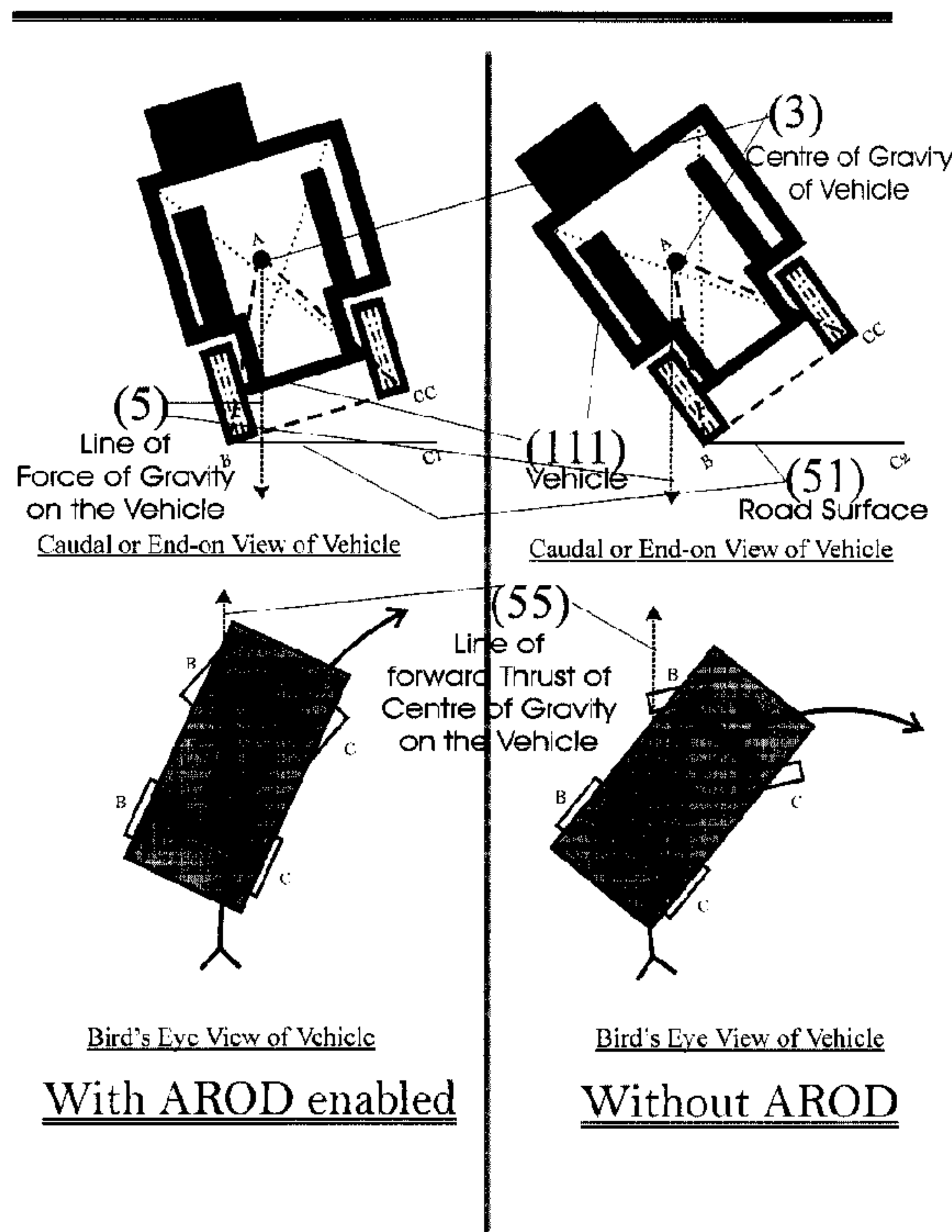




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(54) Titre : DISPOSITIF ANTI-TONNEAU
(54) Title: ANTI-ROLLOVER DEVICE



(57) **Abrégé/Abstract:**

This is a device or a set of mechanisms that prevents or minimizes the possibility of rollover of a vehicle turning more sharply than is safe. This is achieved by means of a computer continuously calculating the safe limit of sharpness (that is, acuteness or abruptness) of turning of the wheels (and, therefore, of the steering wheel) at any given speed, with any given load in the vehicle, with prevailing road condition, state of tires, etc., etc., and not allowing the wheels (and, ultimately, the steering wheel) to turn, or letting it pass through increasing amount of difficulty as it tends to turn, beyond that said safe limit of sharpness of turning, or, alternatively, automatically reducing the speed of the vehicle to a level safe enough for the approaching and intended sharpness of the turning at the time; this may be accompanied by some warning signals. This invention, called Anti-Rollover Device (or ARO Device or AR Device or AROD or ARD, in short), includes an override or temporarily disabling mechanism to be used as desired.

