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(54) Title: A SYNCHRONIZER MECHANISM FOR RESTRICTING MOTION OF A VEHICLE AND A METHOD OF OPERATING THEREOF

(57) Abstract: The present disclosure discloses a synchronizer mechanism (100) for restricting motion of a vehicle (200). The synchronizer mechanism (100) includes an actuating plate (4) connectable to the support stand (3) and connectable to at least one of a first cable (6) and a second cable (8). The actuating plate (4) actuates at least one of the first cable (6) and the second cable (8) on displacement of at least one connecting link (2). The synchronizer mechanism (100) restricts movement of the vehicle (200) thereby may eliminate or reduce the accidents due to un-retracted support stand (3) of the vehicle (200).

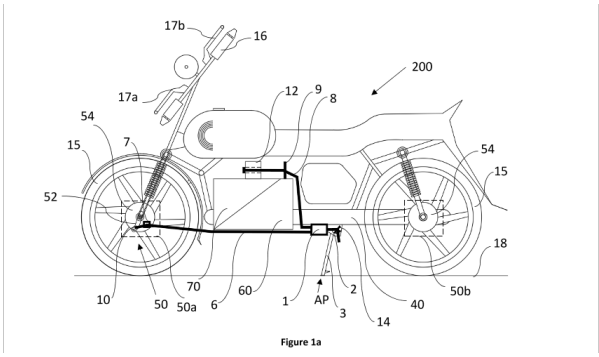

Figure 1a

# FORM 2

THE PATENTS ACT 1970
(39 OF 1970)
&
The Patent Rules, 2003

# Complete Specification
(See Section 10 and Rule 13)

**1. TITLE OF THE INVENTION**

**A SYNCHRONIZER MECHANISM FOR RESTRICTING MOTION OF A VEHICLE AND A METHOD OF OPERATING THEREOF**

**2. APPLICANT(S)**

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**3. PREAMBLE TO THE DESCRIPTION**

**COMPLETE**

The following specification describes the invention and the manner in which it is to be performed

## DESCRIPTION

### TECHNICAL FIELD

[0001] Present disclosure, in general, relates to a field of automobiles. Particularly, but not exclusively, the present disclosure relates to a support stand of a vehicle. Further, embodiments of the present disclosure relate to a synchronizer mechanism for restricting motion of the vehicle when the support stand of the vehicle is in an actuated state.

### BACKGROUND OF THE DISCLOSURE

[0002] Two-wheeled vehicles, such as bicycles and motorcycles, cannot balance merely on its two wheels when parked. Thus, two-wheeled vehicles are often equipped with a support stand for supporting the two-wheeled vehicles when being parked or in a stationary condition in order to prevent a fall or tip over. The two wheeled vehicles are often equipped with a side support stand positioned on one side of the vehicle and optionally a central support stand positioned at a central position of the vehicle. The side support stand is easy to access and adds a supporting point outside a line passing through the two points of support on the two wheels. Actuation of the side support stand is easy and increases the stability of the two-wheeled vehicle when the two-wheeled vehicle is in the parked condition.

[0003] It happens so often that riders of two-wheeled vehicles ride their motorcycle without levelling or retracting the side support stand and in such instances, when the non-retracted support stand touches a protruded object on the ground surface, the motorcycle inevitably overturns by shock or rebound effect. Such overturns may cause damage to the two wheeled vehicle and passengers and may sometimes be fatal.

[0004] To overcome the problem, various configurations have been developed, where one such configuration includes an inductive sensor to sense an actuated position of the support stand and a control unit may be provided at an indication to a user/operator to retract the support stand. Furthermore, some configurations include a solenoid cutoff mechanism to turn off an engine by sensing the actuated position of the support stand by a sensor. However, such configurations involve expensive electronic components, that increases complexity of assembly of the vehicles and this increases overall costs. Furthermore, electronic components may fail to detect the actuated position upon damage or disconnection of the sensor, and the

user/operator may drive the vehicle with the support stand in an actuated/extended position, which may again compromise safety of the user/operator.

[0005] The present disclosure is directed to overcome one or more limitations stated above or any other limitations associated with the conventional mechanisms.

## SUMMARY OF THE DISCLOSURE

[0006] One or more shortcomings of the prior art are overcome by a method and a system as claimed and additional advantages are provided through the method and the system as claimed in the present disclosure. Additional features and advantages are realized through the techniques of the present disclosure. Other embodiments and aspects of the disclosure are described in detail herein and are considered a part of the claimed disclosure.

[0007] In one non-limiting embodiment of the present disclosure a synchronizer mechanism for restricting motion of a vehicle is disclosed. The synchronizer mechanism comprises a housing, at least one connecting link and an actuating plate. The at least one connecting link is connectable to a support stand of the vehicle at one end and is connectable to the housing at an other end. The at least one connecting link is configured to displace upon movement of the support stand between a rest position (RP) to an actuated position (AP). The actuating plate is accommodated in the housing and is connectable to the at least one connecting link on one side and an other side of the actuating plate is connectable to one end of a first cable, and a second cable. The actuating plate, on displacement of the at least one connecting link, is configured to actuate the first cable and the second cable, where other ends of the first cable is connectable to a brake unit and the second cable is connectable to a transmission unit respectively. The motion of the vehicle is restricted when the support stand is in the actuated position (AP) by engaging the brake unit through the first cable and the transmission unit of the vehicle through the second cable.

[0008] In an embodiment, the synchronizer mechanism comprises a resilient member positioned between an end of the actuating plate and a portion of the housing, wherein the resilient member being configured to selectively bias the actuating plate.

[0009] In an embodiment, the synchronizer mechanism comprises a first stopper connected to the brake unit and configured to slidably receive a first cable head of the first cable, the first

cable head is connectable proximal to the brake unit, wherein the first cable head engages with the first stopper when the support stand shifts from the rest position (RP) to the actuated position (AP) engaging the brake unit.

[0010] In an embodiment, the synchronizer mechanism comprises a second stopper connected to a clutch cam of the transmission unit and configured to slidably receive a second cable head of the second cable connectable proximal to the transmission unit, wherein the second cable head engages with the second stopper when the support stand shifts from the rest position (RP) to the actuated position (AP) engaging the transmission unit.

[0011] In an embodiment, the synchronizer mechanism comprises a third stopper connected to the support stand and configured to receive the at least one connecting link, wherein the at least one connecting link may engage with the third stopper when the support stand shifts from the rest position (RP) to the actuated position (AP) displacing the actuating plate.

[0012] In another non-limiting embodiment, a vehicle is disclosed. The vehicle comprises a driving unit, a transmission unit, a brake unit, and a synchronizer mechanism. The driving unit is positioned on a chassis of the vehicle. The transmission unit is selectively coupled to the driving unit to drive a plurality of wheels of the vehicle. The transmission unit comprises a clutch unit operable by a clutch cable. The brake unit is connectable to the plurality of wheels and is configured to selectively engage at least one of the plurality of wheels to restrict motion of the vehicle. The brake unit is operable by a brake cable.

[0013] The synchronizer mechanism comprises a housing, at least one connecting link and an actuating plate. The at least one connecting link is connectable to a support stand of the vehicle at one end and is connectable to the housing at an other end. The at least one connecting link is configured to displace upon movement of the support stand between a rest position (RP) to an actuated position (AP). The actuating plate is accommodated in the housing and is connectable to the at least one connecting link on one side and an other side of the actuating plate is connectable to one end of a first cable, and a second cable. The actuating plate, on displacement of the at least one connecting link, is configured to actuate the first cable and the second cable, where other ends of the first cable is connectable to a brake unit and the second cable is connectable to a transmission unit respectively. The motion of the vehicle is restricted when the support stand is in the actuated position (AP) by engaging the brake unit through the first cable and the transmission unit of the vehicle through the second cable.

[0014] In an embodiment, the synchronizer mechanism comprises a resilient member positioned between an end of the actuating plate and a portion of the housing, wherein the resilient member being configured to selectively bias the actuating plate.

[0015] In an embodiment, the synchronizer mechanism comprises a first stopper connected to the brake cable and configured to slidably receive a first cable head of the first cable connectable between the brake unit and the actuating plate, wherein the first cable head engages with the first stopper when the support stand shifts from the rest position (RP) and the actuated position (AP) engaging the brake unit.

[0016] In an embodiment, the synchronizer mechanism comprises a second stopper connected to a clutch cam of the transmission unit and configured to slidably receive a second cable head of the second cable connectable proximal to the transmission unit, wherein the second cable head engages with the second stopper when the support stand shifts from the rest position (RP) to the actuated position (AP) to engage the transmission unit.

[0017] In another non-limiting embodiment, a method of operating a synchronizer mechanism in a vehicle is disclosed. The method involves actuating a support stand of the vehicle from a rest position (RP) to an actuated position (AP). Then, the actuating plate is displaced to engage at least one of a brake unit and disengage a transmission unit connectable to the actuating plate through a first cable and through a second cable, wherein the actuating plate is connectable to the first cable and the second cable on one side and is connectable to the support stand of the vehicle on another side to restrict motion of the vehicle. Then, the support stand is actuated from the actuated position (AP) to the rest position (RP). Finally, the actuating plate is displaced and in turn the first cable and the second cable are displaced to disengage at least one of the brake unit and engage the transmission unit to allow motion of the vehicle.

[0018] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

## BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0019] The novel features and characteristic of the disclosure are set forth in the appended claims. The disclosure itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying figures. One or more embodiments are now described, by way of example only, with reference to the accompanying figures wherein like reference numerals represent like elements and in which:

[0020] Figure 1a illustrates a side view depicting assembled synchronizer mechanism in the geared vehicle equipped with a drum brake configuration, in accordance with an embodiment of the present disclosure.

[0021] Figure 1b illustrates a side view depicting assembled synchronizer mechanism in the geared vehicle equipped with a disc brake configuration, in accordance with an embodiment of the present disclosure.

[0022] Figure 1c illustrates a side view depicting assembled synchronizer mechanism in a non-geared vehicle equipped with a drum brake configuration, in accordance with an embodiment of the present disclosure.

[0023] Figure 1d illustrates a side view depicting assembled synchronizer mechanism in the non-geared vehicle equipped with a disc brake configuration, in accordance with an embodiment of the present disclosure.

[0024] Figure 1e illustrates a side view depicting assembled synchronizer mechanism in the geared vehicle and a support stand in a rest position, in accordance with an embodiment of the present disclosure.

[0025] Figure 1f illustrates a side view depicting assembled synchronizer mechanism in the non-geared vehicle equipped with a dual disc brake configuration, in accordance with an embodiment of the present disclosure.

[0026] Figure 2a is an exemplary sectional view of a synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0027] Figure 2b is an exemplary front view of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0028] Figure 2c is a perspective view of the synchronizer mechanism depicting a first cable and second cable, in accordance with an embodiment of the present disclosure.

[0029] Figure 2d is an exemplary sectional view of the synchronizer mechanism depicting rectangular cross section of a housing, in accordance with an embodiment of the present disclosure.

[0030] Figure 3 illustrates a handle of the vehicle depicting an engaged position of a lever by the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0031] Figure 4a illustrates a perspective view of the synchronizer mechanism connected to the support stand, in accordance with an embodiment of the present disclosure.

[0032] Figure 4b illustrates a side view depicting connection of a first cable of the synchronizer mechanism, first stopper, first cable head and a brake cable of the vehicle, in accordance with an embodiment of the present disclosure.

[0033] Figure 4c illustrates a perspective view depicting connection of a second cable, second stopper and second connector of the synchronizer mechanism and a clutch cable of the vehicle, in accordance with an embodiment of the present disclosure.

[0034] Figure 5 illustrates different views of a first connector of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0035] Figure 6 illustrates a front view of a second connector of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0036] Figure 7 illustrates different views of a second stopper of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0037] Figure 8 illustrates a front view of a third stopper of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0038] Figure 9 illustrates different views of a first stopper of the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0039] Figure 10 illustrates a flow diagram depicting a method of operating the synchronizer mechanism, in accordance with an embodiment of the present disclosure.

[0040] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the system and method illustrated herein may be employed without departing from the principles of the disclosure described herein.

## DETAILED DESCRIPTION

[0041] While the embodiments in the disclosure are subject to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the figures and will be described below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the scope of the disclosure.

[0042] The terms "comprises", "comprising", or any other variations thereof used in the disclosure, are intended to cover a non-exclusive inclusion, such that a device, assembly, mechanism, system, method that comprises a list of components does not include only those components but may include other components not expressly listed or inherent to such system, or assembly, or device. In other words, one or more elements in a system proceeded by "comprises… a" does not, without more constraints, preclude the existence of other elements or additional elements in the system or method.

