present disclosure, is now described with reference to Figure 1 through Figure 13.

Referring to Figure 1 to Figure 13, an apparatus 100 is shown.

The apparatus 100 comprises at least one platform 125 and at least one motorized means. The platform 125 is configured to support either one or both feet of the seated vehicle occupant thereon. In an embodiment, the apparatus comprises two platforms 125, wherein each platform 125 is configured to support one foot thereon. The motorized means is configured for controlled raising or lowering of the platform 125 to cause up and down movement of either one or both legs of the seated occupant placed on the platform 125.

The apparatus 100 further comprises a casing 105, a first member 110, at least one support member 115, and a second member 120.

The casing 105 is attached to a floor 102 of a passenger cabin in the vehicle. Typically, the casing 105 is welded to the floor 102 of the passenger cabin. The casing 105 is of metallic material.

The first member 110 is attached to the floor 102 of the vehicle. In an embodiment, the first member 110 is welded to an operative base portion of the casing 105. In another embodiment, if the casing 105 is not provided with a base or has only side walls, the first member 110 is welded to the floor 102 of the vehicle.

The support member 115 is mounted on the first member 110, and is angularly displaceable about a joint between the first member 110 and the support member 115.

In an embodiment, the apparatus 100 includes a pair of support members 115.

In another embodiment, the support members 115 are mounted on the first member 110 by means of a pair of first U-clips 140 and a first pair of pins 145. The pins 145 pass through holes configured on the U-clips 140 and the support members 115. The U-clips 140 and the pins 145 facilitate angular displacement of the support member 115 about the joint between the support member 115 and the first member 110.

In an embodiment, the number of first U-clips 140 is equal to the number of support members 115.

In another embodiment, the first U-clips 140 are arranged such that the distance between the adjacent first U-clips 140 is equal to the height of the support members 115.

The second member 120 is mounted on the support members 115. The second member 120 is connected to the platform 125 at an operative bottom portion thereof. The support members 115 are configured to be angularly displaceable about a joint between the second member 120 and the support members 115. The second member 120 is arranged parallel to the first member 110.

In an embodiment, the second member 120 has a hollow configuration.

The apparatus 100 comprises a second U-clip 150 and a bracket 155 configured to facilitate mounting of the second member 120 on the support members 115. The apparatus 100 further comprises a second pair of pins, wherein each of the second pair of pins is inserted through holes configured on the second U-clip 150 and the bracket 155 and passed through the corresponding support member 115 to facilitate angular displacement of the support members 115 about the joint between the second member 120 and the support members 115.

In an embodiment, the second U-clip 150 and the bracket 155 are arranged such that the distance between the second U-clip 150 and the bracket 155 is equal to the distance between the two first U-clips 140.

In an embodiment, the platform 125 has skirting walls extending operatively downwards, and configured to encompass the casing 105 and the second member 120.

The motorized means is configured to displace the second member 120 in a vertical direction. The motorized comprises a gear 170, a rack 175, a motor 210, a battery 250, and a switch 255.

The gear 170 is connected to the platform 125 via a pin. In Figure 1, the gear 170 is shown in a disconnected state with the platform 125.

The rack 175 is connected to the casing 105, and is engaged with the gear 170. The motor 210 is coupled to the gear 170, and is configured to rotate the gear 170 when actuated. The rotation of the gear 170 facilitates vertical displacement of the second member 120 as the gear translates on the rack 175.

The battery 250 is electrically coupled to the motor 210. The switch 255 is configured to selectively facilitate electrical connection between the battery 250 and the motor 210 in a closed position of the switch 255. More specifically, the switch 255 makes or breaks the electrical circuit between the battery 250 and the motor 210.

In an embodiment, the apparatus 100 comprises a first sensor 215, a second sensor 220, and a control unit 225. The first sensor 215 is disposed proximal to a lowermost end of the rack 175 to detect arrival of the gear 170 proximal to the lowermost end. The first sensor 215 is further configured to generate a first detection signal based on the detection of the gear 170 proximal to the lowermost end of the rack 175. The second sensor 220 is disposed proximal to an uppermost end of the rack 175 to detect arrival of the gear 170 proximal to the uppermost end. The second sensor 220 is configured to generate a second detection signal based on the detection of the gear 170 proximal to the uppermost end of the rack 175.