10 April 2000

Application For A PatentAnti-Rollover DeviceInventor: Bibhuti Bhusan BardhanAddress: 84 Adams Drive, Ajax, ON, L1S 5T3.Telephone/Fax: (905) 686 4999Abstract

This is a device or a set of mechanisms that prevents or minimizes the possibility of rollover of a vehicle turning more sharply than is safe. This is achieved by means of a computer continuously calculating the safe limit of sharpness (that is, acuteness or abruptness) of turning of the wheels (and, therefore, of the steering wheel) at any given speed, with any given load in the vehicle, with prevailing road condition, state of tires, etc., etc., and not allowing the wheels (and, ultimately, the steering wheel) to turn, or letting it pass through increasing amount of difficulty as it tends to turn, beyond that said safe limit of sharpness of turning, or, alternatively, automatically reducing the speed of the vehicle to a level safe enough for the approaching and intended sharpness of the turning at the time; this may be accompanied by some warning signals.

This invention, called Anti-Rollover Device (or ARO Device or AR Device or AROD or ARD, in short), includes an override or temporarily disabling mechanism to be used as desired.

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Background of Invention

Rollover of vehicles (especially minivans, sports utility vehicles or SUV's, etc.) is a major cause of road accidents causing property damages, personal injuries and fatalities, etc.. Generally, a rollover (that is, tripping over or turning over of a vehicle on its side) is caused by excessive thrust of the centre of gravity of the vehicle pushing it beyond the points of contact of tires with the road surface on the side of the potential rollover when the vehicle is turned more sharply and at a higher speed than what may be safe under the circumstance, taking into account such factors as the speed of the vehicle at the time (thereby providing greater forward thrust on the centre of gravity of the vehicle), distribution of loads in the vehicle, especially pushing the centre of gravity at a higher level (e.g., by more passengers or loads, etc. inside or above the vehicle, etc.), grip of tires on the road surface, primarily preventing the skidding of the tires (that might have, ironically in the present circumstance, prevented the centre of gravity of the vehicle to go outside the outer limits of the tires, and thus prevented the rollover!), etc..

Such a rollover is effected, generally speaking, when a vehicle turns on its wheels more sharply than would allow the centre of gravity of the vehicle to anchor the vehicle safely on the road (that is, its force passing between the two sets of tires on each side). If at any time this thrust of centre of gravity happens to pass over (the forward thrust) and fall on (downward pull) the outer side of the limit of the area between the said set of tires on each side, there would be a chance or possibility of a rollover. There is more likelihood of this happening under such circumstances as when the turning of the wheels is sharper, or the speed is greater, or the centre of gravity of the vehicle is pushed higher, say, by distribution of loads, the road condition or the state of the tire or tires does not allow for skidding, etc., etc..

Thus, in short, generally speaking, possibility of automobile rollover kicks in once a certain sharpness of turning is exceeded, and then it is mainly a function of sharpness of the turning of the vehicle and its speed relative to the said sharpness of turning as well as the relative position, especially height and the nearness to the side of a potential rollover, of the centre of gravity of the vehicle at a given time. In such situations a potential rollover can generally be avoided either by reducing the speed of the vehicle or by not going over a safe sharpness of its turning. Since the latter case usually prevails in a rollover, the present invention mainly draws on and deals with this eventuality. However, another possible way of avoiding a rollover is automatic reduction of the speed of the vehicle as the sharpness of the turn is increased by the driver (maybe inadvertently) beyond the safe sharpness of turning under the prevailing condition. As a further, and compromising, alternative (using both priorities of speed and sharpness of turning, so to say), as a more than safe sharpness of turning is approached (by the driver, maybe inadvertently), the computer would prompt the steering wheel to present greater and greater (that is, increasing degree of) difficulty or hardness in turning while automatically reducing the speed of the vehicle until it reaches a safe level commensurate with the attempted sharpness of turning. All such devices or mechanisms would be deemed to be within the purview of this invention as these can be easily achieved by the computer used in this invention using state-of-the-art technology of common knowledge.

The present invention is primarily intended to prevent or minimize such automobile rollovers by calculating (with the help of a computer, etc.) the safe upper limit of sharpness of turning of the wheels at any given time taking into account such factors as the prevailing speed of the vehicle, spread of loads of the vehicle, etc. or, even, the friction level between the tires and the road surface, etc. (for example, a slippery road surface, or poor contact or gripping of tires on the road surface, etc., may cause a skidding of the tires and may thus avoid a rollover under certain circumstances — which of these two hazards is a greater evil is another question, of course), and then preventing, or increasing (gradually or at once) resistance to, the turning of the vehicle by the driver beyond the said upper limit of the sharpness of turning of the wheels.

There may be an overriding mechanism to disable or disengage this feature of the present invention as and when desired (e.g., by professional drivers, for stunt effects, etc.).

It should be noted that if, theoretically, the grip of the tires on the road is absolute, there is always a theoretical speed high enough to trip the centre of gravity of the vehicle outside the said points of contact (BB or CC) of the tires with the road surface (BC, BC1, BC2) when the vehicle is turning sharply enough, and thus to cause a rollover. The higher the speed of the vehicle, the higher the prevailing level of its centre of gravity, and greater the sharpness of turning, the more is the possibility of rollover, of course.