[0043] Embodiments of the present disclosure discloses a synchronizer mechanism for restricting motion of a vehicle. The synchronizer mechanism comprises a housing, at least one connecting link and an actuating plate. The at least one connecting link is connectable to a support stand of the vehicle at one end and is connectable to the housing on an other end. The at least one connecting link is configured to displace upon movement of the support stand between a rest position (RP) to an actuated position (AP). The actuating plate is accommodated in the housing and is connectable to the at least one connecting link on one side and an other side of the actuating plate is connectable to one end of a first cable, and a second cable. The actuating plate is configured to actuate the first cable and the second cable on displacement of

the at least one connecting link, where an other end of the first cable is connectable to the brake unit and an other end of the second cable is connectable to the transmission unit. The actuation by the actuating plate restricts movement of the vehicle when the support stand is in the actuated position (AP) by engaging the brake unit through the first cable and the transmission unit of the vehicle through the second cable. With such configuration, the mechanism may automatically restrict motion of the vehicle when the support stand is in actuated position (AP) and accidents due to the support stand may be minimized or eliminated.

[0044] The disclosure is described in the following paragraphs with reference to Figures 1a to 9. In the figures, the same element or elements which have same functions are indicated by the same reference signs. One skilled in the art would appreciate that the assembly and the method as disclosed in the present disclosure may be used in any vehicle including but not liming to commercial vehicles, passenger vehicles, and the like. The system and the method of the present disclosure may also be implemented in vehicles having manual transmission or automatic transmission with a support stand, for suitably maneuvering the vehicle without deviating from the principles of the present disclosure.

[0045] Referring now to Figures 1a to 1e, a vehicle (200) is disclosed. In an embodiment, the vehicle (200) may be a two wheeled vehicle (200) including but not limited to a bicycle, a motorcycle, an electric motorcycle and the like. In the illustrative embodiment, the vehicle (200) is depicted as a motorcycle and the same shall not be considered as a limitation. The vehicle (200) includes a chassis (40) configured to accommodate components of the vehicle (200). A driving unit (70) may be positioned on the chassis (40) of the vehicle (200) and configured to generate and supply driving torque to a plurality of wheels (15) to displace/move the vehicle (200) as best seen in Figure 1a. The driving unit (70) may be at least one of an internal combustion engine, an electric motor coupled to an energy source such as a battery pack, a capacitor and the like. The vehicle (200) may also include a transmission unit (60) selectively coupled to the driving unit (70) and configured to provide torque to the plurality of wheels (15) by transmitting the torque to the plurality of wheels (15).

[0046] Further, in case the driving unit (70) is an internal combustion engine, an appropriate transmission unit may be provided. The transmission unit (60) may further include a clutch unit, a driving mechanism such as a gearbox, a belt drive and the like [not shown in figures]. In an embodiment, the clutch unit may be operable by a clutch cable (61). The clutch cable (61) may be coupled to the clutch unit through a clutch cam (62) [as shown in Figure 4c] at one

end and coupled to a first lever (17a) positioned proximal to a handle (16) of the vehicle (200) at an other end as can be seen in Figure 3. The first lever (17a) may allow engaging and disengaging of the clutch by a user/operator of the vehicle (200) for selectively transmitting the torque from the driving unit (70) to the plurality of wheels (15) through the transmission unit (60). Further, the transmission unit (60) may include a plurality of gears [not shown in figures] rotatably connectable to the plurality of wheels (15) for transmission of the torque from the driving unit (70) to the plurality of wheels (15). The plurality of gears may be engaged and disengaged by selectively engaging and disengaging the clutch unit by the user/operator as in case of any conventional manual transmission vehicle.

[0047] Referring again to Figures 1a to 1d, the vehicle (200) may include a brake unit (50) connectable to the plurality of wheels (15) and adapted to restrict motion of the vehicle (200) selectively. The brake unit (50) may selectively engage at least one wheel of the plurality of wheels (15). In an embodiment, the brake unit (50) may be operable by the user/operator, where the brake unit (50) may be connected to a second lever (17b) [shown in Figure 1a] positioned proximal to the handle (16) of the vehicle (200) by a brake cable (51) for the user/operator to operate the brake unit (50). In an embodiment, the brake unit (50) may include a front brake unit (50a) [shown in Figure 1a] engageable with at least one front wheel of the plurality of wheels (15). The brake unit (50) may include a rear brake unit (50b) [shown in Figure 1a] engageable with at least one rear wheel of the plurality of wheels (15). In the illustrative embodiment, the handle (16) of the vehicle (200) is depicted with at least two levers such as a first lever (17a) and a second lever (17b) positioned on a portion of the handle (16) to allow operation of at least the front brake unit (50a), the rear brake unit (50b) and the clutch unit. In an embodiment, the front brake unit (50a) and the rear brake unit (50b) may be selected to be at least one of a drum brake unit (54), a disc brake unit (53) as shown in Figure 1c and the like. The user/operator may actuate at least one of the first lever (17a) and the second lever (17b) to engage at least one of the clutch unit, the front brake unit (50a) and the rear brake unit (50b) to maneuver the vehicle (200).

[0048] Further, the vehicle (200) may include a support stand (3) to support the vehicle (200) in a parked condition. In an embodiment, the support stand (3) may include a side support stand (3) to support the vehicle (200) in a tilted position on a ground surface (18) and a central support stand [not shown in figures] to support the vehicle (200) in a vertically erect position for parking, where the vehicle (200) may be substantially perpendicular to the ground surface

(18). For sake of illustration, the support stand (3) is depicted to be a side support stand (3) and the same shall not be considered as a limitation. The support stand (3) may be displaced between a rest position (RP) [shown in Figure 1e], where the support stand (3) may be retracted to an actuated position (AP) [shown in Figure 1a] where the support stand (3) may be extended to support the vehicle (200) as can be seen in Figures 1a to 1d in the parked condition. In an embodiment, the support stand (3) may be parallel to length of the vehicle (200) in the rest position (RP) as best seen in Figure 1e and may be inclined at an angle to the vehicle (200) in the actuated position (AP) extending laterally from the vehicle (200) as best seen in Figure 1a. The support stand (3) may be displaced between the rest position (RP) and the actuated position (AP) by the user/operator, by at least one foot of the user/operator on the vehicle (200). The support stand (3) may pivot about a joint (3a) [shown in Figure 1d] provided on the chassis (40) of the vehicle (200) to displace angularly between the rest position (RP) and the actuated position (AP). In an embodiment, the support stand (3) may displace from the rest position (RP) to the actuated position (AP) by pivoting about the joint (3a) in an anti-clockwise direction.

[0049] Figures 2a to 2d refer to an exemplary embodiment of the present disclosure which illustrates a synchronizer mechanism (100). The synchronizer mechanism (100) includes a housing (1) that is supported or connected to the chassis (40) of the two wheeled vehicle (200) [shown in Figure 1a]. The synchronizer mechanism (100) may include the housing (1), at least one connecting link (2), and an actuating plate (4). The housing (1) may accommodate at least a portion of the actuating plate (4), and the at least one connecting link (2). For sake of illustration, shape of the housing (1) is depicted to be in a rectangular shape as can be seen in Figure 2d. However, the housing (1) may be defined by other shapes such as circular, rectangular, triangular shape etc., and the same shall not be considered as a limitation. The at least one connecting link (2) may be connectable to the support stand (3) of the vehicle (200) on one end and an other end of the at least one connecting link (2) may be connectable within the housing (1) as can be seen in Figure 1a. The at least one connecting link (2) may include at least one of a connecting wire (2b) and a connecting rod (2a) and/or combinations thereof. For sake of illustration, the at least one connecting link (2) is depicted with the connecting rod (2a) and the connecting wire (2b) as can be seen in figure 4a. The at least one connecting link (2) may be configured to displace upon shift of the support stand (3) between the rest position (RP) and the actuated position (AP). The at least one connecting link (2) may displace the actuating plate (4) upon shift of the support stand (3) between the rest position (RP) and the actuated

position (AP). The actuating plate (4) may be connected to a first cable (6) and a second cable (8) on another side opposite to the side connected to the at least one connecting link (2). The first cable (6) may be connectable to the brake unit (50) of the vehicle (200) and the second cable (8) may be connectable to the transmission unit (60) of the vehicle (200).

[0050] Referring now to Figures 4a to 4c, the first cable (6) and the second cable (8) may be connected to the brake unit (50), where the first cable (6) may be connected to the front brake unit (50a) and the second cable (8) may be connected to the rear brake unit (50b) [shown in figure 1c] of the vehicle (200), where the vehicle (200) may not have the transmission unit (60) and the same shall not be considered as a limitation. For example, the vehicle (200) may be a non-geared vehicle (200) or an electric vehicle (200) etc. In the illustrative embodiment, the first cable (6) is connected to a brake arm (52) of the front brake unit (50a) and the second cable (8) is connected to the brake arm (52) of the rear brake unit (50b) to selectively engage and disengage the front brake unit (50a) and the rear brake unit (50b) based on shifting of the support stand (3) from rest position (RP) to actuated position (AP) and the same shall not be considered as a limitation. The first cable (6) and the second cable (8) may be connected to the first lever (17a) and the second lever (17b) of the vehicle (200), where the vehicle (200) may be equipped with at least one disc brake unit (53) and may not include a brake arm (52), for actuation of the brake unit (50). In an embodiment, the at least one connecting link (2) may be connected to the support stand (3) by a third stopper (14) [shown in Figure 8] and the other end of the at least one connecting link (2) may be connected to one side of the actuating plate (4) as can be seen in Figure 4a. In an embodiment, the vehicle (200) may include dual disc brake units (53) such as a front disc brake unit (53), where the first cable (6) and the second cable (8) may be connected to the first lever (17a) and the second lever (17b) and of the vehicle (200) to actuate the dual disc brake units (53).

[0051] Referring again to Figure 4b, the synchronizer mechanism (100) may include a first stopper (10) [shown in Figure 2c] connected to the brake arm (52). The first stopper (10) may be defined with a sixth aperture (9f) [shown in Figure 9] to receive a first cable head (11) of the first cable (6). In an embodiment, the first stopper (10) may be integrally defined on the first cable (6) as can be seen in Figure 2c and the same shall not be considered a limitation. The first cable head (11) may be connectable proximal to the brake unit (50). In an embodiment, the first cable head (11) may be connected to the brake arm (52) of the brake unit (50) through the first stopper (10). The first cable head (11) may engage with the first stopper (10) when the

support stand (3) shifts from the rest position (RP) to the actuated position. The first cable head (11) may selectively engage with the first stopper (10) to engage and disengage the brake unit (50) by displacing the brake arm (52). In an embodiment, the synchronizer mechanism (100) may include a first connector (7) defined with a first aperture (9a) [shown in figure 5] to receive the first cable (6) through the first aperture (9a) as best seen in Figure 4b. The first connector (7) may be connected to the brake unit (50) on one end. The engagement and disengagement of the brake arm (52) may engage and disengage at least one of the front brake unit (50a) and the rear brake unit (50b) of the vehicle (200).

[0052] Referring again to Figure 4c, the synchronizer mechanism (100) may include a second stopper (12) [shown in Figure 7] connected to the clutch cam (62) of the transmission unit (60) and may slidably receive a second cable head (13) of the second cable (8). The second cable head (13) may be connectable proximal to the transmission unit (60). In an embodiment, the synchronizer mechanism (100) may include a second connector (9) defined with a second aperture (9b) and a third aperture (9c) [shown in Figure 6]. The second aperture (9b) may receive a clutch cable (61) of the vehicle (200) and the third aperture (9c) may receive the second cable (8) of the synchronizer mechanism (100) as best seen in Figure 4c. The second stopper (12) may be connected to the transmission unit (60) and may be defined with a fourth aperture (9d) to receive at least a portion of the second cable head (13). In the illustrative embodiment, the second stopper (12) is connected to the clutch cam (62) of the clutch unit to actuate the clutch cam (62) by displacement of the second cable (8) and the same shall not be considered as a limitation. In an embodiment, the second cable head (13) may be connected to the clutch cam (62) of a clutch unit in the transmission unit (60) as best seen in Figure 4c. The second cable head (13) may selectively engage and disengage with the second stopper (12) when the support stand (3) shifts between the rest position (RP) and the actuated position (AP) to engage and disengage the transmission unit (60). In an embodiment, the displacement of the second cable head (13) may displace the clutch cam (62) to engage and disengage the clutch unit of the vehicle (200). In an embodiment, the third stopper (14) may be defined with a fifth aperture (9e) configured to receive the at least one connecting link (2).