The control unit 225 is in communication with the first sensor 215 and the second sensor 220, and is configured to receive the first and second detection signals from the first sensor 215 and the second sensor 220 respectively. The control unit 225 is further configured to generate a forward actuation signal based on the first detection signal to operate the motor 210 in clockwise direction, and a reverse actuation signal based on the second detection signal to operate the motor 210 in anticlockwise direction. More specifically, the control unit 225 alters the direction of rotation of the motor 210 based on the position of the gear 170. When the gear 170 is proximal to the lowermost end of the rack 175, the control unit 225 reverses the direction of rotation of the motor 210, thereby translating the gear 170 towards the uppermost end of the rack 175. Further, when the gear 170 is proximal to the uppermost end of the rack 175, the control unit 225 reverses the direction of rotation of the motor 210 again to translate the gear 170 towards the lowermost end of the rack 175. This results in reciprocating motion of the second member 120, and thereby of the platform 125.

In another embodiment, the apparatus 100 includes a timing unit 230. The timing unit 230 is configured to cooperate with the control unit 225, and generate a de-actuation signal upon completion of a predetermined time-period post actuation of the motor 210. The control unit 225 is configured to de-actuate the motor 210 upon receiving the de-actuation signal. This allows the apparatus 100 to operate for pre-determined time. Once the pre-determined time is elapsed, the control unit 225 de-actuates the motor 210.

In case of the embodiment wherein the apparatus comprises two platforms 125, there are two motorized means, wherein each motorized means is coupled independently to each of the two platforms. More specifically, two motors 210 are coupled to the gears 170 of each platform 125. In this case, the control unit 225 cooperates with both the motors 210, and actuates the motors 210 in a way such that if one platform is lowered, the other platform is raised and vice versa. More specifically, the control unit 225 operates the motor 210 in opposite direction with respect to each other. If one motor 210 is actuated to rotate in clockwise direction, other motor 210 is actuated to rotate in anticlockwise direction.

In case a vehicle occupant operates the switch 255 by displacing it in an open position, the circuit between the battery 250 and the motor 210 breaks and the platform 125 remains standstill without raising or lowering. Once the switch 255 is operated by displacing it in the closed position, the circuit between the battery 250 and the motor 210 is established, and the platform 125 starts to displace in vertical direction from its earlier position.

The apparatus 100 further comprises a biasing member 185. One end of the biasing member 185 is connected to the first member 110, whereas the other end, i.e., the free end of the biasing member 185 is passed through holes 180 configured on the second member 120. More specifically, the biasing member 185 enters in the second member through one hole 180, and exits through the other hole 180 configured proximal to the bracket 155.

In an embodiment, the biasing member 185 is a spring.

The apparatus 100 further includes a limiter 190 attached to the free end of the biasing member 185. The limiter 190 is disposed in a space 192 defined on the bracket 155.

In an embodiment, the bracket 155 comprises a limiting rod 195 configured to maintain the limiter 190 in the space 192 defined on the bracket 155. More specifically, the limiting rod 195 prevents lateral displacement of the limiter 190 in the space 192.

The first member 110, the support members 115, the second member 120, and the motorized means are configured to be sturdy enough to take the load of a lower limb or a leg thereon. Typically, the components of the apparatus 100 are of a metallic material.

Referring to Figure 12 and Figure 13, operation of the apparatus 100 is shown. A vehicle occupant 200 places his one or both feet on the platform 125 (as shown in Figure 12), and operates the switch 255 to be in the closed position. The control unit 225 actuates the motor

210, thereby allowing the translation of the gear 170 on the rack 175. This raises the second member 120 and the platform 125, thereby lifting the foot placed on the platform 125 (as shown in Figure 13). The support members 115 are angularly displaced about their respective joints with the first member 110 and the second member 120. The control unit 225 operates the motor 210 in alternate clockwise and anticlockwise directions to set the platform 125 in reciprocating motion. Further, the control unit 225 de-actuates the motor 210 after the predetermined time period. The vehicle occupant can also de-actuate the motor 210 by operating the switch 255.