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Description of Invention

Like numbers in parenthesis here refer to like numbers in the drawings in the DIAGRAMS (A, B, and C).

Vehicle (1) has a centre of gravity (3). This vehicle may be empty or may have added loads (11). Vehicle with added load (111) also has its centre of gravity (3), but the latter may be at a different point than in the vehicle without this added load, depending on distribution of this load. Typically, in a vehicle (1) the centre of gravity (3) is at a lower point than the anatomical centre of the vehicle (2) because most of the weight of the vehicle is generally at its lower part.

However, when the vehicle (1) is loaded (111), either with materials or people, or both, the loads are placed at a higher level than the level of the original centre of gravity (3) of the vehicle when empty (1), thus driving this centre of gravity (3) higher than what was before this load was added. This makes the vehicle more susceptible to rollover. This is because the rollover takes place when the centre of gravity happens to exert its force on a line of force of gravity (5) on the outside of the points of contact of the tires (B or C in DIAGRAM – A, and BB or CC in DIAGRAM – C, depending on the side of rollover) with the road surface (BC in DIAGRAM – A, and BC1 and BC2 in DIAGRAM – C). This is typically the case when the vehicle is turning at a higher speed, the centre of gravity tending to be forced outside of the said crucial points of contact of the tires with the road surface. This happens more and more easily as the spread of load in the vehicle pushes the centre of gravity higher and as the vehicle is driven faster when turning. This is also the case when the tire is gripping the road surface more firmly without allowing these points of contact (B or C) to skid and, thus, to shift to the outer side of the line of force of gravity (5).

Like when animals are running, when the automobile is moving, it is all the time trying to catch its own centre of gravity thrust forward. However, since this centre of gravity cannot, normally, move in front outside of the front tires it does not roll over frontally. But when the automobile turns sideways sharply, this centre of gravity, helped by the line of forward thrust of the centre of gravity (55) of the vehicle falling on the outer side of the points of contacts of the tires with the road surface on the side of potential rollover (BB in this instance in DIAGRAM – C) in case of a sharp enough turning, may tip over to the outside of the two side tires of the opposite side of the direction of the said turning, thus allowing and helping the automobile to rollover on that side.

Therefore, one sure way of preventing such rollover (sideways) is to prevent or avoid the automobile turning any more sharply than is safe, namely, in this instance, preventing or avoiding the prevailing centre of gravity (3) moving sideways beyond the above said crucial points of contact (BB or CC) of the tires with the road surface (BC, BC1, BC2) (or, alternatively, by automatic reduction of the speed to a level safe enough for the sharpness of the turning at the time).

This goal can be achieved by a computer (7) calculating the risk factors prevailing at any given instant, such as the centre of gravity (taking into account the added loads — calculating from the present weight of the automobile minus the weight of the automobile when empty, or even calculating the general position of the centre of gravity from data showing how easily the automobile is tending to sway sideways with any amount of turning at any given point in time, especially immediately before the potential rollover could possibly take place and before and during the anti-rollover device of the present invention comes into play, the speed of the car, the road condition (especially slippery condition that may allow skidding but, thus, avoid rollover), etc..

Then this computer activates a mechanism (say, fitted at the end of the steering wheel) that would prevent the sharpness of turning of the wheels beyond a certain limit that may cause a rollover at any particular point in time under a given circumstance, or, alternatively, cause an automatic reduction of the speed to a level safe enough for the approaching intended sharpness of the turning at the time, taking the steering wheel through an increasing amount of difficulty (such a stiffness) in turning as a safe sharpness in turning (critical and commensurate with the prevailing or ultimate speed of the vehicle) is gradually and eventually reached.