[0053] The actuating plate (4) may actuate at least one of the first cable (6) and the second cable (8) upon displacement of the at least one connecting link (2) due to shifting of the support stand (3) between the actuated position (AP) and the rest position (RP). In the illustrative embodiment, the actuating plate (4) actuates the first cable (6) and the second cable (8)

synchronously to selectively actuate the brake unit (50) and the transmission unit (60) upon shifting of the support stand (3). The synchronizer mechanism (100) may include a resilient member (5) positioned between an end of the actuating plate (4) and a portion of the housing (1). The resilient member (5) may be configured to selectively bias the actuating plate (4). One end of the resilient member (5) may be connected to the actuating plate (4) and the other end of the resilient member (5) may be connected to a portion of the housing (1) to bias the actuating plate (4) relative to the housing (1) position as best seen in Figures 2a and 2d.

[0054] In an embodiment, when the support stand (3) is shifted from the rest position (RP) to the actuated position (AP), the at least one connecting link (2) may be displaced by the clockwise pivoting of the support stand (3) about the joint (3a). The at least one connecting link (2) may displace the actuating plate (4) towards a bottom edge (1a) of the housing (1) to actuate the first cable (6) and the second cable (8) upon displacement. The resilient member (5) may be compressed between the actuating plate (4) and the bottom edge (1a) of the housing (1) due to displacement of the actuating plate (4). The actuating plate (4) may actuate the first cable (6) and the second cable (8) by displacement towards the bottom edge (1a) of the housing (1) and displacing the first cable (6) and second cable (8). The first cable head (11) of the first cable (6) may engage with the first stopper (10) and the second cable head (13) of the second cable (8) may engage with the second stopper (12) upon actuation of the first cable (6) and the second cable (8) by the actuating plate (4). The engagement of the first cable head (11) and the second cable head (13) may displace the brake arm (52) and the clutch cam (62), engaging the brake unit (50) and disengaging the transmission unit (60). At least one of the front brake unit (50a) and the rear brake unit (50b) of the brake unit (50) may be engaged and the clutch unit may be disengaged due to displacement of the brake arm (52) and the clutch cam (62). The brake unit (50) may not allow movement of at least one wheel of the plurality of wheels (15) of the vehicle (200) and the transmission unit (60) may lock at least one wheel of the plurality of wheels (15) in an engaged gear upon disengagement of the clutch unit by the clutch cam (62). Thus, the synchronizer mechanism (100) may restrict motion of the vehicle (200) by engaging the brake unit (50) and disengaging the transmission unit (60) while the support stand (3) is in the actuated position (AP).

[0055] In an embodiment, the first lever (17a) and second lever (17b) proximal to the handle (16) may disengage and may displace freely [shown in figure 3] when the support stand (3) is in the actuated position (AP) due to engagement of the brake unit (50) and disengagement of

the transmission unit (60) by the synchronizer mechanism (100). Thus, the synchronizer mechanism (100) may indicate to the user/operator that the support stand (3) is in the actuated position (AP) and allows the user/operator to shift the support stand (3) from the actuated position (AP) to the rest position (RP).

[0056] Further, when the support stand (3) may be shifted from the actuated position (AP) to the rest position (RP), the at least one connecting link (2) may be displaced in an opposite direction to that of when the support stand (3) is shifted from the rest position (RP) to the actuated position (AP). For example, the actuating plate (4) may be displaced towards a top edge (1b) of the housing (1). In an embodiment, the resilient member (5) may bias the actuating plate (4) away from the bottom edge (1a) and towards the top edge (1b). The first cable head (11) and the second cable head (13) may disengage and slidably displace in the first stopper (10) and the second stopper (12) respectively upon actuation of the actuating plate (4). The brake arm (52) may be disengaged and the clutch cam (62) may be engaged upon sliding of the first cable head (11) and the second cable head (13). The disengagement of the first cable (6) and the second cable (8) may disengage the brake unit (50) allowing free rotation of the plurality of wheels (15) and may engage the transmission unit (60) allowing transmission of torque from the engine to the plurality of wheels (15). Thus, the synchronizer mechanism (100) may allow motion of the vehicle (200) when the support stand (3) may be in the rest position (RP).

[0057] In an embodiment, brake unit (50) may engage and resist the movement of plurality of wheels(15), when the support stand(3) is in the actuated position (AP).

[0058] In an embodiment, clutch unit (60) may disengage and resist the movement of plurality of wheels(15), when the support stand(3) is in the actuated position (AP).

[0059] In an embodiment, the vehicle (200) may comprise a support stand tension spring (3b) [shown in Figure 4a] connected between one end of the support stand (3) and at least a portion of the chassis (40). The support stand tension spring (3b) may restrict the movement of the support stand (3) when at least one of the first lever (17a) and the second lever (17b) may be actuated by the user/operator of the vehicle (200) for engaging the brake unit (50) and the transmission unit (60). Thus, actuation of at least one of the first lever (17a) and the second lever (17b) by the user/operator may not affect operation of the synchronizer mechanism (100).

[0060] Referring back to Figure 1b, the first cable (6) of the synchronizer mechanism (100) may be connectable to the second lever (17b) to actuate the disc brake unit (53) and the second cable (8) may be connectable to the clutch cam (62) of the transmission unit (60). In an embodiment, actuation of the first cable (6) and the second cable (8) may actuate the disc brake unit (53) and the transmission unit (60) of the vehicle (200), to restrict motion of the vehicle (200) when the support stand (3) is in the actuated position (AP).

[0061] Referring back to Figure 1c, the first cable (6) of the synchronizer mechanism (100) may be connected to the front drum brake unit (54) and the second cable (8) may be connected to the rear drum brake unit (54) of the vehicle (200). In an embodiment, actuation of the first cable (6) and the second cable (8) may displace the front brake arm (52) and the rear brake arm (52) respectively to restrict motion of the vehicle (200) when the support stand (3) is in the actuated position (AP).

[0062] Referring back to Figure 1d, the first cable (6) of the synchronizer mechanism (100) may be connected to the second lever (17b) through the first stopper (10) to actuate the brake unit (50), where the first stopper (10) may be positioned proximal to the handle (16). The second cable (8) may be connectable to the rear drum brake unit (54) of the brake unit (50). In an embodiment, actuation of the first cable (6) and the second cable (8) may actuate the front disc brake unit (53) and the rear drum brake unit (54) to restrict the motion of the vehicle (200) when the support stand (3) is in the actuated position (AP).

[0063] Referring back to Figure 1f, the first cable (6) of the synchronizer mechanism (100) may be connected to the second lever (17b) through the first stopper (10) to actuate the front disc brake unit (53), where the first stopper (10) may be positioned proximal to the handle (16). The second cable (8) may be connectable to the first lever (17a) through second stopper (12) to actuate the rear disc brake unit (53), where the second stopper (12) may be positioned proximal to the handle (16). In an embodiment, actuation of the first cable (6) and the second cable (8) may actuate the front disc brake unit (53) and the rear disc brake unit (53) to restrict the motion of the vehicle (200) when the support stand (3) is in the actuated position (AP).

[0064] In a similar manner, the vehicle may be a geared vehicle configured with dual disc brake configuration, where the first cable (6) of the synchronizer mechanism (100) may be connected to the second lever (17b) through the first stopper (10) to actuate the front disc brake unit (53). The second cable (8) may be connectable to the first lever (17a) through the second stopper

(12) to actuate the rear disc brake unit (53). In an embodiment, actuation of the first cable (6) and the second cable (8) may actuate the front disc brake unit (53) and the rear disc brake unit (53) to restrict the motion of the vehicle (200) when the support stand (3) is in the actuated position (AP).

[0065] Referring now to figure 10, which is an exemplary block (301) diagram illustrating a method (300) of operating a synchronizer mechanism (100).

[0066] The order in which the method is described is not intended to be construed as a limitation, and any number of the described method blocks may be combined in any order to implement the method. Additionally, individual blocks may be deleted from the methods without departing from the scope of the subject matter described herein. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0067] At block 301, the user/operator of the vehicle (200) may actuate the support stand (3) of the vehicle (200) from the rest position (RP) to the actuated position (AP) to park the vehicle (200). In an embodiment, when the support stand (3) is shifted from the rest position (RP) to the actuated position (AP), the at least one connecting link (2) of the synchronizer mechanism (100) may be displaced by the support stand (3). The at least one connecting link (2) may displace the actuating plate (4) towards the bottom edge (1a) of the housing (1) to actuate the first cable (6) and the second cable (8) upon displacement.

[0068] At block 302, the actuating plate (4) may actuate the first cable (6) and the second cable (8) by displacement towards the bottom edge (1a) of the housing (1) and displacing the first cable (6) and the second cable (8). The first cable head (11) of the first cable (6) may engage with the first stopper (10) and the second cable head (13) of the second cable (8) may engage with the second stopper (12) upon actuation of the first cable (6) and the second cable (8) by the actuating plate (4). The engagement of the first cable head (11) and the second cable head (13) displace the brake arm (52) and the clutch cam (62), engaging the brake unit (50) and disengaging the transmission unit (60). At least one of the front brake unit (50a) and the rear brake unit (50b) of the brake unit (50) may be engaged and the transmission unit (60) may be disengaged due to displacement of brake arm (52) and the clutch cam (62). The brake unit (50) may not allow movement of at least one wheel of the plurality of wheels (15) of the vehicle (200) and the transmission unit (60) may not transmit the torque from the engine to the plurality

of wheels (15) upon engagement of the clutch unit by the clutch cam (62). Thus, the synchronizer mechanism (100) may restrict motion of the vehicle (200) by engaging the brake unit (50) and disengaging the transmission unit (60) while the support stand (3) is in the actuated position (AP).

[0069] At block 303, the user/operator may actuate the support stand (3) from the actuated position (AP) to the rest position (RP) to drive the vehicle (200). The at least one connecting link (2) may be displaced in an opposite direction to that of when the support stand (3) is shifted from the rest position (RP) to the actuated position (AP).

[0070] At block 304, the actuating plate (4) may be displaced towards the top edge (1b) of the housing (1). The first cable head (11) and the second cable head (13) may disengage and slidably displace in the first stopper (10) and the second stopper (12) respectively upon actuation of the actuating plate (4). The brake arm (52) and the clutch cam (62) may be displaced upon sliding of the first cable head (11) and the second cable head (13). The disengagement of the first cable (6) and the second cable (8) may disengage the brake unit (50) allowing free rotation of the plurality of wheels (15) and may engage the transmission unit (60) allowing transmission of the torque from the engine to the plurality of wheels (15) through the transmission unit (60). Thus, the synchronizer mechanism (100) may allow motion of the vehicle (200) when the support stand (3) may be in the rest position(RP).

[0071] In an embodiment, the synchronizer mechanism (100) may not require timely maintenance due to simplicity of the synchronizer mechanism (100) and further does not require any external supply of power.

[0072] In an embodiment, the synchronizer mechanism (100) may be cost effective and may be retrofitted to existing vehicles.

[0073] The synchronizer mechanism (100) may not affect operation of the vehicle (200) and further ensures safety of the user/operator of the vehicle (200) by restricting motion when the support stand (3) is in the actuated position (AP), where the user/operator may not ride the vehicle (200) without retracting the support stand (3) to the rest position (RP).

[0074] In an embodiment, the synchronizer mechanism (100) may not require switching ON ignition of the vehicle (200) and may not even require insertion of a key into a key slot of the vehicle (200).

## EQUIVALENTS

[0075] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0076] It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to inventions containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would

understand the convention (e.g., “a system having at least one of A, B, or C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase “A or B” will be understood to include the possibilities of “A” or “B” or “A and B.”

[0077] In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the Markush group.