The occupant can keep the platform 125 at certain height by de-actuating the motor 210 when the platform 125 is elevated to that height.

When the second member 120 is lowered to its lowermost position, the support members 115 are received on the first member 110.

The biasing member 185 maintains the second member 120 at its lowermost position, intermediate position, and uppermost position. More specifically, when the second member 120 is at its lowermost position, the biasing member 185 is in tension. The limiter 190 slightly moves downwards to retain the second member 120 at its lowermost position. When the second member 120 is at its uppermost position, the tension in the biasing member 185 releases, however, the limiter 190 is restricted against the second member 120.

The present disclosure further envisages a method for relieving stress on legs of vehicle occupants. The method comprises the following steps:

- placing either one or both legs of the seated vehicle occupant on at least one platform 125;
- controlled raising or lowering of the platform 125 to cause up and down movement of the one or both legs to release the stress on the legs.

The apparatus 100 releases stress on the legs of vehicle occupants by causing up and down movement of one or both legs of the vehicle occupant 200. This prevents jamming of legs during long journeys. Further, the apparatus 100 also prevents formation of blood clots in thigh veins of the vehicle occupant resulting in reduced risk of lower limb disorders such as deep vein thrombosis. As shown in Figure 12, the thighs of the vehicle occupant 200 are in

continuous contact with a passenger seat 205 which results in prolonged pressing of occupant's thigh veins against the seat 205. This may cause development of deep vein thrombosis in the veins of thighs. The apparatus 100 causes the legs to move involuntarily in upward and downward direction. Thus, as shown in Figure 13, the thighs of the vehicle occupants 200 are not in continuous contact with the passenger seat 205. This allows smooth blood flow through the thigh veins, thereby reducing the risk of development of deep vein thrombosis.

Further, the apparatus 100 is sturdy enough to take the load of leg thereon, and can be easily mounted on the floor of the vehicle's passenger cabin.

The foregoing description of the embodiments has been provided for purposes of illustration and not intended to limit the scope of the present disclosure. Individual components of a particular embodiment are generally not limited to that particular embodiment, but, are interchangeable. Such variations are not to be regarded as a departure from the present disclosure, and all such modifications are considered to be within the scope of the present disclosure.

TECHNICAL ADVANCEMENTS

The present disclosure described herein above has several technical advantages including, but not limited to, the realization of an apparatus that:

- Releases stress on legs of seated vehicle occupants;
- reduces the risk of lower limb disorders like deep vein thrombosis in vehicle occupants during/after long distance journeys;
- can be mounted on a floor of a vehicle's passenger cabin;
- is sturdy; and
- is easy to operate.

The embodiments herein and the various features and advantageous details thereof are explained with reference to the non-limiting embodiments in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. The examples used herein are intended

merely to facilitate an understanding of ways in which the embodiments herein may be practiced and to further enable those of skill in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

The foregoing description of the specific embodiments so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

The use of the expression “at least” or “at least one” suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

Any discussion of documents, acts, materials, devices, articles or the like that has been included in this specification is solely for the purpose of providing a context for the disclosure. It is not to be taken as an admission that any or all of these matters form a part of the prior art base or were common general knowledge in the field relevant to the disclosure as it existed anywhere before the priority date of this application.

The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters, dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary.

While considerable emphasis has been placed herein on the components and component parts of the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from the principles of the disclosure. These and other changes in the preferred embodiment as well as other embodiments of the disclosure will be apparent to those skilled in the art from the

disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the disclosure and not as a limitation.

CLAIMS:

1. A leg stress relieving apparatus (100) comprising:

   at least one platform (125) configured to support either one or both feet of the seated vehicle occupant thereon; and

   at least one motorized means for controlled raising or lowering of said platform (125) to cause up and down movement of either one or both legs of said seated occupant placed on said platform (125).