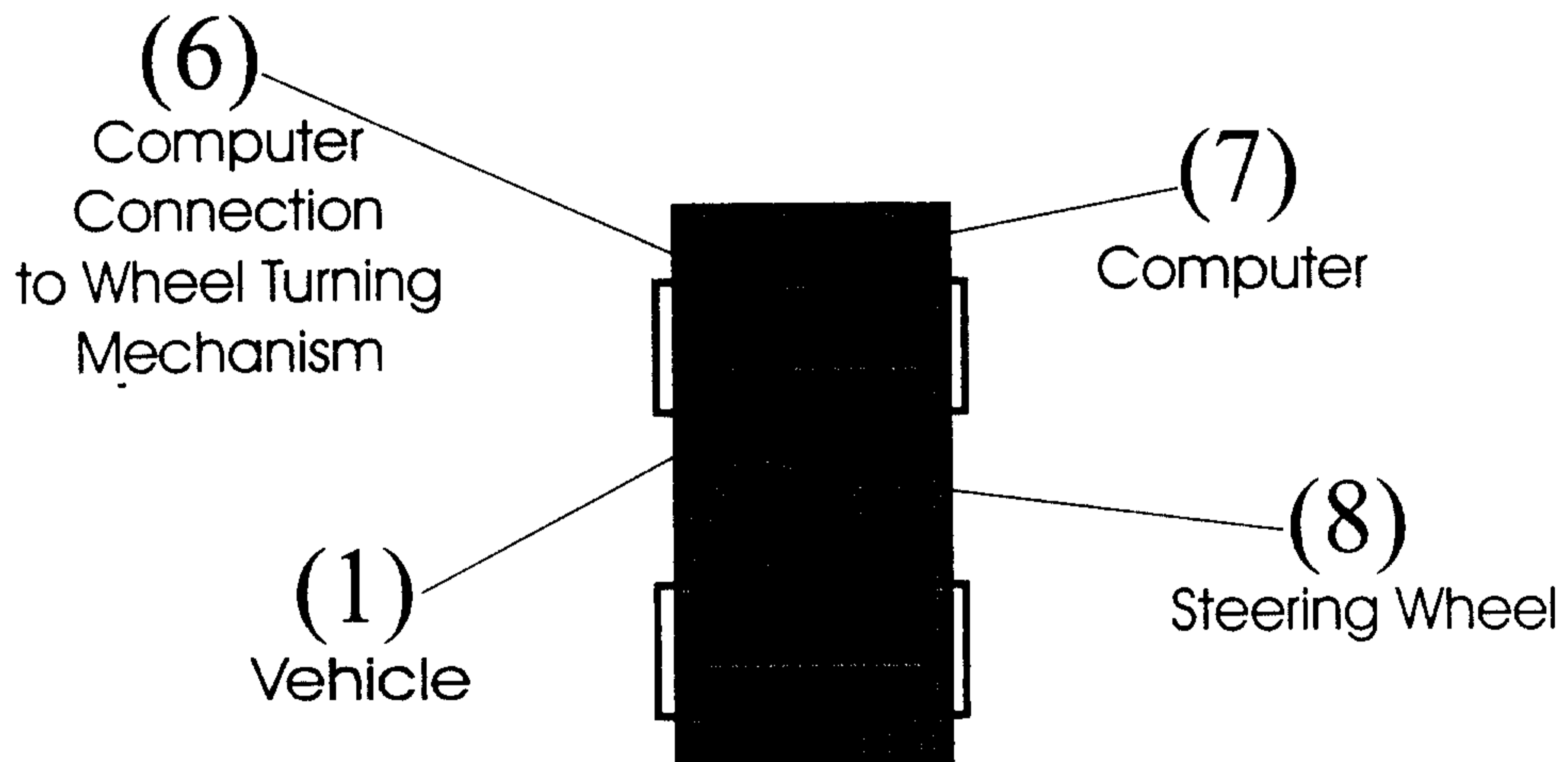
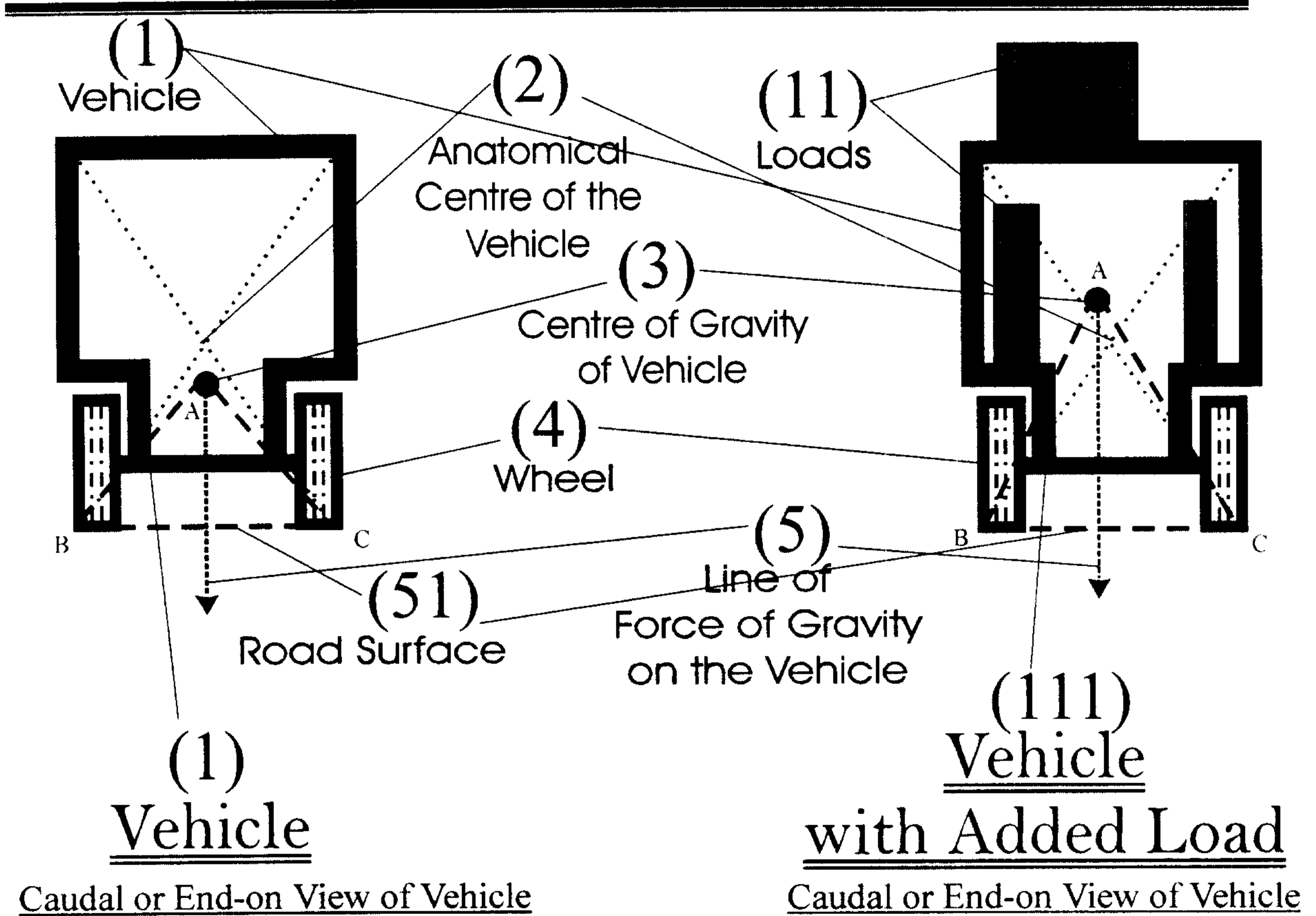
This anti-rollover device (or AROD) may be operated in several ways, including by being totally disabled or overridden, or by disallowing any further turning whatsoever beyond the safe limit as described and explained above, or by making it gradually and increasingly harder and harder, after a certain predetermined point, for the driver to turn the steering wheel to allow, thereby, the automobile to turn beyond this safe limit of sharpness of turning eventually, or by automatic reduction of the speed of the vehicle to a level safe enough for the attempted sharpness of the turning. There may be accompanying warning signals, such as with sound, light, etc..