[0078] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

Referral Numeral:

| **Component** | **Referral numerals** |
|---|---|
| Synchronizer mechanism | 100 |
| vehicle | 200 |
| Housing | 1 |
| Bottom edge | 1a |
| Top edge | 1b |
| At least one connecting link | 2 |
| Connecting rod | 2a |
| Connecting wire | 2b |
| Support stand | 3 |
| Joint | 3a |
| Support stand tension spring | 3b |

| | |
|---|---|
| Actuating plate | 4 |
| Chassis | 40 |
| Brake unit | 50 |
| Front brake unit | 50a |
| Rear brake unit | 50b |
| Transmission unit | 60 |
| brake cable | 51 |
| Brake arm | 52 |
| Disc brake unit | 53 |
| Drum brake unit | 54 |
| clutch cable | 61 |
| Clutch cam | 62 |
| Resilient member | 5 |
| First cable | 6 |
| First connector | 7 |
| Second cable | 8 |
| Second connector | 9 |
| First aperture | 9a |
| Second aperture | 9b |
| Third aperture | 9c |
| Fourth aperture | 9d |
| Fifth aperture | 9e |
| Sixth aperture | 9f |
| First stopper | 10 |
| First cable head | 11 |
| Second stopper | 12 |
| Second cable head | 13 |
| third stopper | 14 |
| Plurality of wheels | 15 |
| Driving unit | 70 |
| Method | 300 |
| Actuated position | AP |

| | |
|---|---|
| Rest position | RP |
| Handle | 16 |
| First lever | 17a |
| Second lever | 17b |
| Ground surface | 18 |

5

**WE CLAIM:**

1. A synchronizer mechanism (100) for restricting motion of a vehicle (200), the synchronizer mechanism (100) comprising:

a housing (1);

at least one connecting link (2) connectable to a support stand (3) of the vehicle (200) at one end and connectable to the housing (1) at an other end, wherein the at least one connecting link (2) is configured to displace upon movement of the support stand (3) between a rest position (RP) to an actuated position (AP);

an actuating plate (4) accommodated in the housing (1), the actuating plate (4) connectable to the at least one connecting link (2) on one side, and an other side of the actuating plate (4) being connectable to one end of a first cable (6), and a second cable (8), wherein the actuating plate (4) on displacement of the at least one connecting link (2) being configured to actuate the first cable (6) and the second cable (8), wherein other ends of the first cable (6) is connectable to a brake unit (50) and the second cable (8) is connectable to a transmission unit (60) respectively; and

wherein motion of the vehicle (200) is restricted when the support stand (3) is in the actuated position (AP) by engaging the brake unit (50) through the first cable (6) and disengaging the transmission unit (60) of the vehicle (200) through the second cable (8).

2. The synchronizer mechanism (100) as claimed in claim 1, comprises a resilient member (5) positioned between an end of the actuating plate (4) and a portion of the housing (1), wherein the resilient member (5) being configured to selectively bias the actuating plate (4).

3. The synchronizer mechanism (100) as claimed in claim 1, comprises a first stopper (10) connected to the brake unit (50) and configured to slidably receive a first cable head (11) of the first cable (6), the first cable head (11) is connectable proximal to the brake unit (50), wherein the first cable head (11) engages with the first stopper (10) when the support stand (3) shifts from the rest position (RP) to the actuated position (AP) engaging the brake unit (50).

4. The synchronizer mechanism (100) as claimed in claim 1, comprises a second stopper (12) connected to a clutch cam (62) of the transmission unit (60) and configured to

slidably receive a second cable head (13) of the second cable (8) connectable proximal to the transmission unit (60), wherein the second cable head (13) engages with the second stopper (12) when the support stand (3) shifts from the rest position (RP) to the actuated position (AP) disengaging the transmission unit (60).

5. The synchronizer mechanism (100) as claimed in claim 1, comprises a third stopper (14) connected to the support stand (3) and configured to receive the at least one connecting link (2), wherein the at least one connecting link (2) may engage with the third stopper (14) when the support stand (3) shifts from the rest position (RP) to the actuated position (AP) displacing the actuating plate (4).

6. A vehicle (200), comprising:

a driving unit (70) positioned on a chassis (40) of the vehicle (200);

a transmission unit (60) selectively coupled to the driving unit (70) to drive a plurality of wheels (15) of the vehicle (200), the transmission unit (60) comprising a clutch unit operable by a clutch cable (61);

a brake unit (50) connectable to the plurality of wheels (15), the brake unit (50) configured to selectively engage at least one of the plurality of wheels (15) to restrict motion of the vehicle (200), the brake unit (50) operable by a brake cable (51); and

a synchronizer mechanism (100) connectable to the brake unit (50), the transmission unit (60) and a support stand (3) of the vehicle (200) and configured to restrict motion of the vehicle (200), the synchronizer mechanism (100) comprising:

a housing (1);

at least one connecting link (2) connectable to a support stand (3) of the vehicle (200) at one end and connectable to the housing (1) at an other end, wherein the at least one connecting link (2) is configured to displace upon movement of the support stand (3) between a rest position (RP) to an actuated position (AP);

an actuating plate (4) accommodated in the housing (1), the actuating plate (4) connectable to the at least one connecting link (2) on one side, and an other side of the actuating plate (4) being connectable to one end of a first cable (6), and a second cable (8), wherein the actuating plate (4) on displacement of the at least one connecting link (2) being configured to actuate the first cable (6) and the second cable (8), wherein other ends of the first cable (6) is connectable to a brake unit (50) and the second cable (8) is connectable to a transmission unit (60) respectively; and

wherein motion of the vehicle (200) is restricted when the support stand (3) is in the actuated position (AP) by engaging the brake unit (50) through the first cable (6) and disengaging the transmission unit (60) of the vehicle (200) through the second cable (8).

7. The vehicle (200) as claimed in claim 5, wherein the synchronizer mechanism (100) comprises a resilient member (5) positioned between an end of the actuating plate (4) and a portion of the housing (1), wherein the resilient member (5) being configured to selectively bias the actuating plate (4).

8. The vehicle (200) as claimed in claim 5, wherein the synchronizer mechanism (100) comprises a first stopper (10) connected to the brake unit (50) and configured to slidably receive a first cable head (11) of the first cable (6) connectable between the brake unit (50) and the actuating plate (4), wherein the first cable head (11) engages with the first stopper (10) when the support stand (3) shifts from the rest position (RP) to the actuated position (AP) engaging the brake unit (50).

9. The vehicle (200) as claimed in claim 5, wherein the synchronizer mechanism (100) comprises a second stopper (12) connected to a clutch cam (62) of the transmission unit (60) and configured to slidably receive a second cable head (13) of the second cable (8) connectable proximal to the transmission unit (60) and, wherein the second cable head (13) engages with the second stopper (12) when the support stand (3) shifts from the rest position (RP) to the actuated position (AP) disengaging the transmission unit (60).

10. A method (300) of operating a synchronizer mechanism (100) in a vehicle (200), the method (300) comprising:

actuating a support stand (3) of the vehicle (200) from a rest position (RP) to an actuated position (AP);

displacing, an actuating plate (4), to engage at least one of a brake unit (50) and disengage a transmission unit (60) connectable to the actuating plate (4) through a first cable (6) and through a second cable (8), wherein the actuating plate (4) is connectable to the first cable (6) and the second cable (8) on one side and is connectable to the support stand (3) of the vehicle (200) on another side, to restrict motion of the vehicle (200);

actuating the support stand (3) of the vehicle (200) from the actuated position (AP) to the rest position (RP); and

displacing, the actuating plate (4) and in turn the first cable (6) and the second cable (8), to disengage at least one of the brake unit (50) and engage the transmission unit (60) to allow motion of the vehicle (200).

Dated this 24th day of March 2023

***-- Digitally Signed--***
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## ABSTRACT

### A SYNCHRONIZER MECHANISM FOR RESTRICTING MOTION OF A VEHICLE AND A METHOD OF OPERATING THEREOF

The present disclosure discloses a synchronizer mechanism (100) for restricting motion of a vehicle (200). The synchronizer mechanism (100) includes an actuating plate (4) connectable to the support stand (3) and connectable to at least one of a first cable (6) and a second cable (8). The actuating plate (4) actuates at least one of the first cable (6) and the second cable (8) on displacement of at least one connecting link (2). The synchronizer mechanism (100) restricts movement of the vehicle (200) thereby may eliminate or reduce the accidents due to un-retracted support stand (3) of the vehicle (200).