2. The apparatus (100) as claimed in claim 1, wherein said apparatus (100) comprises:

   a casing (105) attached to a floor (102) of a passenger cabin of said vehicle;

   a first member (110) attached to the floor (102) of said vehicle;

   at least one support member (115) mounted on said first member (110), said support member (115) angularly displaceable about a joint between said first member (110) and said support member (115); and

   a second member (120) mounted on said support member (115), and connected to said platform, wherein said support member (115) is angularly displaceable about a joint between said second member (120) and said support member (115), wherein said motorized means is configured to raise or lower said second member (120), thereby raising or lowering said platform.

3. The apparatus (100) as claimed in claim 2, wherein said motorized means includes:

   a gear (170) connected to said platform (125);

   a rack (175) connected to said casing (105), and engaged with said gear (170);

   a motor (210) coupled to said gear (170), and configured to rotate said gear (170) when actuated;

   a battery (250) electrically coupled to said motor (210); and

   a switch (255) configured to selectively facilitate electrical connection between said battery (250) and said motor (210).

4. The apparatus (100) as claimed in claim 3, wherein said apparatus (100) includes:

   a first sensor (215) disposed proximal to lowermost end of said rack to detect arrival of said gear proximal to said lowermost end, and generate a first detection signal based on said detection;

a second sensor (220) disposed proximal to uppermost end of said rack to detect arrival of said gear proximal to said uppermost end, and generate a second detection signal based on said detection;

a control unit (225) configured to receive said first detection signal and second detection signal from said first sensor (215) and said second sensor (220) respectively, and configured to:

- generate a forward actuation signal based on said first detection signal to operate said motor (210) in clockwise direction; and
- generate a reverse actuation signal based on said second detection signal to operate said motor (210) in anticlockwise direction.

5. The apparatus as claimed in claim 4, wherein said apparatus includes a timing unit (230) configured to cooperate with said control unit (225), said timing unit (230) is configured to generate a de-actuation signal upon completion of a predetermined time-period post actuation of said motor (210), wherein said control unit (225) is configured to de-actuate said motor (210) upon receiving said de-actuation signal.

6. The apparatus (100) as claimed in claim 4, wherein said apparatus (100) includes two platforms and two motorized means coupled to said platforms, wherein said control unit (225) is configured to operate said motorized means to displace both platforms in opposite directions.

7. The apparatus (100) as claimed in claim 2, wherein said apparatus (100) includes a pair of support members (115).

8. The apparatus (100) as claimed in claim 7, wherein said support members (115) are mounted on said first member (110) via a pair of first U-clips (140) and a first pair of pins (145) passing through said U-clips (140) and said support members (115).

9. The apparatus (100) as claimed in claim 8, wherein the distance between said first U-clips (140) is more than the height of said support members (115).

10. The apparatus (100) as claimed in claim 7, wherein said apparatus (100) includes a second U-clip (150) and a bracket (155) configured to facilitate mounting of said second member (120) on said support members (115).

11. The apparatus (100) as claimed in claim 10, wherein said apparatus (100) includes:

a biasing member (185) connected to said first member (110) and passed through said second member (120), wherein said second member (120) has a hollow configuration;

a limiter (190) attached to a free end of said biasing member (185), said limiter (190) disposed in a space (192) defined on said bracket (155).

12. The apparatus (100) as claimed in claim 11, wherein said bracket (155) comprises a limiting rod (195) configured to maintain said limiter (190) in said space (192).

13. The apparatus (100) as claimed in claim 2, wherein said casing (105) is welded to said floor (102), and said first member (110) is welded to an operative base portion of said casing (105).

14. A method for relieving stress on legs of vehicle occupants, said method comprising the following steps:

placing either one or both legs of said seated vehicle occupant on at least one platform (125);

controlled raising or lowering of said platform (125) to cause up and down movement of said one or both legs to release the stress on said legs.

