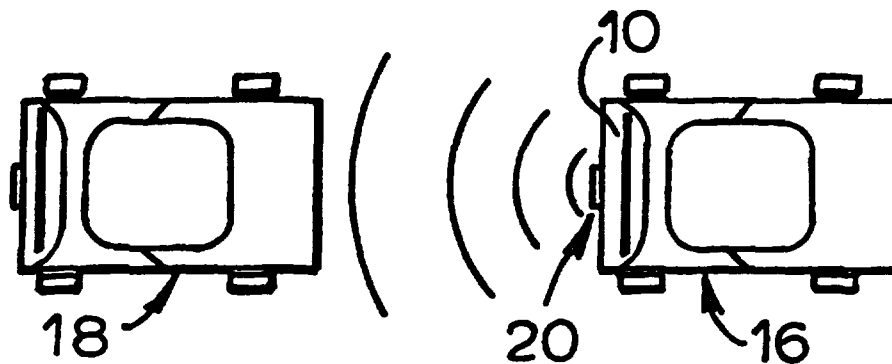


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(54) Title: SAFETY SYSTEM FOR VEHICLES

(57) Abstract

The system comprising a controller fitted to a subject vehicle (16) and sensor means (20) operable to sense a distance of separation and relative velocity of a trailing vehicle (18). Also input to the controller is a velocity signal derived from a velocity sensing means (97) determining the ground speed of the subject vehicle using a doppler radar system. The controller calculates a safety envelope and activates a visible warning device attached to the rear of the subject vehicle if the trailing vehicle penetrates the safety envelope. An enhanced safety envelope determined by adverse road conditions is also established, any incursion into the enhanced envelope resulting generally in the visible warning being at a less prominent level. If however the closing speed of the trailing vehicle exceeds a predetermined threshold, penetration of the enhanced envelope results immediately in the full warning being displayed with full prominence to the driver of the trailing vehicle. The system has application to improving the safety of road vehicles.



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SAFETY SYSTEM FOR VEHICLES

The invention relates to vehicle safety systems including warning means which provide safety information for example
5 to drivers of following vehicles.

A known warning means comprising a vehicle display system is described in WO93/15931 which provides a display system which indicates discrete ranges of deceleration of a
10 vehicle and which can also provide a display to indicate that the vehicle is stationary. All the features of that display system are incorporated in this specification especially when referring to a progressive brake warning (PBW) or vehicle stationary indicator (VSI) display. A
15 known ground speed measuring device is disclosed in WO92/01951 which uses a double horned radar device, again the teachings of that specification are incorporated herein.

20 The invention seeks, inter alia, to improve known vehicle display systems and ground speed measuring systems.

According to one aspect of the invention there is provided a safety system for vehicles comprising a controller fitted
25 in use to a subject vehicle, sensor means fitted to the subject vehicle in use and operable to sense a distance of separation and/or a relative velocity of a trailing vehicle and operable to input data signals representative thereof to the controller, velocity sensing means operable to sense
30 the velocity of the subject vehicle relative to the ground and to input to the controller a velocity signal representative thereof, wherein the controller is operable to process the received velocity signal and data signals to determine the existence of an unsafe condition, and the
35 safety system further comprising warning means controlled

by the controller and operable to warn a driver of the trailing vehicle of the existence of the unsafe condition.

5 Preferably the controller is operable to determine the existence of the unsafe condition by determining a safe distance corresponding to a safety envelope to the rear of the subject vehicle within which any incursion by the trailing vehicle constitutes the existence of an unsafe condition.

10

This provides the advantage of assisting the driver of the trailing vehicle to more accurately determine the safe distance, drivers typically tending to underestimate the safe distance in the absence of any such warning system.

15

The safe distance may be determined to be substantially the safe stopping distance of a vehicle travelling at the velocity of the trailing vehicle.

20

The safe stopping distance may be determined to be proportional to the velocity of the subject vehicle.

25 Preferably the warning is terminated after the measured value reaches a safe value. The warning can be provided by a display operably carried by the subject vehicle and positioned for viewing by the driver of the trailing vehicle, and the display can comprise a row of lights.

30 The system may comprise means for warning that the subject vehicle is stationary. The system can further comprise means for providing warning of different levels of deceleration of the subject vehicle. The warning means can comprise an orange light display for the relative speed and/or relative separation conditions and a red light display for the vehicle stationary and/or levels of
35

deceleration conditions. The relative separation and/or relative speed warning may be overridden by the level of deceleration warning.

5 The system in a preferred embodiment has a radar device having two receiver antenna which device operably communicates with a controller which is able thereby to determine the direction of motion of the vehicle, and warning means which is automatically actuated by the
10 controller to provide a warning when the vehicle moves.

A further warning means can be automatically activated when the vehicle reverses and may comprise an array of lights and/or means for generating sound.

15 The controller may be operable to determine an enhanced safe distance corresponding to an enlarged safety envelope and the warning means may be further operable to indicate a first level of warning corresponding to incursion by the
20 trailing vehicle into the enlarged safety envelope and a second level of warning which is more prominently presented to the driver than the first level of warning and corresponds to any incursion into the safety envelope.

25 The size of the enhanced safe distance and enlarged safety envelope will generally be predetermined so as to correspond to typical parameters appropriate for driving under adverse road conditions. These parameters may for
30 example be stored in a look up table allowing the parameters to be determined from the signals received by the controller together with the parameters defining the normal safety envelope.

The safety system may comprise ground condition
35 communication means operable to input to the controller a

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