***[Figure 1a is a representative figure.]***

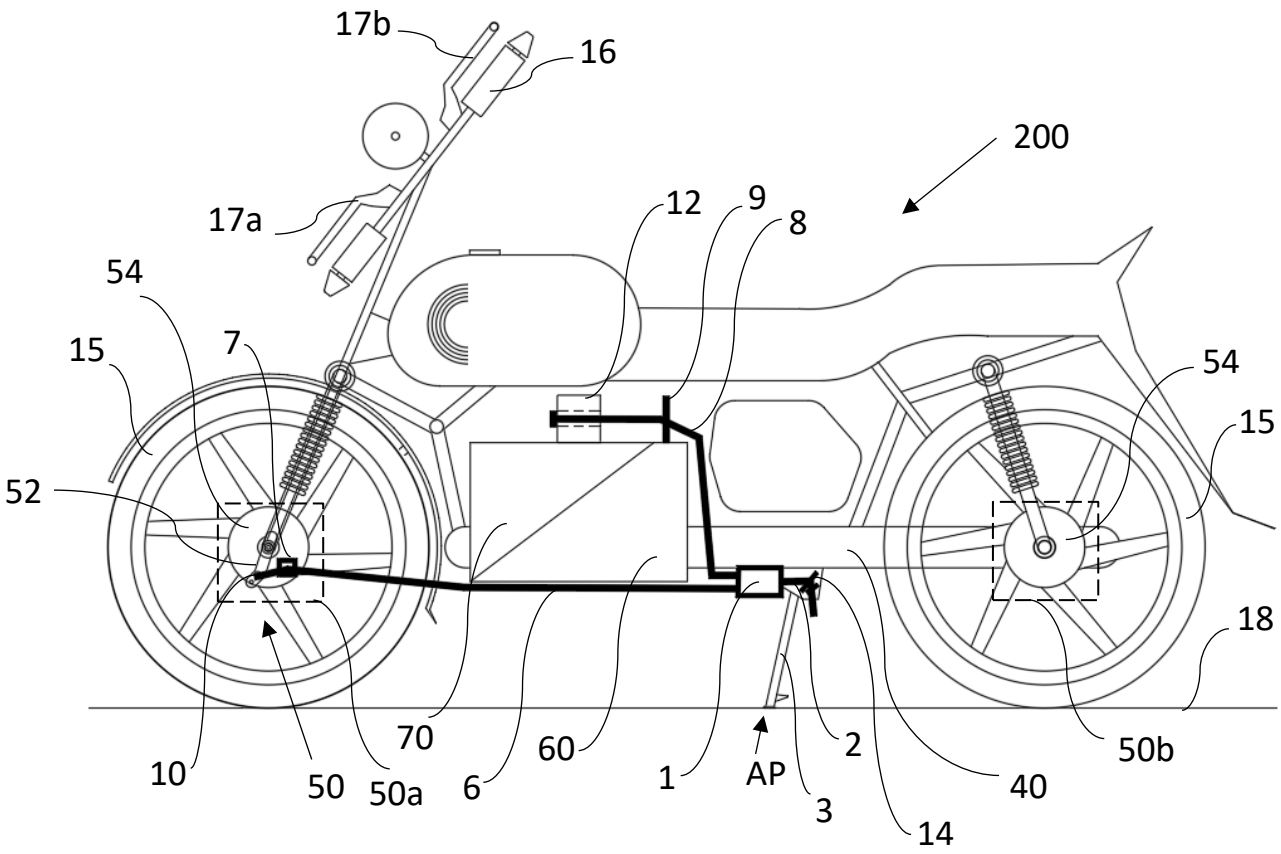


**Figure 1a**

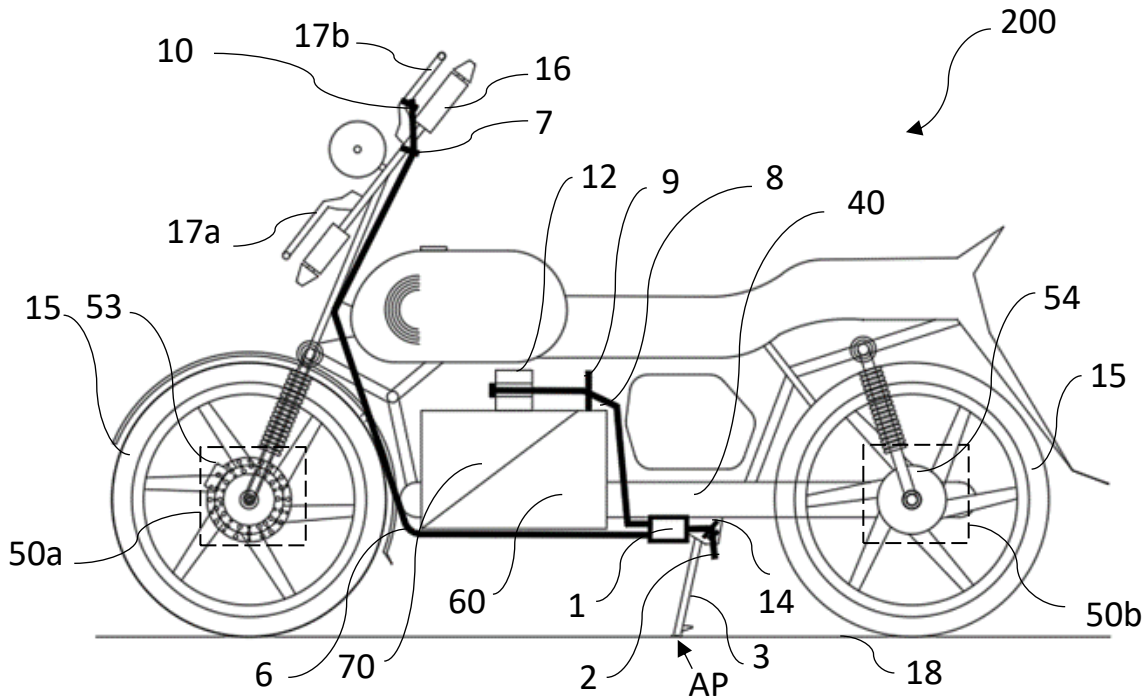


**Figure 1b**

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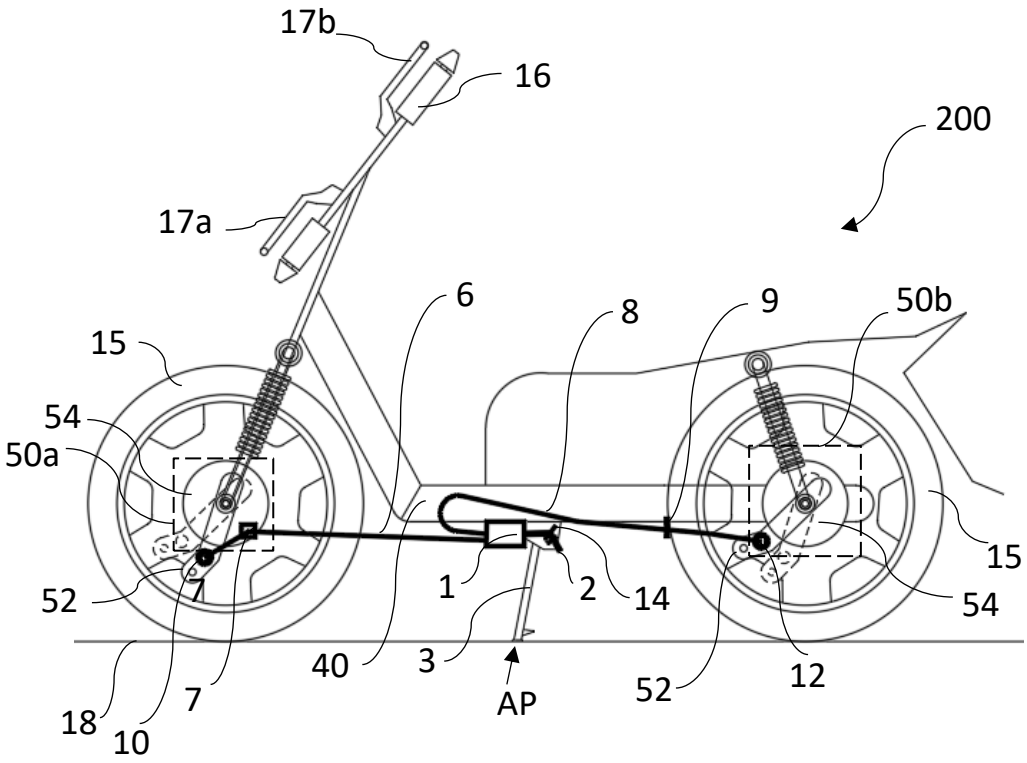


Figure 1c

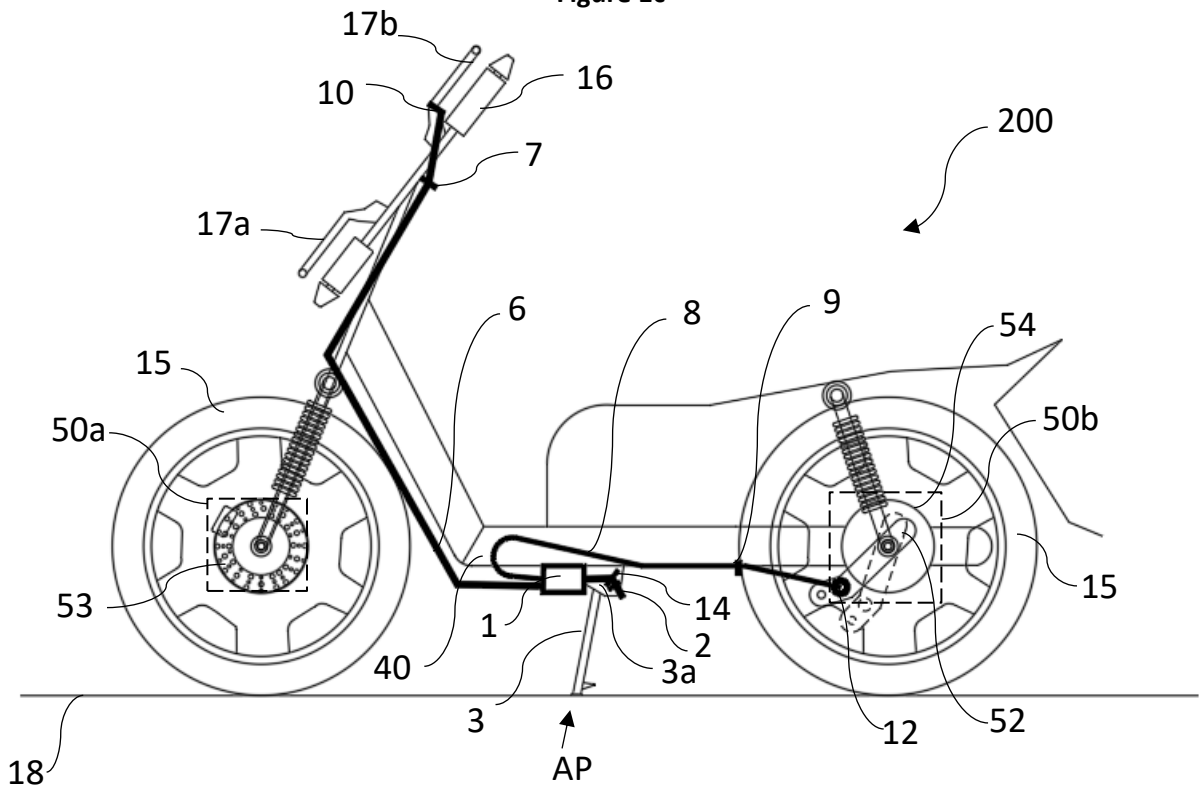


Figure 1d

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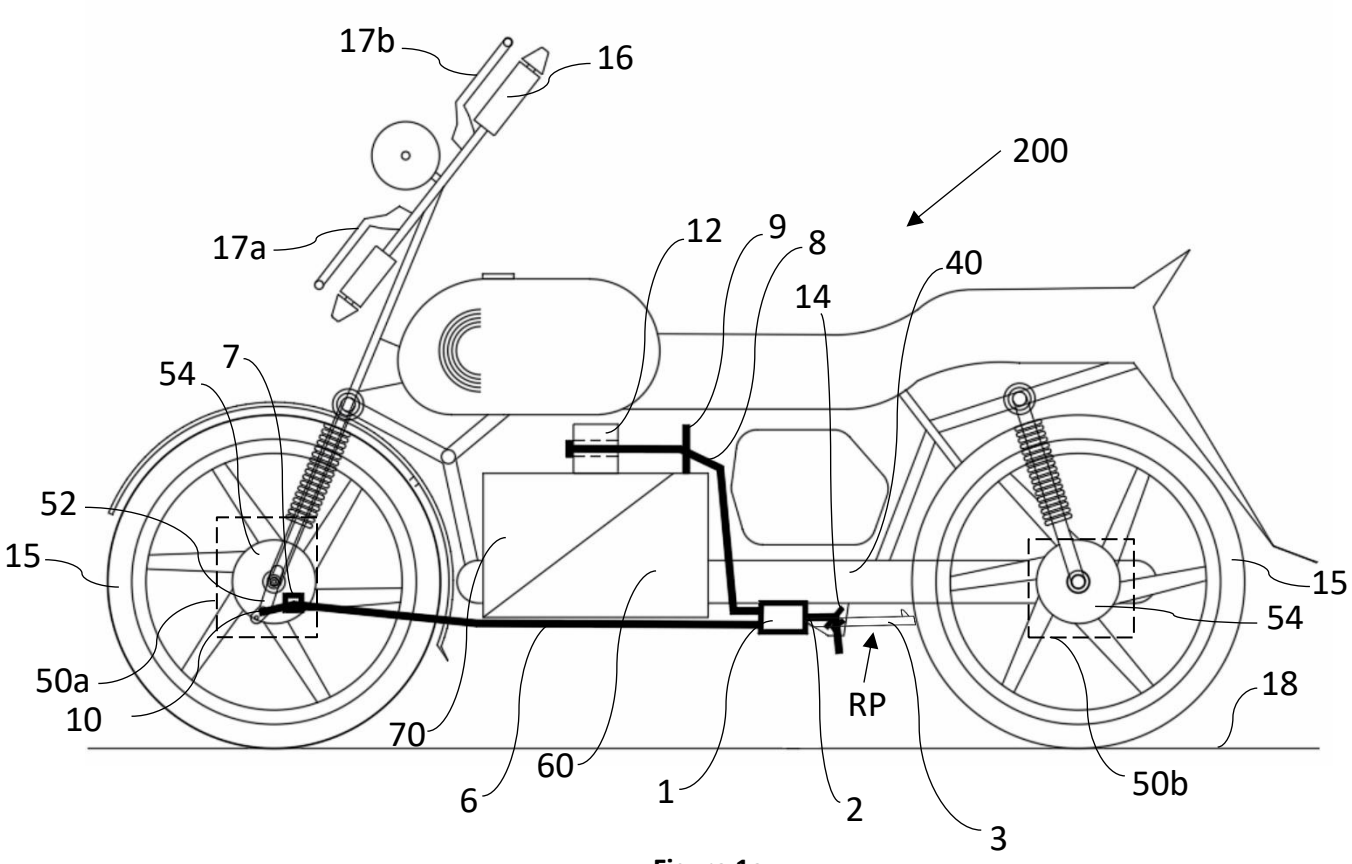