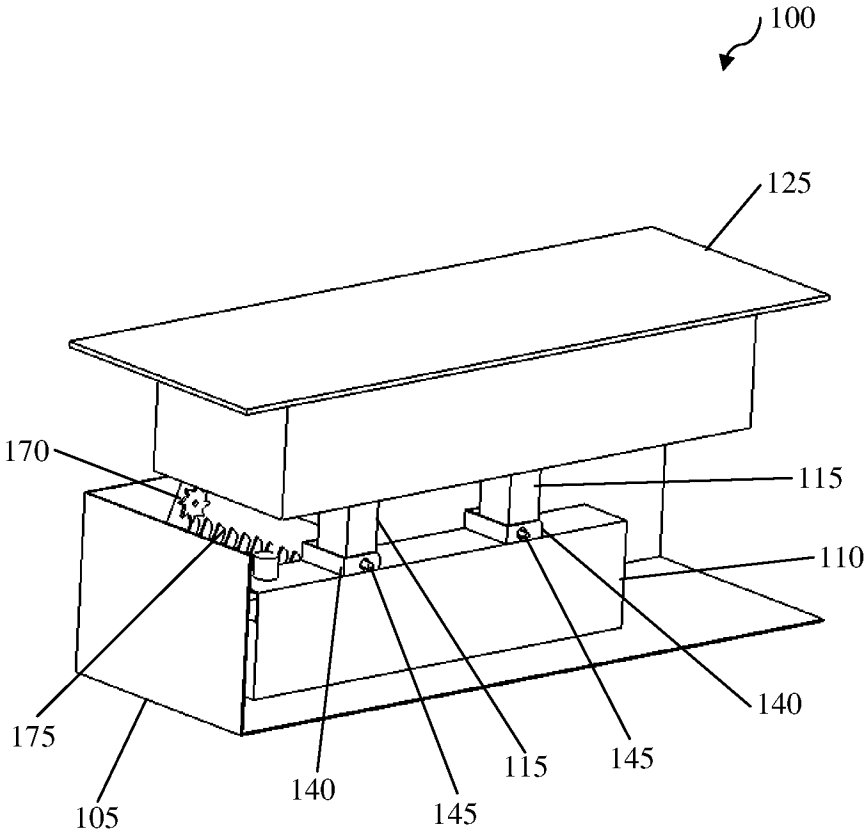

Figure 1

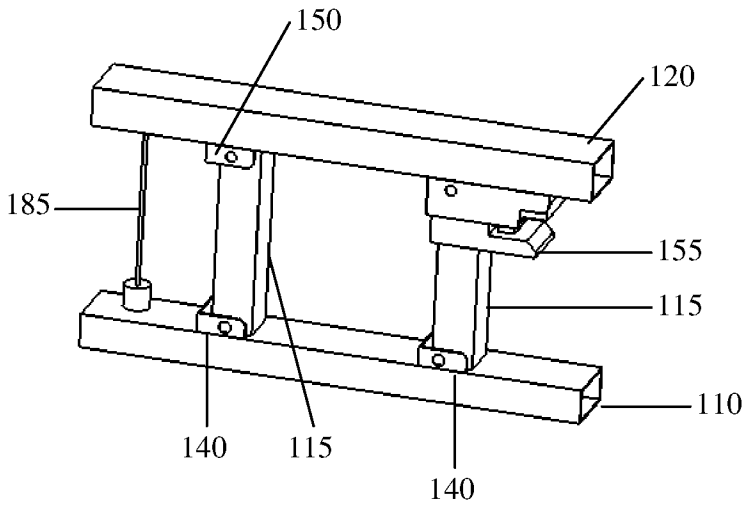

Figure 2

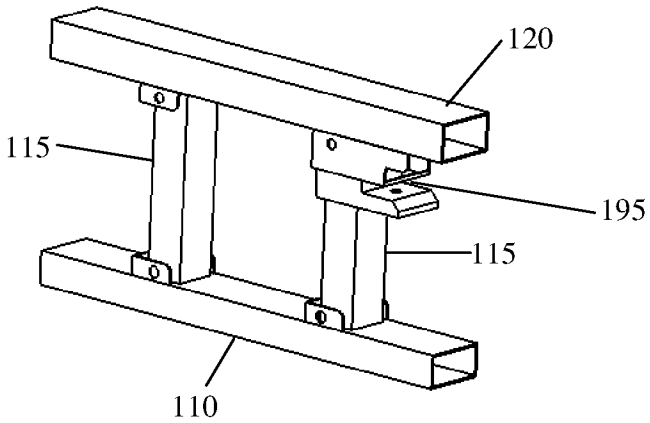

Figure 3

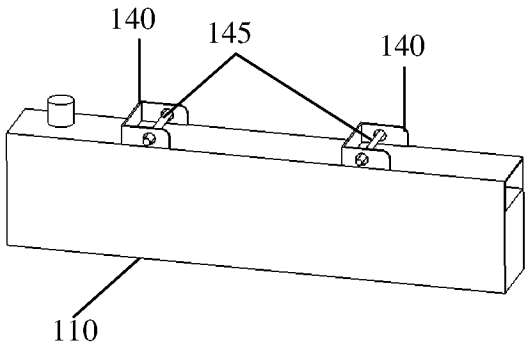

Figure 4

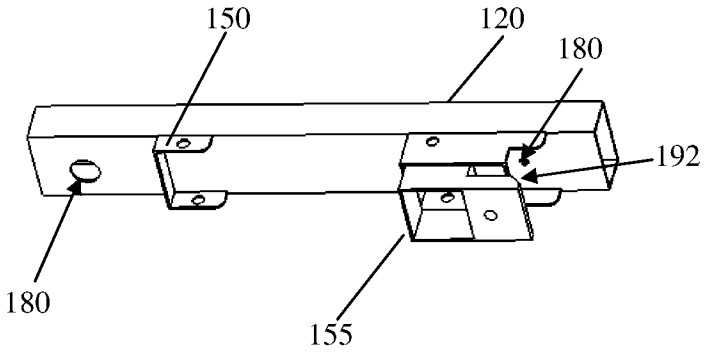

Figure 5

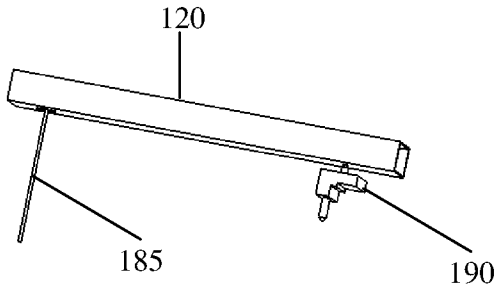

Figure 6

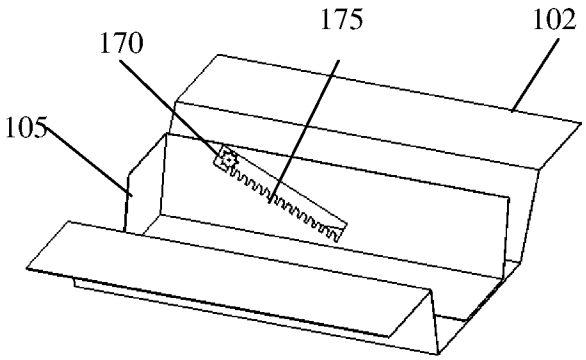

Figure 7

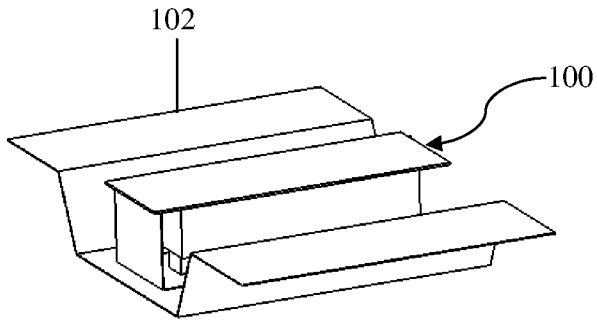

Figure 8