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I claim:

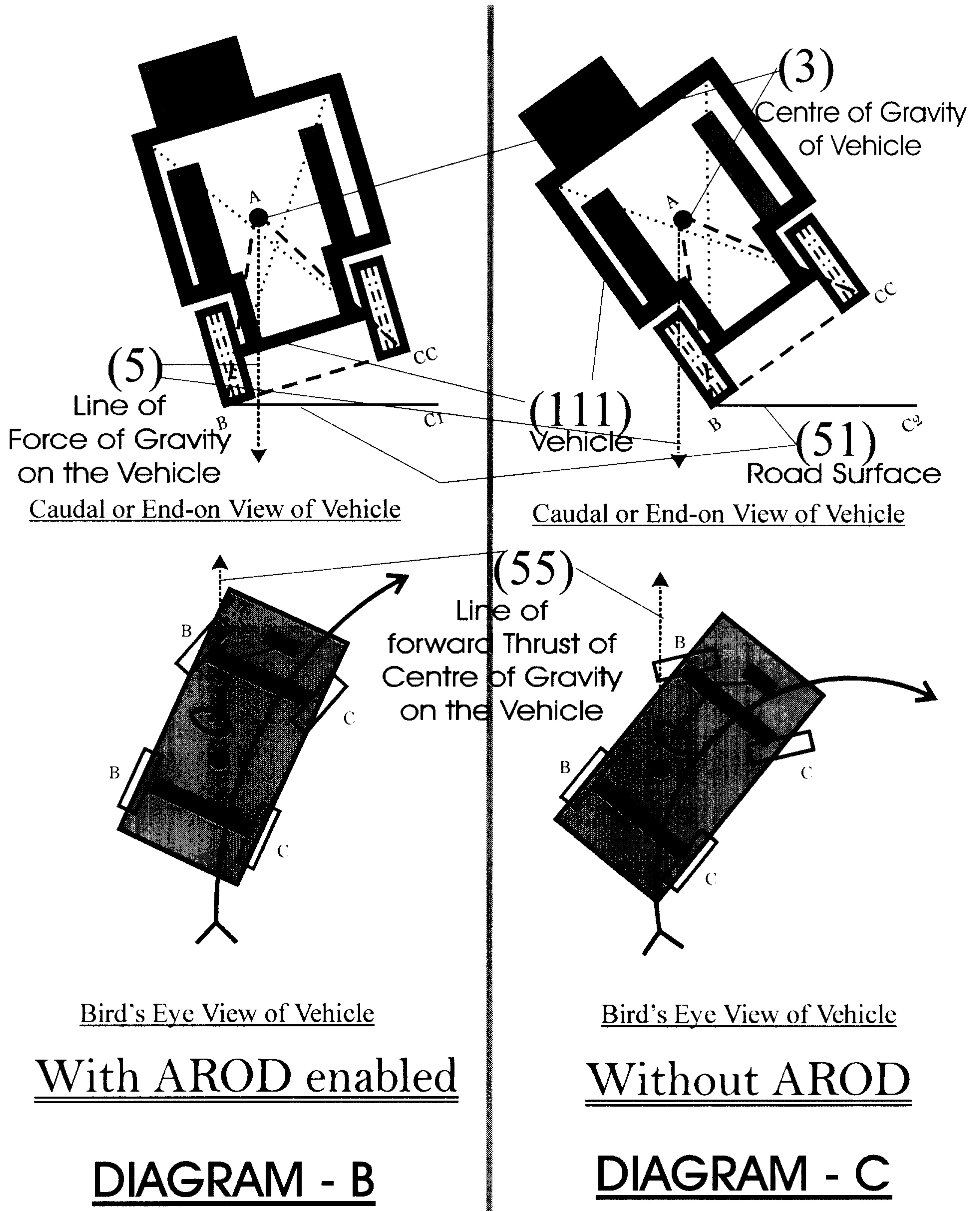
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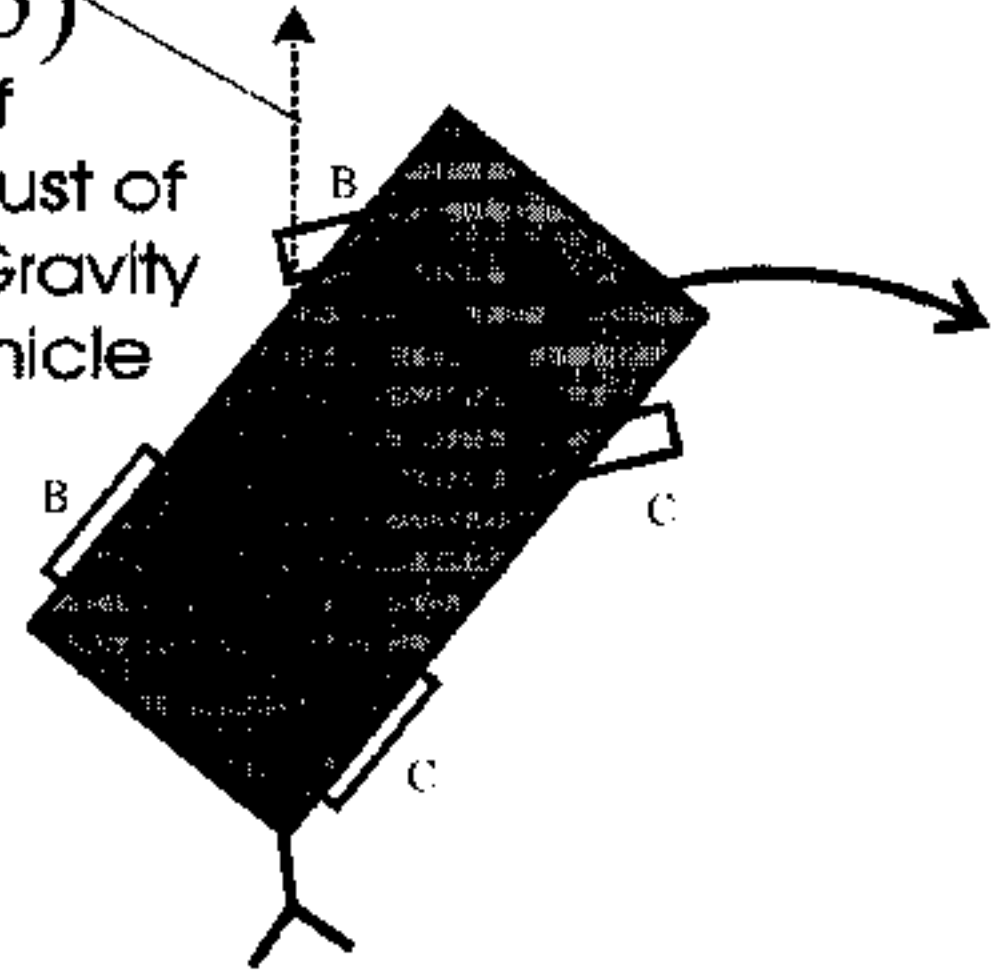