Figure 1e

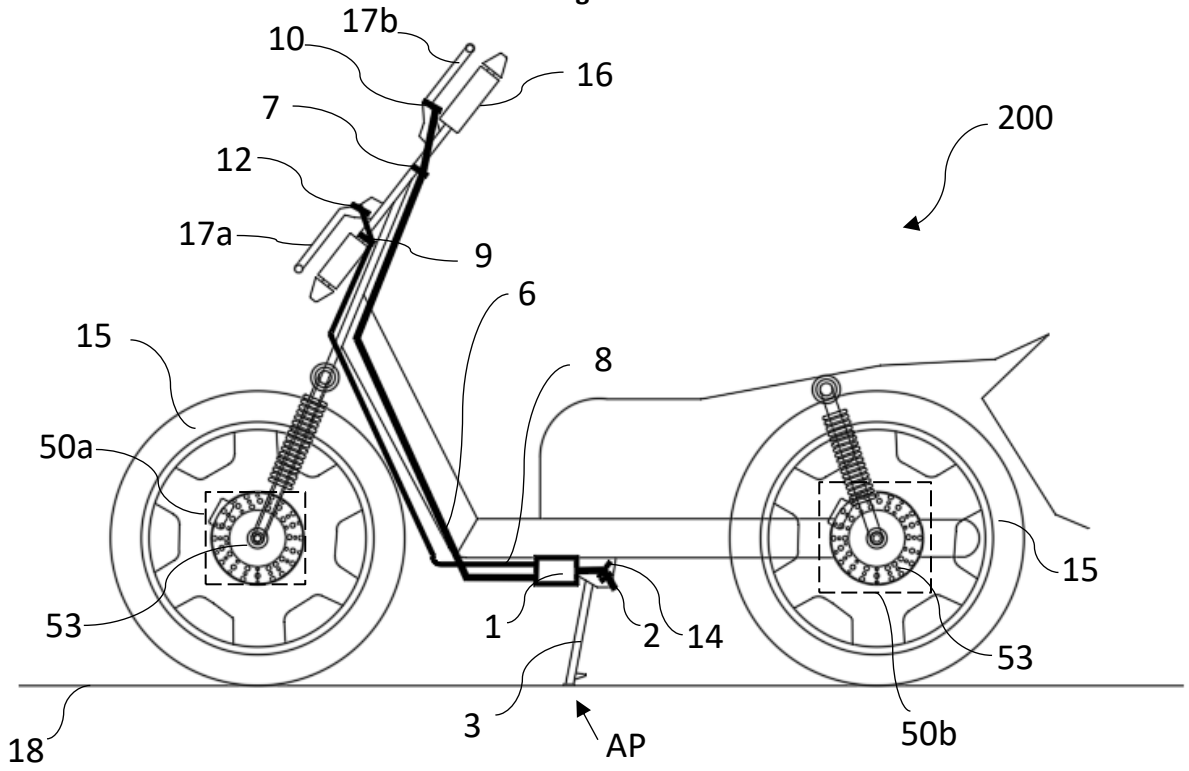


Figure 1f

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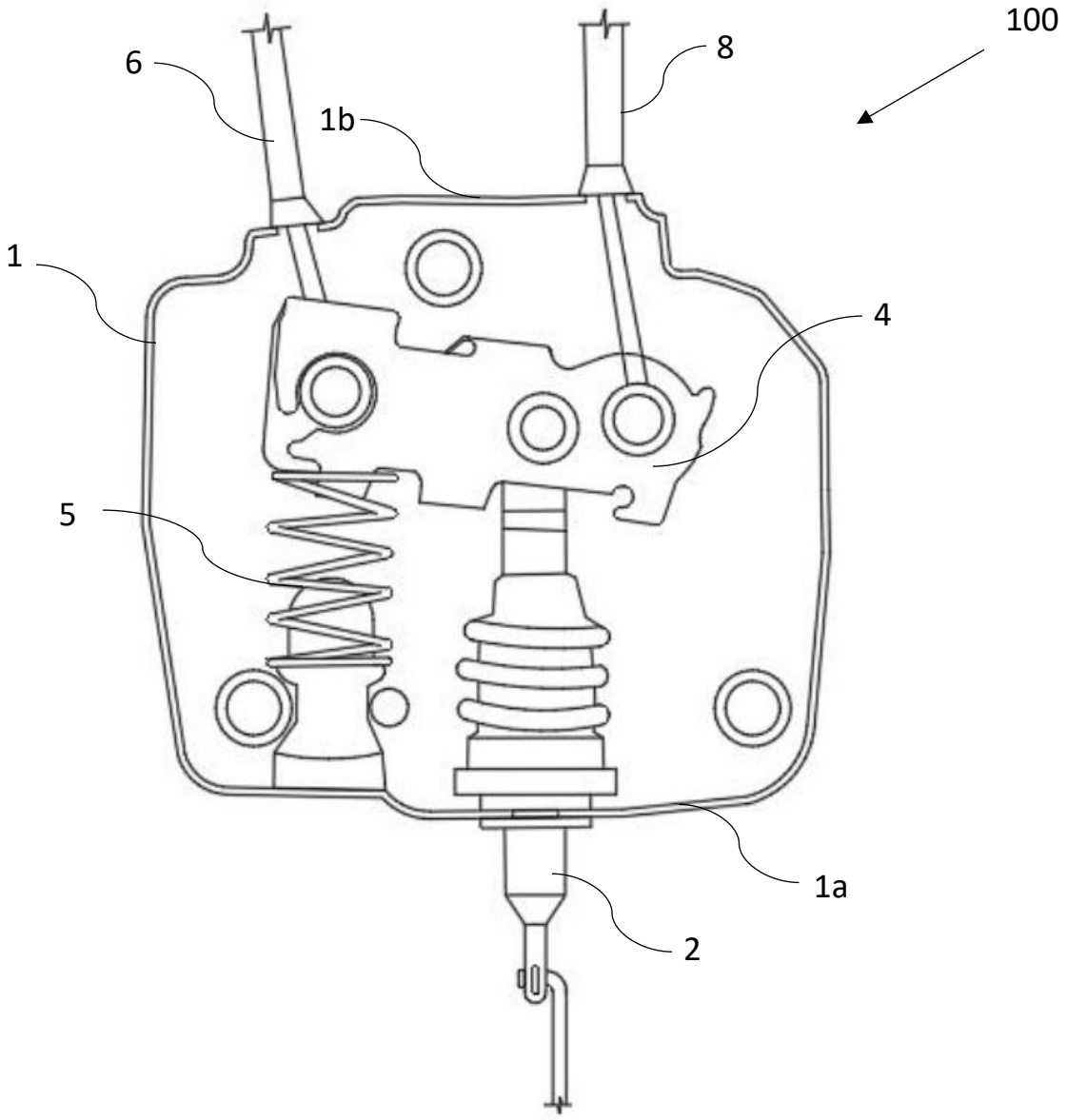


**Figure 2a**

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Head, IPR Dept.,
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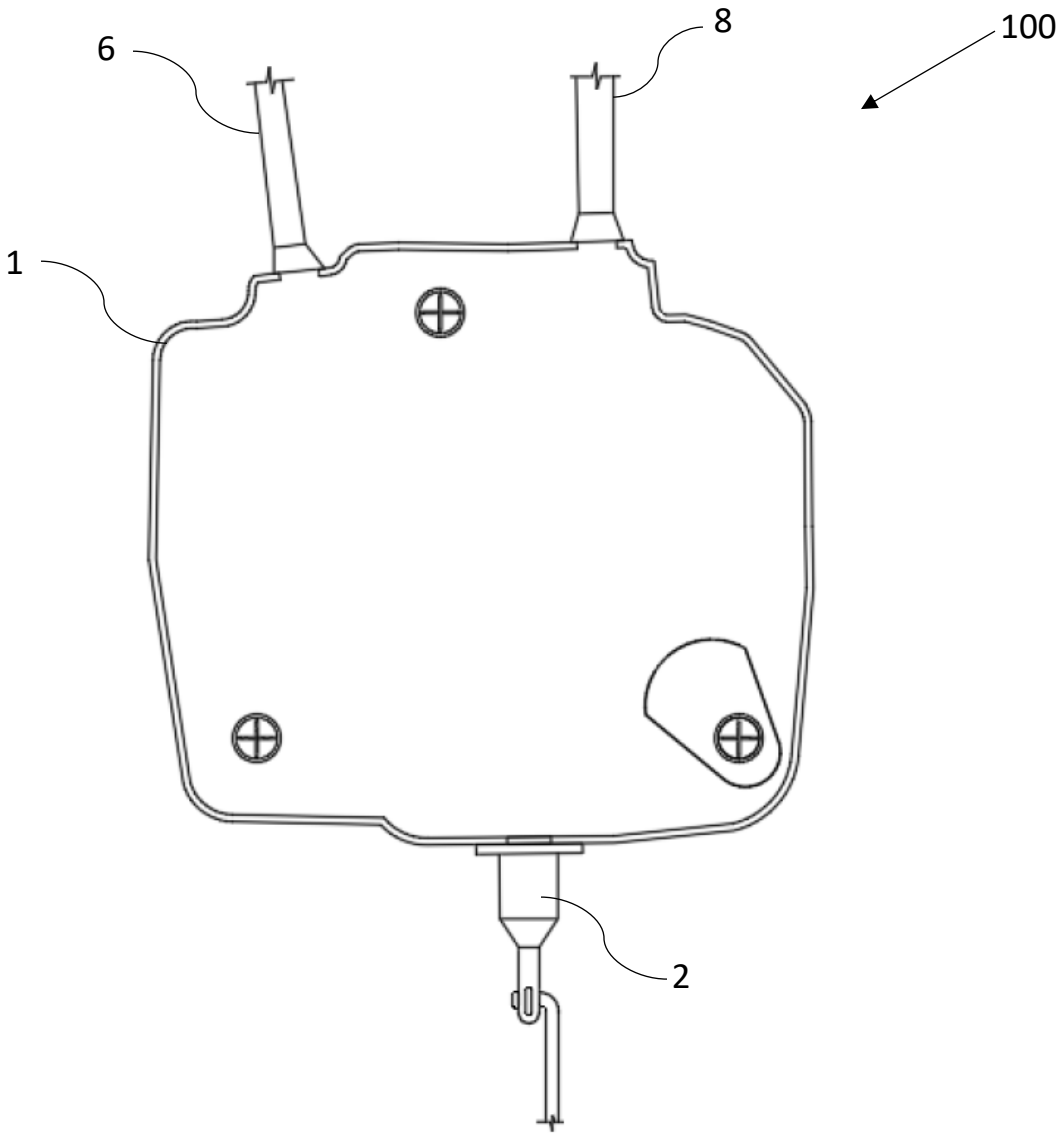


**Figure 2b**

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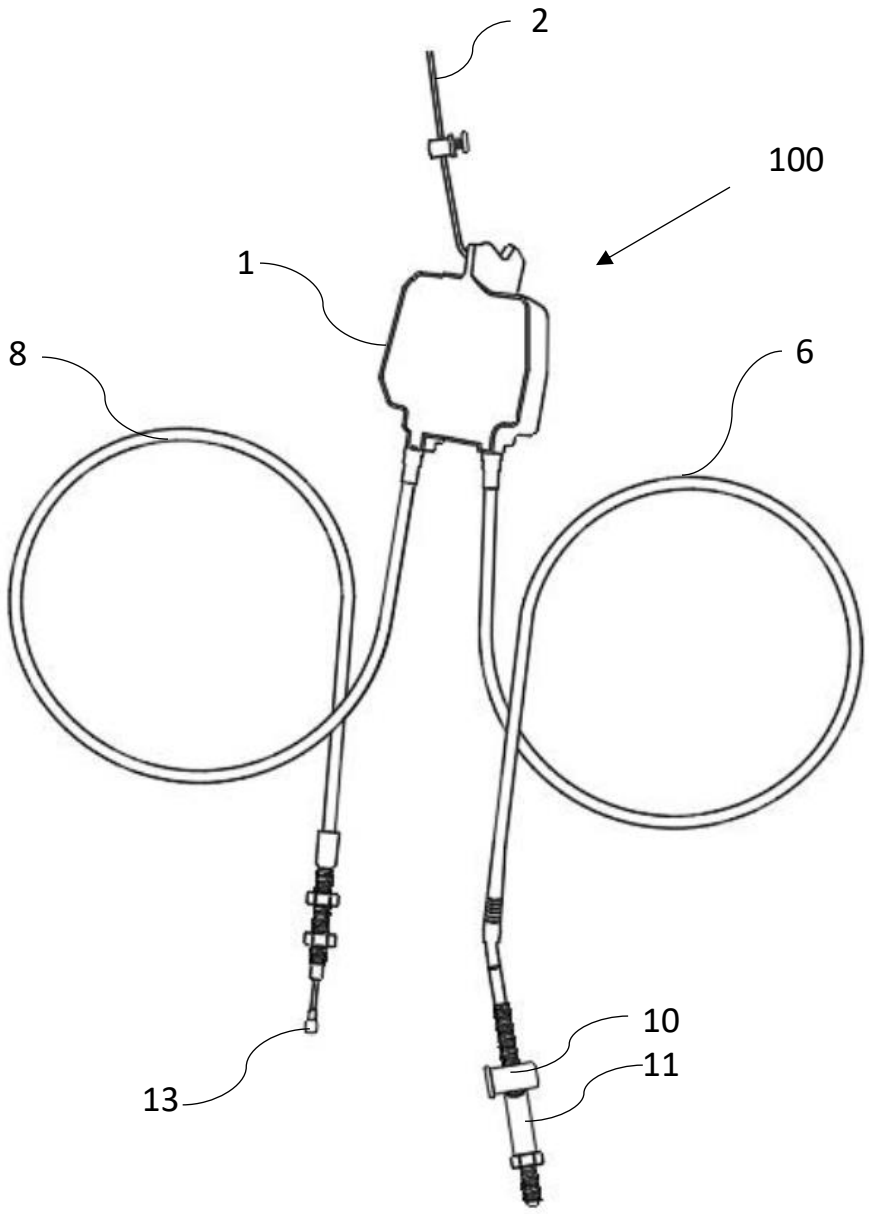