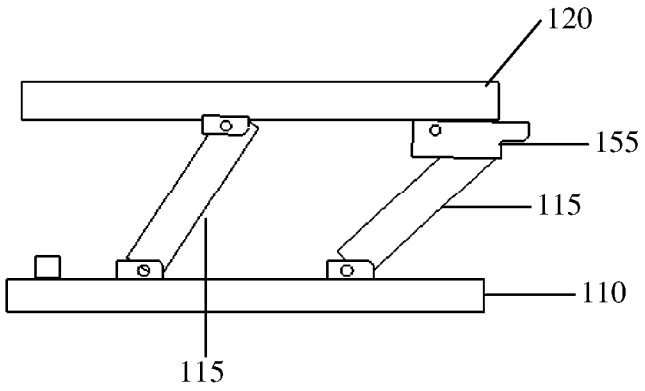

Figure 9

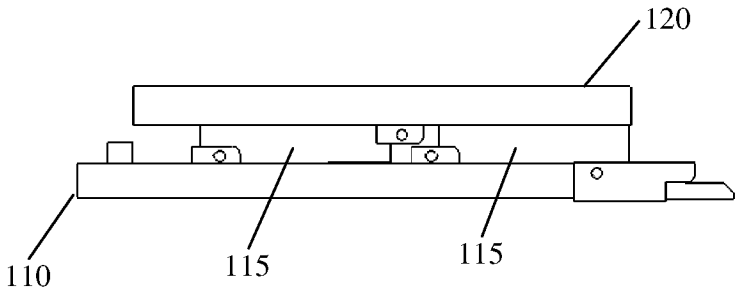

Figure 10

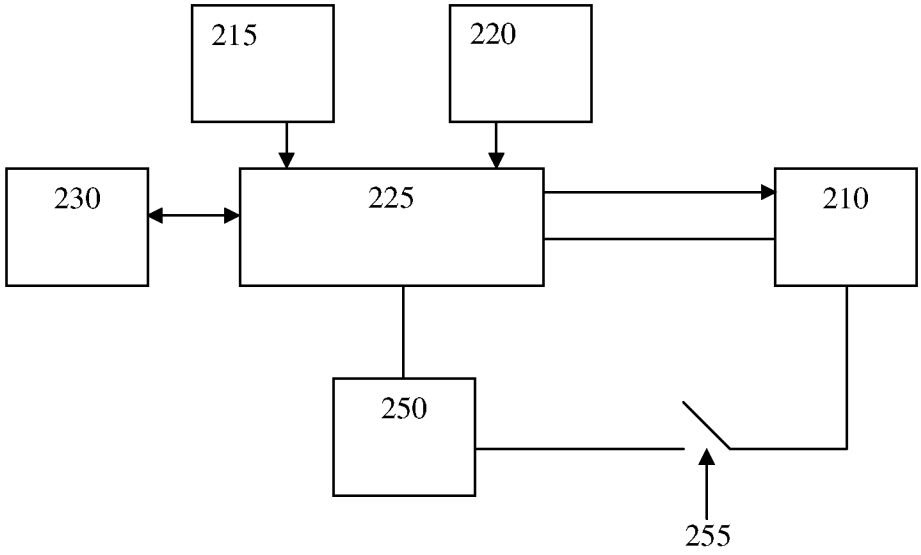

Figure 11

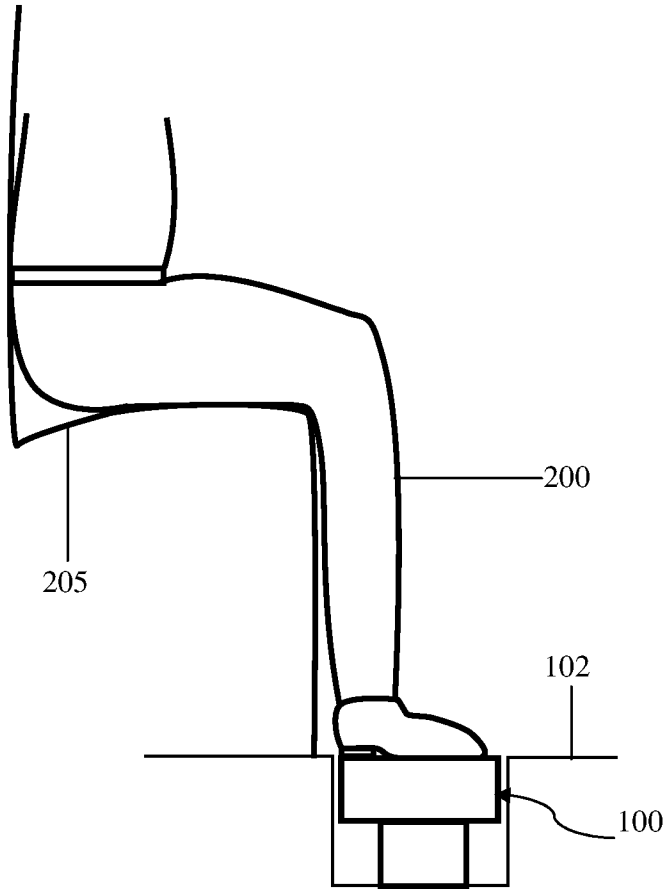

Figure 12

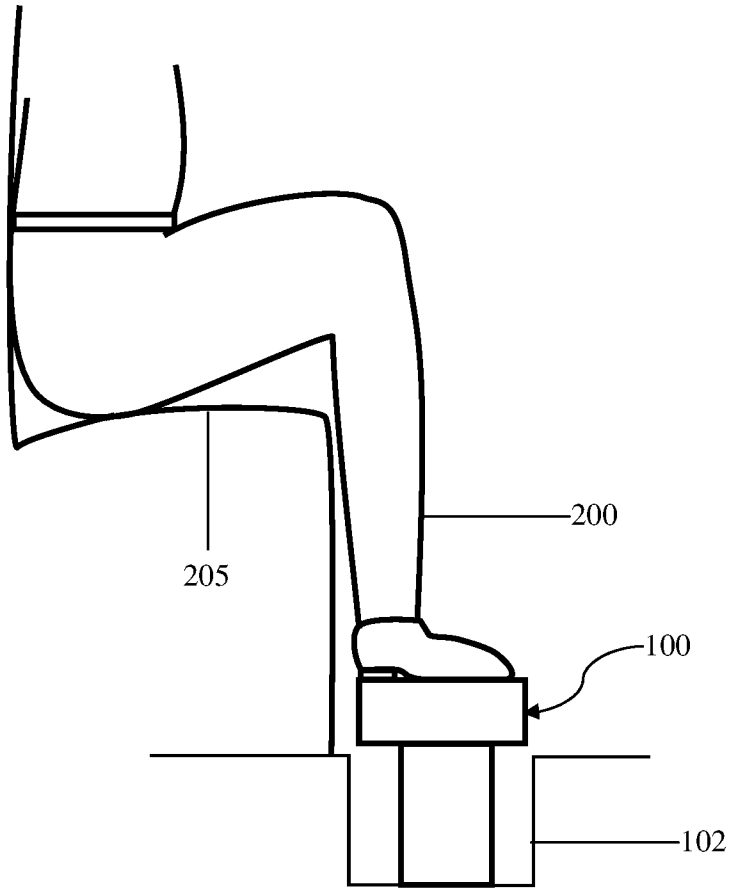

Figure 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2020/052507

A. CLASSIFICATION OF SUBJECT MATTER
B60N03/06 Version=2020.01

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)

B60N

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)

TotalPatent One, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR19980029744U (DAEWOO MOTOR CO LTD; 17 August 1998) fig. 3-5; English translated description from TotalPatent One;	1,14
A	the whole document;	2-13
X	JP5988741B2 (SHIROKI INDUSTRY CO LTD; 07 September 2016) para [0012]- para [0047] of English translation from Espacenet; fig. 4-5;	1,14
A	the whole document;	2-13

☐ 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
"D" document cited by the applicant in the international application
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"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
28-07-2020	28-07-2020
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Manoj Verma Telephone No. +91-1125300200