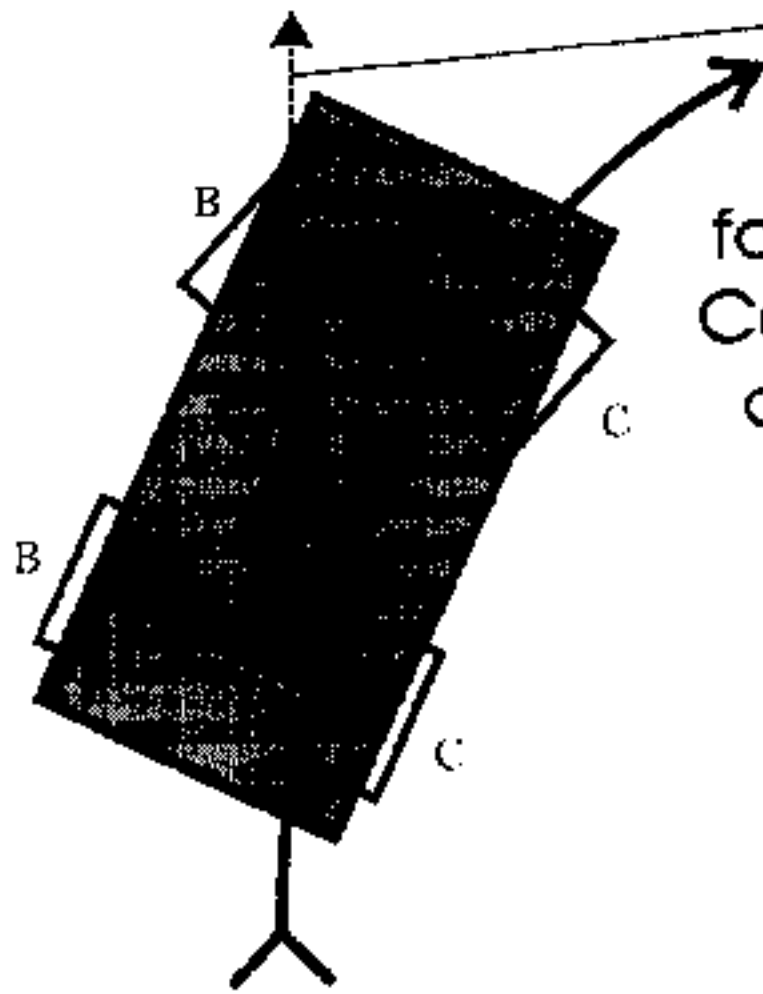
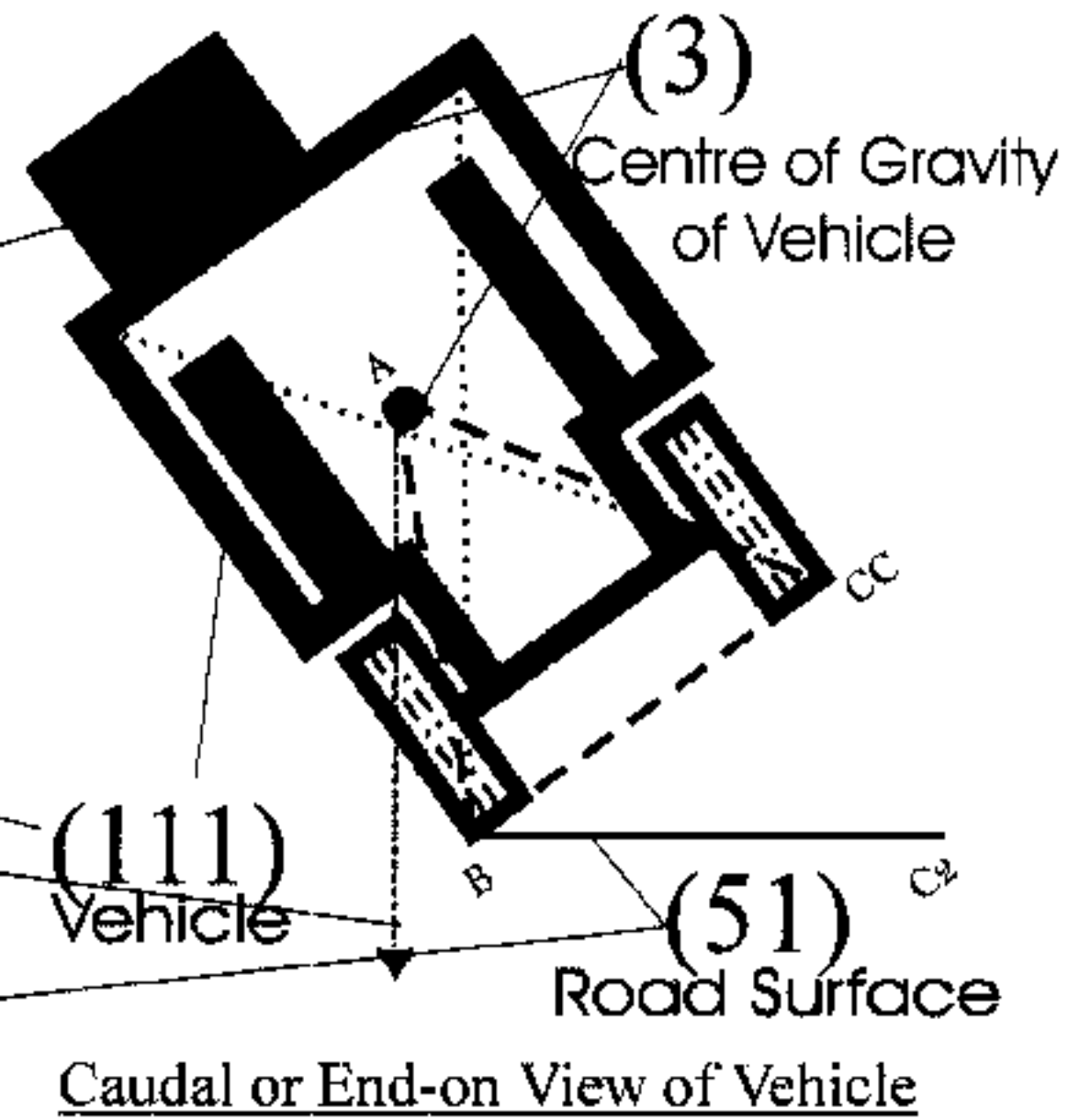
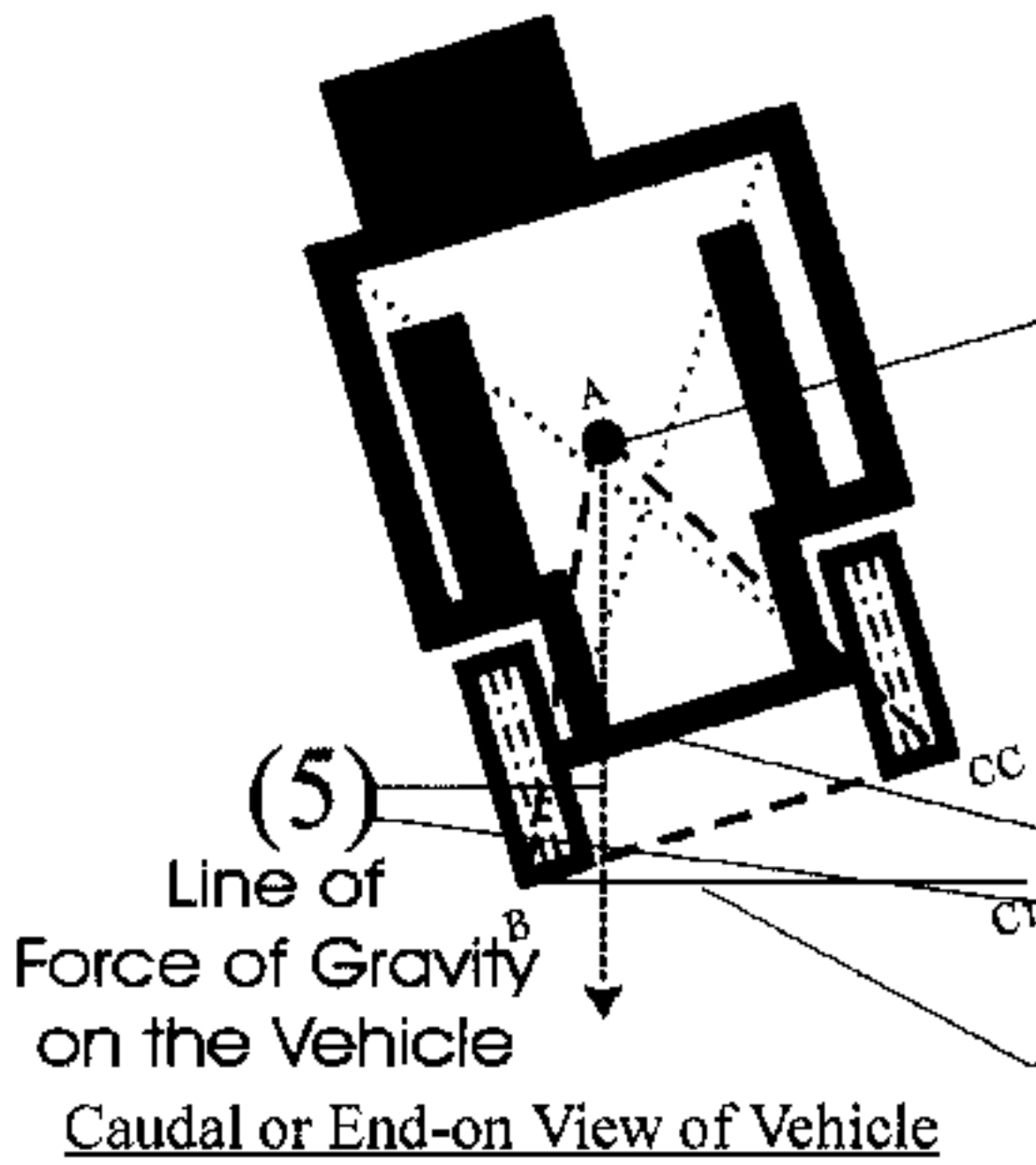


Bird's Eye View of Vehicle

DIAGRAM - A

Patent Application: ANTI-ROLLOVER DEVICE
Inventor: BIBHUTI BHUSAN BARDHAN





Bird's Eye View of Vehicle

With AROD enabled

Bird's Eye View of Vehicle

Without AROD