**Figure 2c**

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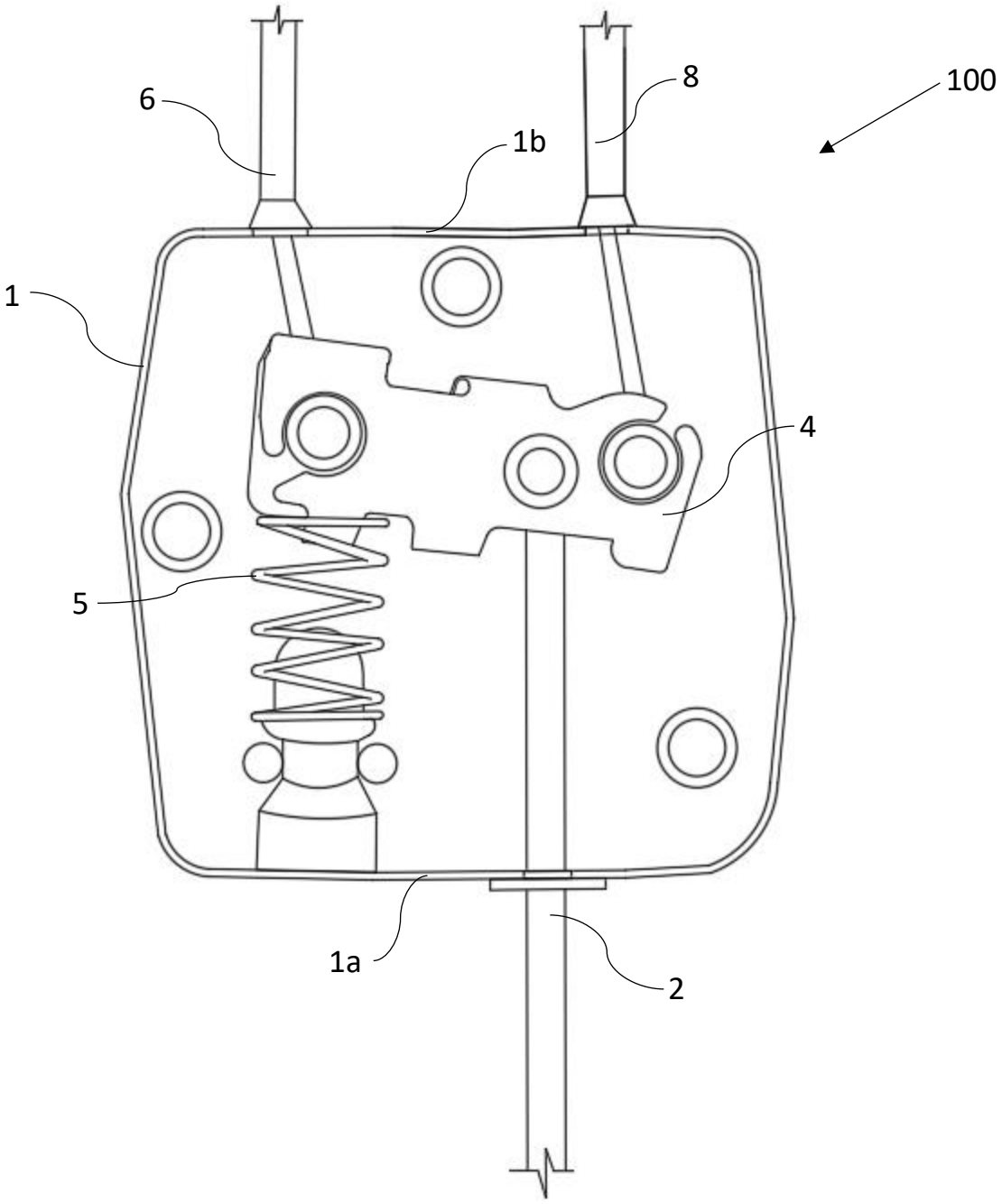


**Figure 2d**

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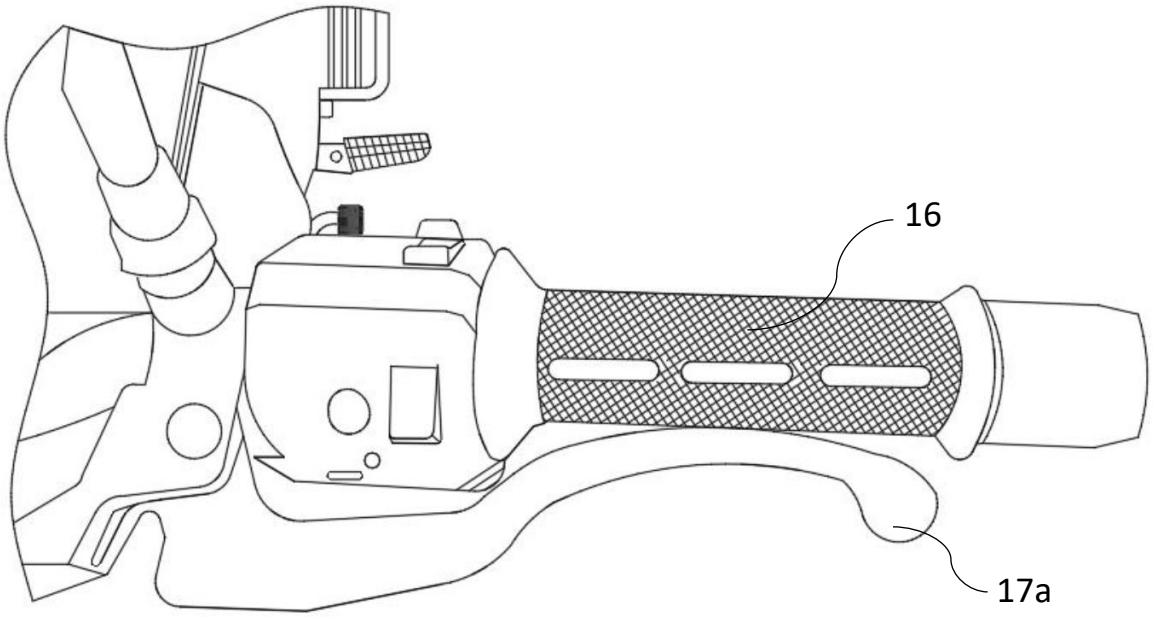


**Figure 3**

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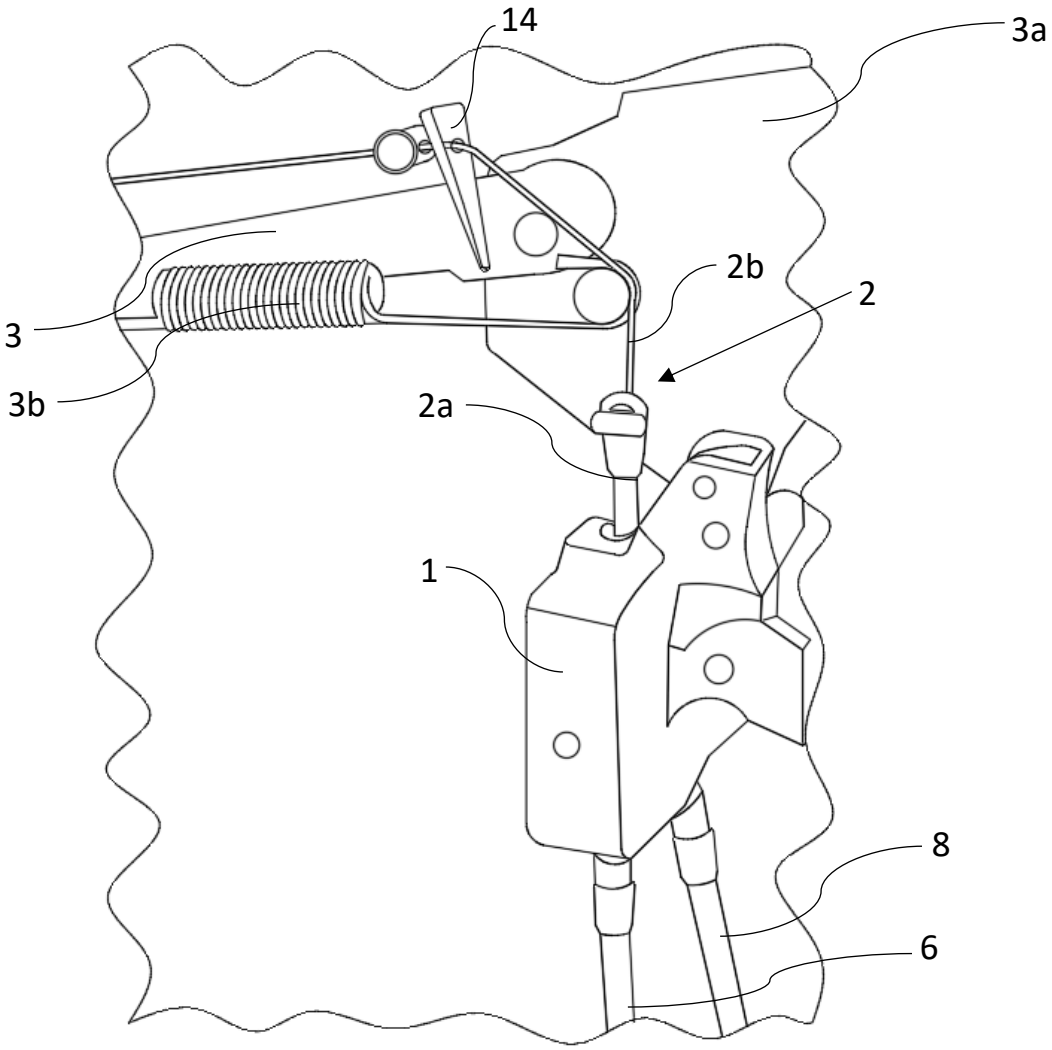


**Figure 4a**

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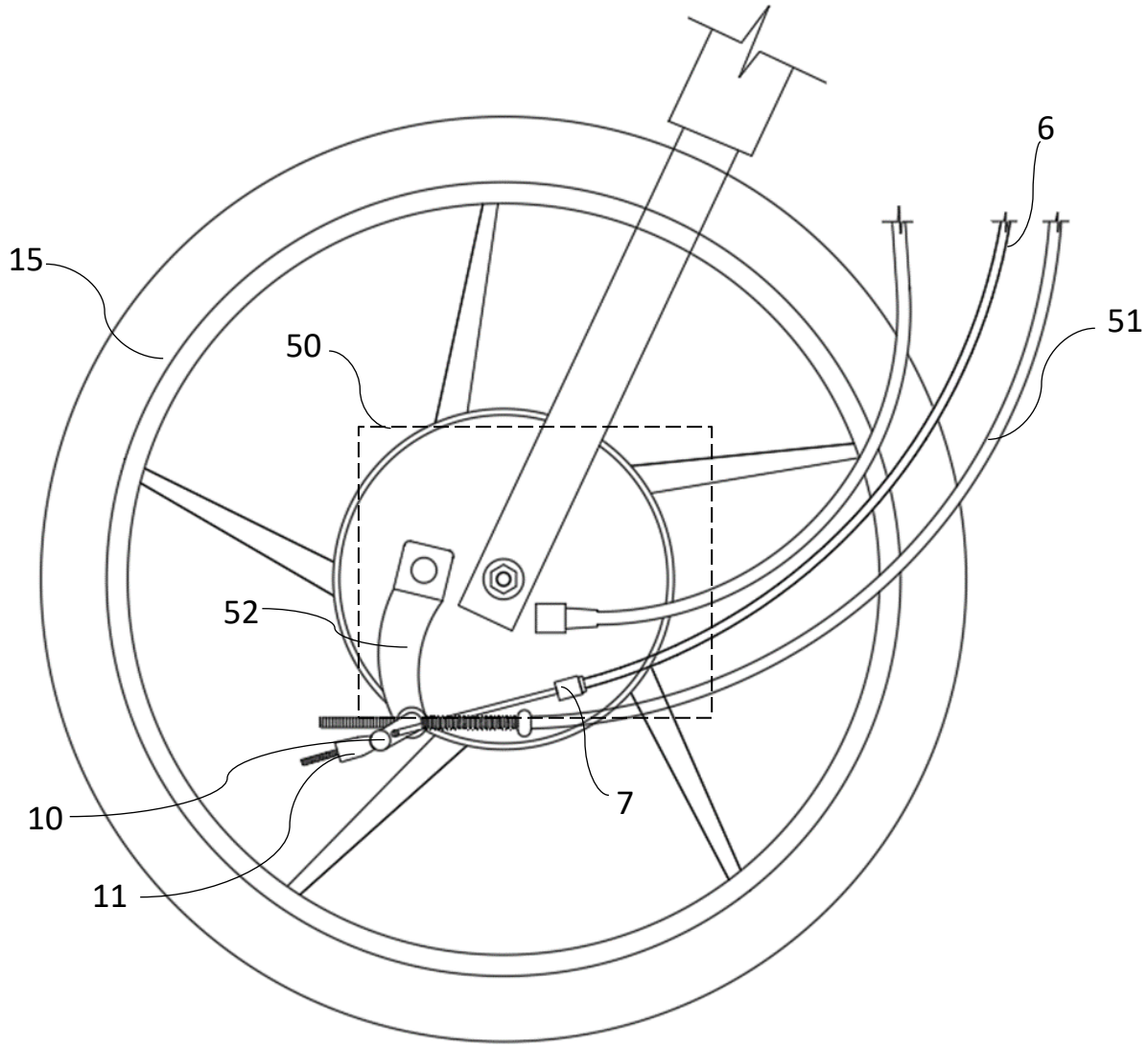


Figure 4b

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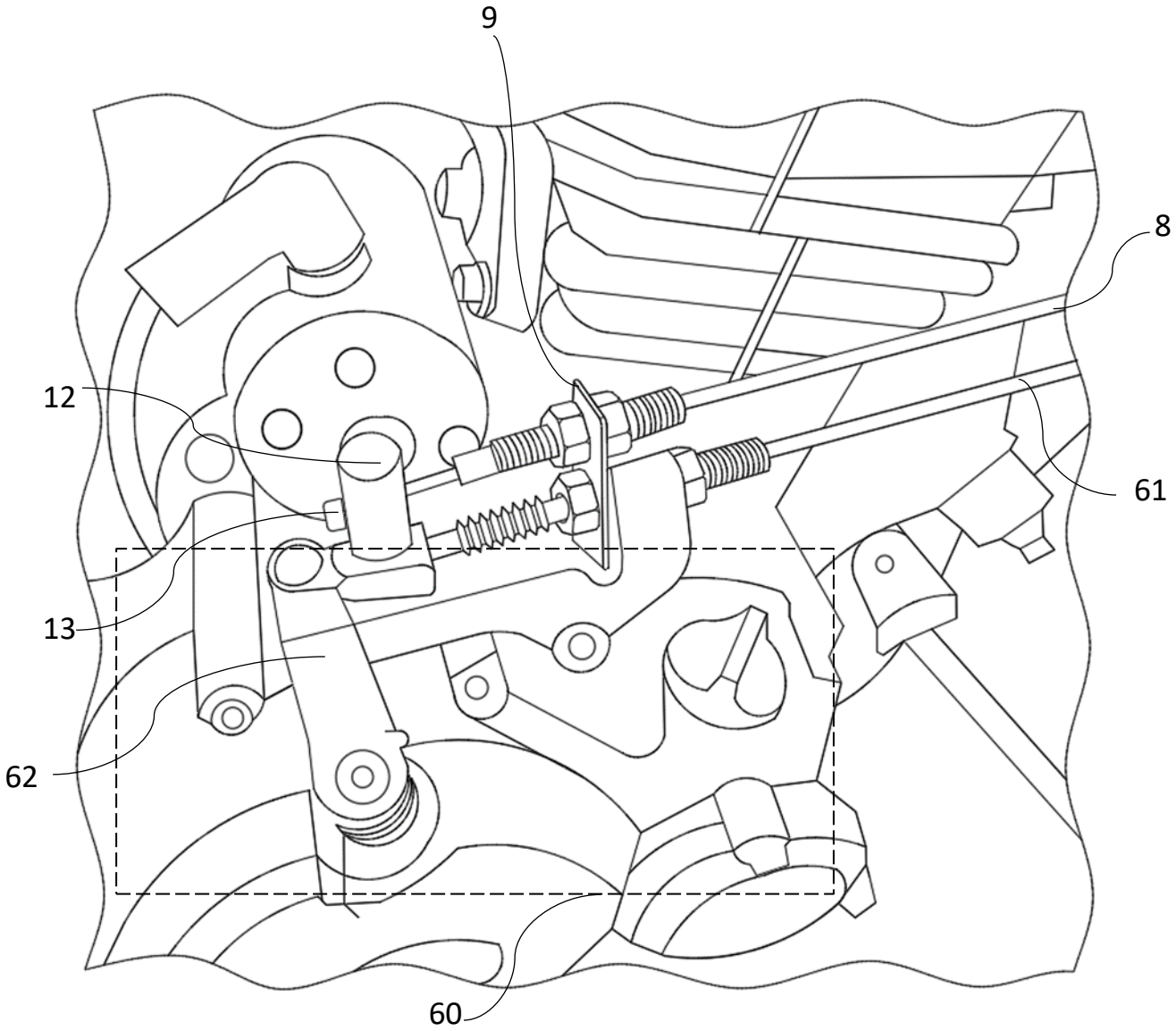


Figure 4c

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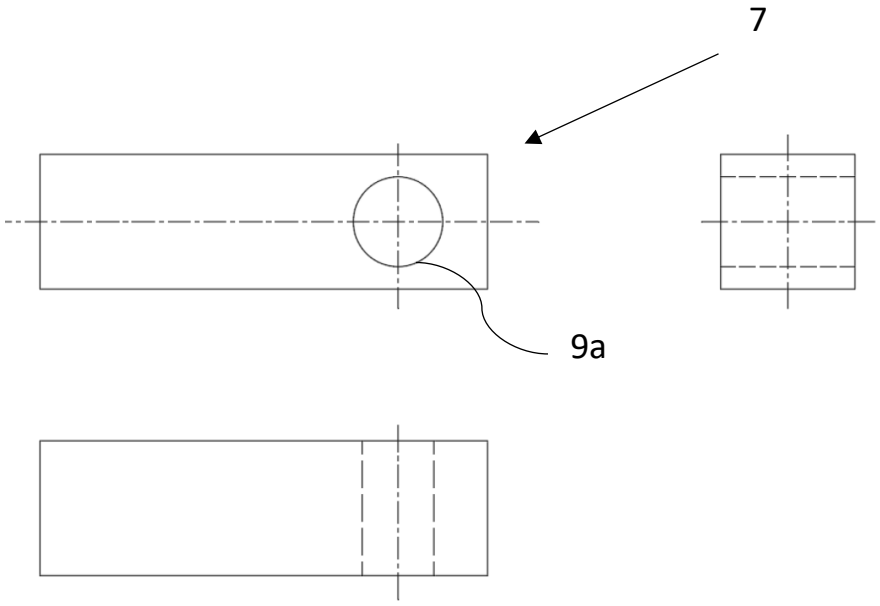


**Figure 5**

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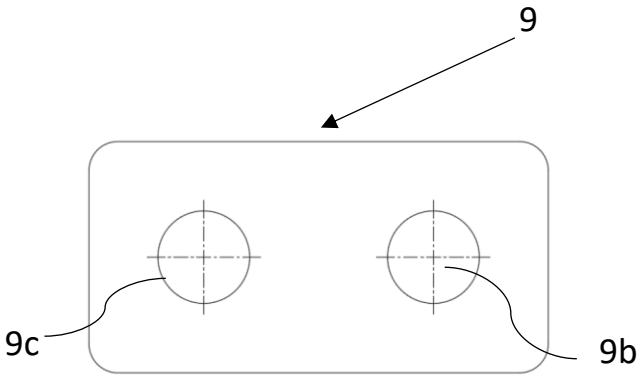


Figure 6

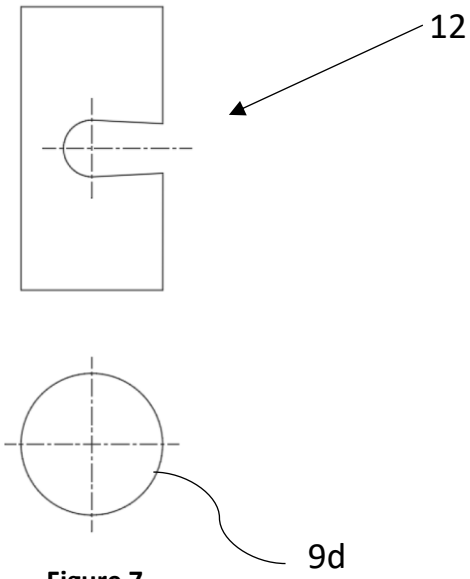


**Figure 7**

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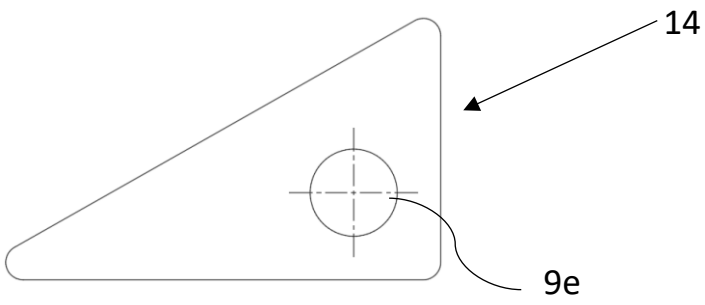


Figure 8

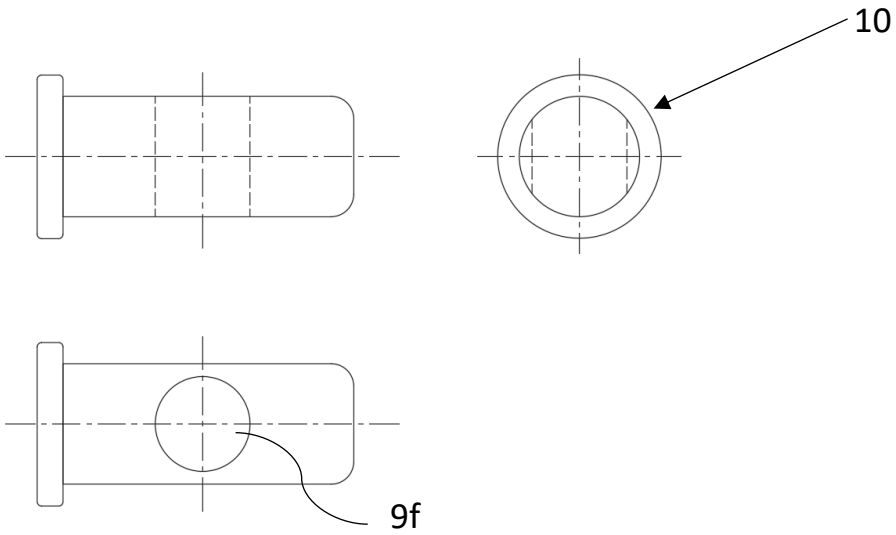


Figure 9

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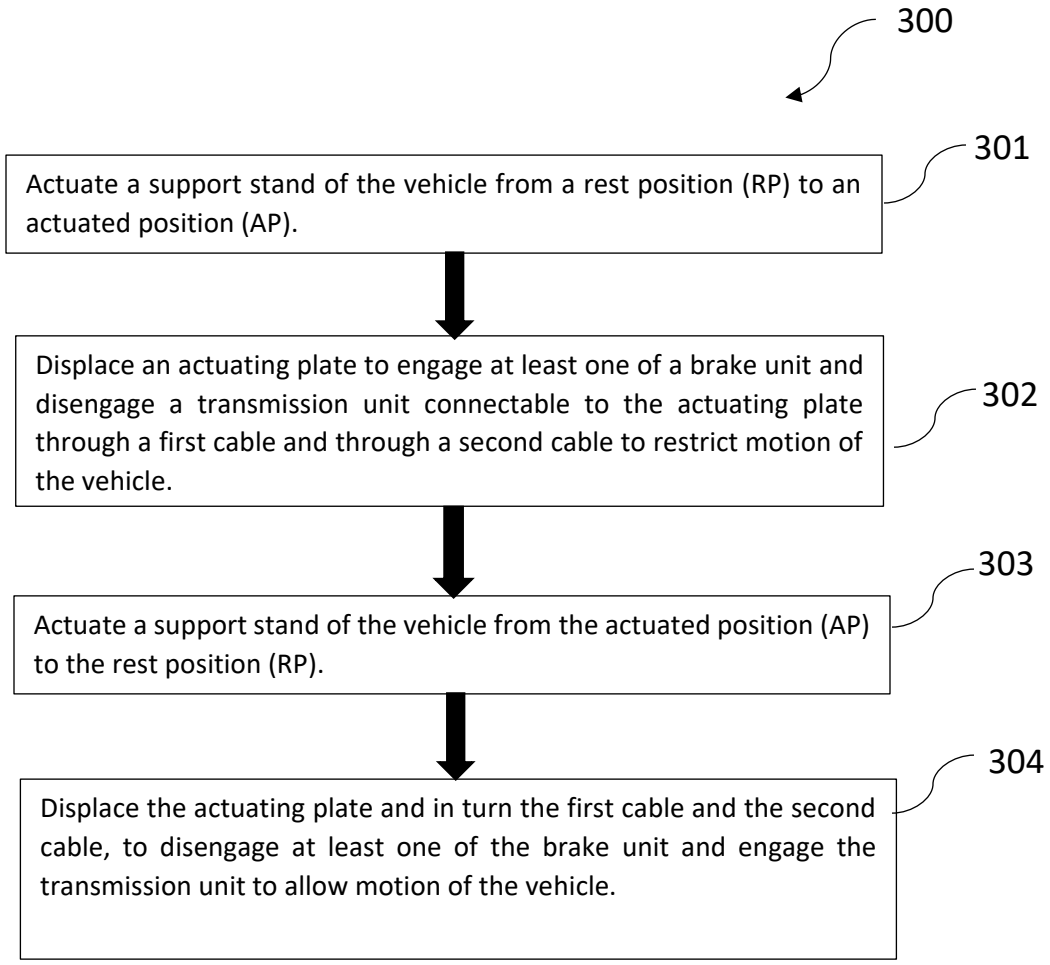


Figure 10

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